

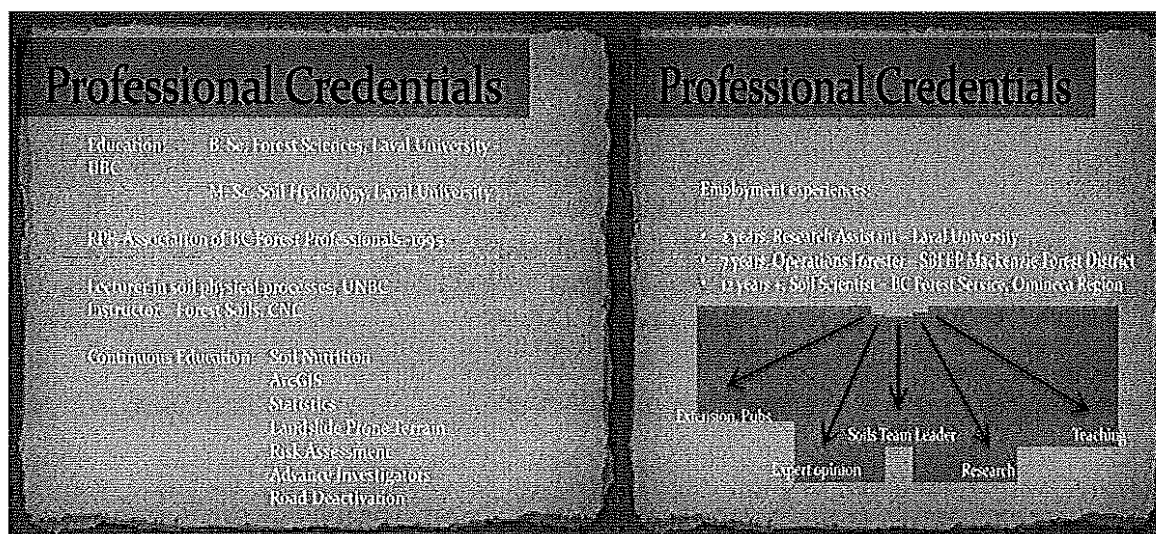
Please, find information as it relates to my work in response to CANFOR request for records.

Page 2. Sec. 4

- (a) All drafts are provided
- (b) See Ministry's Information Package
- (c) No field notes are available other than field cards already submitted
- (d) N/A

Page 2. Sec. 5.

- (a) Walkthrough inspection (or visual assessment) was carried out in accordance with the FREP protocol for Soil Resource Stewardship Monitoring: Cutblock level and Soil Conservation Surveys Guidebook.
- (b) We entered the northwest corner of the cutblock and visually inspected any survey transects that were in the vicinity in no particular order. More info in the "recommendations.htm file"
- (c) N/A
- (d) Myself (see below) and Mike Boyde (certified soil surveyor).



- (e) See Dube's report
- (f) No statistically valid approach taken; just an ocular assessment

Page 3. Sec. 6.

- (a) See FREP Protocol, FREP Report #31 and Journal of Applied Remote Sensing 7(1) paper.
- (b) Look up www.terasaurus.ca for camera specs.
- (c) Records include all trail polygons delineated (based on FREP Protocol) on the aerial photo using OziExplorer Mapping Software (.plt files). Percentages were calculated using "the Area Calculation" function in OziExplorer. The pixel resolution is 15 cm size.
- (d) Other disturbance polygons and calculations conducted in the same manner in OziExplorer (.plt files).
- (e) See above
- (f) See above
- (g) Myself and Eiji Matsuzaki (soil research assistant under my supervision)

Page 4. Sec. 7.

- (a) See FREP Technical Note #5
- (b)
 - i. see Ministry Info Package
 - ii. Myself
 - iii. Myself with Mike Boyde
 - iv. Built-in GlobasSat GPS Module in GETAC E100 Tablet PC
 - v. <1 m on average
 - vi. <1 m on average
- (c) No additional info
- (d) No additional info
- (e) Points were selected in ERSI ArcGIS (Technical Note #5)
- (f) See "Calculation sheet CAR464 only" Excel spreadsheet
- (g) Myself and Eiji Matsazuki under my supervision

Page 5. Sec. 8.

- (a) Compaction was classified based on Soil Conservation Surveys Guidebook and additional info in Dube's report.
- (b) Same as above
- (c) As per soil survey using random sampling
- (d) Shovel and trowels
- (e) No additional info
- (f) No additional info
- (g) No additional info
- (h) Compaction was classified in the same manner consistently throughout CAR464
- (i) No additional records

Page 6. Sec. 9.

See peer-reviewed FREP Technical Note #5

Page 6. Sec 10.

See Soil Conservation Surveys Guidebook

Page 6. Sec 11.

No specific records. Soil Survey Using Random Sampling has become a standard practice throughout the Province for assessing soil limits.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist, BC Forest Service

January 7, 2013

Background

After discussing with Mike Boyde of Ft. St. James C&E Field Unit, a soil conservation assessment on CANFOR block No. A33601 CP B66 CB CAR464 was carried out in 3 phases to ensure that logging practices conserved the productivity and hydrologic function of the soil as stated in *Forest Planning and Practices Regulation (FPPR, section 5)*.

Phases of assessment consisted of:

- I. Walkthrough inspection including checking out soil disturbance survey results submitted by CANFOR;
- II. Formal soil conservation survey using random point sampling method, and;
- III. Evaluation of soil disturbance using high resolution aerial photography.

As a result, within this logging block we found 3 instances of non-compliance with results and strategies described in CANFOR forest stewardship plan for soil conservation in accordance to BC forest practices legislation:

- 1) Under *FPPR* section 35 (3)(b), the amount of soil disturbance within Standard Unit (SU) A exceeded 10% of the area covered by SU A;
- 2) Under *FPPR* 35 (3)(c), the amount of soil disturbance within Roadside Work Areas (RWA's) exceeded 25% of the area covered by the RWA's, and;
- 3) Under *FPPR* 3 (1), for the purpose of section 46 (1) of the *Forest and Range Practices Act* excessive soil disturbance caused by cut-to-length logging practices directly and indirectly resulted in damage to the environment.

Interpretation and discussion of our findings from this assessment are presented below.

Results & Discussion

Cut-To-Length (CTL) operations were utilized to harvest block CAR464, in which trees are delimbed and cut to length directly at the stump and then, a forwarder transports the logs from the stumps to the road. Recognized as a gentle logging practice, CTL uses less area to move the wood than does whole-tree harvesting however CTL may result into more soil disturbance due to repeated travel on designated trails and log decking areas.

Phase I - Walkthrough inspection

During a walkthrough inspection carried out in 2010, it became apparent that throughout block CAR464, there had been harmful changes to the environment. A review of soil disturbance survey results submitted by CANFOR for CAR468 revealed that (i) my counted disturbance greatly exceeds that measured by their surveyor (based on 360 survey points, Table 1), (ii) my results point towards disturbance levels over maximum limits set out in the site plan (Appendix 1), and (iii) the survey methodology used i.e. Big Block method with grid centres was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is mostly confined to forwarding trails and RWA's. With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This will result into lower confidence limits and therefore, a false acceptance of in-compliance.

Table 1. Results of soil disturbance percentages from CANFOR report, walkthrough and random point sampling survey in the NAR and RWA's.

	CANFOR	Walkthrough	Random Point Survey
Areas	%	%	%
NAR	2.9	11.0	28.4
RWA	15.0	42.0	60.5

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic (code "E") is called when the survey point and sampling window (1m Wide x 2m Long rectangle) show evidence of compaction indicated by increased soils density (coarse platy structure), puddling or compacted deposits of slash and organic debris. Compaction was assessed by comparing soil structure at survey point to soil conditions of adjacent undisturbed areas (i.e., presenting similar soil conditions). The "natural soil condition" was checked frequently by digging to ascertain compaction during our survey.

We could not guarantee the exact location of survey points during our review was that of CANFOR. However discrepancies between their results and the results from our review were significant enough that in our opinion, compaction condition of the soil was not properly identified on this block. In one particular area, a transect line crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as "E's".

Similarly to NAR, Big Block method with grid centres was also inappropriate for surveying RWA's because it was not representative of the main disturbance pattern. Some transects ran parallel to soil disturbance almost avoiding it while others skipped the surveyed area (e.g., survey points falling outside RWA or on roads) so CANFOR did not collect enough points to get a precise estimate of the RWA soil disturbance.

Phase II – Random Point Sampling Survey

Out of 10 locations, 8 soil samples had texture with clay within the first 30 cm from ground level. Silty soil was found almost everywhere along the route (Figure 1) and therefore, was the predominant texture throughout the cutblock. The susceptibility of the site was determined Very High for compaction mainly because of the abundance of clay and lack of coarse fragments. Therefore, we recognized this site having non-sensitive soils as stated under *FPPR* section 35 (1) and so, soil disturbance limit should not exceed 10%.

A formal survey for accurate measurements using random point sampling (Appendix B) did confirm the extent to which the cutblock area was in non-compliance with the allowable limits under *FRPR* section 35 (3). With this procedure, soil disturbance was measured at GPS points or waypoints randomly located throughout the cutblock as shown on the GPS soil survey map (Figure 2).

Within the NAR, based on 94 random sample points (n=94) the soil disturbance level was 38%, which exceeds soil limits of both 5% and 10%, respectively for sensitive and non-sensitive soils. Likewise, excessive disturbed soils were present within the RWA's. Disturbance measured was 88%, which is not

within an acceptable limit of 25% for the area covered by RWA's (n=16). Repeated Machine Traffic was the most common disturbance type (E) throughout the cutblock and this should not be a surprise to anyone considering the fine-textured soils.

Excessive soil disturbance (herein defined as un-rehabilitated temporary access structure, gouges, ruts and scalps and compacted areas under *FPPR* Part 1 – Interpretation section 1) adversely altered ecosystem integrity by altering the way the soil functions on this site and therefore, the capacity of this site to grow forest has been diminished. Results from Phases I, II and III indicated that machine logging traffic lead to changes to: (i) structural properties of the soil as shown by significant amount of ruts and compaction on forwarding trails and within RWA's, (ii) natural drainage patterns that were not maintained as evidenced from ponded water along 4 channels (Figure), and (iii) almost complete loss of forest floor within RWA's that results in loss of habitat for specialist species (e.g., worms, fungi, microbes etc.) important to soil biodiversity.

and still to this day are not compatible with the original natural drainage patterns because of poor forwarding trail construction. . Thus, a person can reasonably expect that compaction will be a concern with careless logging. Repeated use of skid trails created too many ruts and disrupted natural drainage patterns near an in-block wetland (Figure 1, 0.8 ha area of wide rutted trail). In these conditions, alternate routes for skidding are a must if you want to prevent soil damage.

Phase 3. Soil disturbance digital mapping

A geo-referenced high resolution aerial photo taken after logging was completed (summer 2010) reflected well my biggest concerns in terms of soil disturbances. Ruts/tracks, waterlogged soils and bare soils did clearly stand out

This site has very low load-bearing strength materials and of the area under SU 1 which is contrary to the site plan result of 10%. Clay soils hold a large amount of water throughout the year and after prolonged rainfalls, become quickly water logged. In forests, clay soils behave the same way they do in cultivated soils or in urban settings

Conclusion

C&E Ft. St. James Unit concerns that the soil disturbance limits may have been exceeded in block were justified. As confirmed by a formal soil conservation survey, extensive soil compaction occurred when heavy weight loads compressed the soil during operations within the NAR and RWA's.

Please, do not hesitate to contact me for further discussion.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist
BC Forest Service

DRAFT

Appendix A



BCTS
BC Timber Sales
Peace-Liard

**SITE PLAN
PEACE-LIARD
BC TIMBER SALES**

Report Date 2008/06/25

A. TENURE IDENTIFICATION

ORIGINAL

CECENCE	CUTTING PERMIT	BLOCK	TRAIL	TRAIL NUMBER	LOCATION	COORDINATES
A81234		1	4080 WJ	83P048	Delate Ridge	55 28 27 / 120 35 53

B. AREA UNDER THE PLAN

CECENCE	PAS	TRAIL	TRAIL NUMBER	LOCATION	COORDINATES
165.0	1.1	8.2	28.1		118.6

C. SOIL DISTURBANCE

CECENCE	TRAIL	TRAIL NUMBER	LOCATION	COORDINATES
1	10	5	25	7 4.7%

RESULTS

D. RESULTS OR STRATEGIES

CECENCE	TRAIL	TRAIL NUMBER	LOCATION	COORDINATES
1	10	5	25	7 4.7%

E. STOCKING REQUIREMENTS

CECENCE	TRAIL	TRAIL NUMBER	LOCATION	COORDINATES
1	118.6	10020		

F. ADMINISTRATION

CECENCE	TRAIL	TRAIL NUMBER	LOCATION	COORDINATES
ORIGINAL	2008 05 26			

PRINTED NAME MURRAY WARD DATE SIGNED 2008/06/25 I certify that the work described herein fulfills standards expected of a member of the Association of British Columbia Forest Professionals, and that I did personally supervise the work.	PROFESSIONAL SIGNATURE (and SEAL)

Map attached forms an integral part of the site plan.

Province of British Columbia

Random Method for Soil Conservation Surveys

DRAFT

Draft version – July 2011

Mike Curran, PhD, PAg, Forest Science and Silviculture Team Leader
(and Research Soil Scientist) Kootenay-Boundary Region, BC Forest
Service, (Ministry of Natural Resource Operations) Nelson, BC

Page 2 of 13

Table of Contents

Introduction.....	3
Measuring Dispersed Disturbance Using a Random Approach	6
Guidelines for Stratification.....	8
Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage.....	9
Compacted Areas	.. 10

DRAFT

Page 3 of 13

Introduction

The objective set by the BC Government for forest soil management is to “without

unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils" (Forest Planning and Practices Regulation). Soil disturbance levels are limited in the FRPA to the following levels:

- (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25% of the area covered by a roadside work area (a roadside work area is defined as the area adjacent to a road where one or both of the following are carried out:
 - (i) decking, processing or loading timber;
 - (ii) piling or disposing of logging debris;

Sensitive soils are soils that, because of their slope gradient, texture class, moisture regime, or organic matter content have the following risk of displacement, surface erosion or compaction:

- (a) for the Interior, a very high hazard;
- (b) for the Coast, a high or very high hazard.

Because the MOF no longer verifies soil hazard ratings in prescriptions, a necessary first step in every survey is to determine the soil hazard rating. The rating determined by the surveyor is then used to determine which soil disturbance categories count, and the disturbance limits for the area to be surveyed.

Soil disturbance is defined as disturbance to the soil in the net area to be reforested in a cutblock because of:

- (a) temporary access structures,
- (b) gouges, ruts and scalps, or
- (c) compacted areas, but does not include the effect on the soil of rehabilitating an area in accordance with section 35 (Section 35 allows for up to 5% of the standards unit to be in excessive disturbance as long as enough of this excess disturbance is rehabilitated so that the disturbance limit is no longer exceeded).

Gouges, ruts, scalps and compacted areas are not defined except in the 2001 Soil Conservation Surveys guidebook. Temporary access structure is defined in regulation as an access structure that is not a gravel pit and does not meet the requirements of a permanent access structure which are:

Page 4 of 13

- (a) at the time of its construction, it is reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the

cutblock, or

(b) it is constructed on or through, or contains, materials unsuitable for the establishment of a commercial crop of trees and is not an excavated or bladed trail, but does not include an area that contained an access structure before rehabilitation of the area under section 36.

An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder:

(a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or

(b) is constructing a temporary access structure and both of the following apply:

(i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area;

(ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such that the agreement holder is in compliance with the limits set out in subsection (3).

Rehabilitation is discussed further in the rehabilitation section below.

There are also limits placed on the amount of permanent access structure allowed in a block. An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless

(a) there is no other practicable option on that cutblock, having regard to

(i) the size, topography and engineering constraints of the cutblock,

(ii) in the case of a road, the safety of road users, or

(iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or

(b) additional permanent access structures are necessary to provide access beyond the cutblock.

If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.

In order to assess whether or not these regulations are being addressed requires definition of terms and a method for measuring the levels of the various disturbances discussed above. This was done in the 2001 Soil Conservation Surveys Guidebook. This guidebook breaks blocks into two categories, small and large and provides two different methods of survey. The big block method was prone to giving large confidence intervals because it utilized a clustered sampling design. The clustered sampling design was a trade-off developed to allow sampling many points in a large block in an efficient manner. The small block method was to have been the preferred method, but when the

Page 5 of 13

option of stratifying blocks for compliance assessment was removed, the small block method was not applied directly to big blocks because it is excessively time consuming to

apply over a large area.

Advancements in GPS and handheld computer technology mean that options are now available to surveyors that were not available when the last guidebook was written. Sampling theory tells us that completely random sampling is the most consistently successful approach for achieving a truly representative sample of a population with the least number of points sampled. That basic principal is confirmed, in a work recently completed by Thompson et al, for the case involving sampling logging disturbance in cutblocks. The next best design is a completely square grid, which is labour intensive and requires the most of amount of walking to implement. The further the design gets from square, the easier it is to implement, but the higher the risk there is of a nonrepresentative sample if the population being sampled is not evenly distributed. Logging disturbance is typically very non-uniform in distribution and may be clustered or linear and so the orientation of non-square sampling grids in relation to disturbance is always a concern.

Until recently, layout of completely random sampling networks over large areas, using commonly available field equipment, has been very labour intensive. However, using readily available GPS technology, it is now relatively easy to take an unbiased-random sample from cutblocks. The method also has the advantage of very little layout time and less walking (especially backtracking) than would be necessary for sampling on the squarer grid layouts. In addition, the completely random design gives lower variability than grid designs for sampling logging type disturbance (Thompson et al??) and determination of confidence intervals is based on binomial distributions. If more power is needed for a particular survey, it is a simple matter to add more random points and resurvey the area without having to worry about creating new grids or infilling grids. For measuring roads, landings, trails and other distinct features within a block, relatively cheap digital imagery can be used for highly accurate and inexpensive assessment of these features, though the older ground based approaches used in the Soil Conservations Surveys Guidebook, can still be used. A high resolution digital image makes a very good base map for the random survey and wherever possible, the use of these images is encouraged.

This guide book outlines the general procedure for estimating dispersed disturbance levels in cutblocks of all sizes using a random sampling approach. It also describes a method for measuring other disturbance features from digital air photos.

utilizes relatively commonly available technology. The broad steps are as follows:

1. Based on the estimated disturbance levels the number of points that need to be sampled to achieve the desired confidence interval is estimated. For a typical survey of a block with 5% to 10% disturbance, 200 points gives a one sided 90% confidence interval of about 3 percentage points. This means that blocks will be called excessively disturbed if the measured disturbance exceeds 13% for a 10% disturbance limit block or 8% for a 5% limit block. In other words, with a sample size of 200 points on 10% disturbance limit blocks, if the number of disturbed points equals or exceeds 26 counted points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. If the number of disturbed points in a 200 point survey, of a 5% disturbance limit block, equals or exceeds 16 points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. It should not be necessary to survey more than 200 points in a block (or stratum), but if a block (or stratum) is highly disturbed, it may be feasible to survey fewer points. Appendix B shows how to determine confidence intervals for surveys of other numbers of survey points or other levels of disturbance. The higher the disturbance level, the fewer points are needed in the total survey to establish with confidence that the block is over the limit. The size of the block has no bearing on the number of points, but unavoidably, the larger the block, the more time it takes to survey.
2. An appropriate number of random waypoints are generated. There may be other ways to do this, but one method involves creating a shape file of the NAR (survey stratum minus roads, landings or other features which are not part of the NAR). A multipoint polygon is generated in Arcmap using a Random Point-in-Polygon Generation Program (VBA Macro) (Sawada, 2002). The multipoint polygon is converted to waypoints in OziExplorer or other mapping software that has this function.
3. The waypoints and a base map are downloaded onto a GPS unit that is set up to beep when the surveyor passes within 1 metre of the waypoint. The surveyor navigates to the waypoint and the exact observation point is indicated by the precise moment at which the GPS beeps. The observation point is fixed exactly at that moment by some arbitrary locator of the observation point. For example the observation point could be deemed to be located directly below one corner of the GPS unit or at the end of the surveyor's right toe, wherever those are at the moment the GPS beeps. The same locator should be used throughout a survey.
4. The survey progresses by using the built in navigation aids in the GPS to move from waypoint to waypoint. The surveyor is free to select the most efficient route through the points.
5. The data is entered directly into the GPS unit.
6. All of the points generated for a particular survey must be surveyed, i.e. one cannot survey points in a portion of the block and then conclude that the surveyed

Page 7 of 13

area is or is not in compliance. Since disturbance within a cutblock is usually distributed unevenly, the entire set of points must be surveyed before making

judgements about the level of disturbance. However, it is possible to initially do a complete survey with a smaller number of points and if that survey does not have sufficient power to give a clear result, a new set of random points can be generated for the same area and surveyed and the results combined with the previous survey to create a more powerful survey.

7. When the survey is complete, the waypoint file is converted to a spreadsheet file, and the calculations are made on the spreadsheet.

Many different configurations of hardware and software can be used to achieve a random survey and it is not possible to cover all those in this guidebook. Presented in Appendix A is a detailed protocol for a particular set of software and hardware. Potential surveyors who wish to use other software/hardware combinations may find some useful tips in this guidance, but they are not required to use the equipment combination described. The fully random survey needs to meet the following criteria:

1. The observation points must be randomly generated with any point in the survey area having a chance to be surveyed.
2. When the actual observation point is located in the field, it must be selected by following an unbiased and precise rule, such as directly under the GPS at the exact moment the GPR beeps (or some other confining trigger). The surveyor must not adjust the observation point in any way, nor have leeway to select the sampling point from within a broader possible sampling area, e.g., it would be unacceptable to simply select the sampling point from anywhere in front of the surveyor at the point the GPS beeps.
3. When the lower one-sided 90% confidence limit for the measured disturbance level is greater than the disturbance limit, the block is counted as over. Whatever size of survey indicates the block is over the lower 90% confidence limit, is acceptable. For surveys where the disturbance limit is greater than the one-sided 90% lower confidence limit, in order for the block to be considered under the disturbance limit- the lower one-sided 90% confidence interval must be 3 percentage units or less, (see Point 4 below). This is to address the situation where a surveyor might choose to survey fewer points because the disturbance is greatly in excess of the limit. Surveying fewer points means that the confidence interval could be larger if the surveyor overestimated the level of disturbance. This situation would make it more likely that the disturbance limit of a block will lie in the ambiguous zone of the confidence interval (between the lower confidence limit and the measured level of disturbance). Therefore, for blocks with disturbance close to the limit, the surveyor must sample sufficient points to make the lower confidence interval $\leq 3\%$ points. In cases where the measured level of disturbance is $\leq 3\%$, the upper 90% confidence interval must be $\leq 3\%$ points. For disturbance levels greatly above or below the limits, a survey could have fewer than 200 points and still be valid as long as the disturbance limit still fell below the 90% confidence interval (i.e., the block is counted as over). For example, if the actual level of disturbance on a block with a 10% disturbance limit

Page 8 of 13

was 30%, it would take fewer points to establish if the block was in compliance (see below). If the surveyor chooses to do a smaller survey based on an

assumption about the disturbance level that turns out to be incorrect and as a result the outcome of the survey is ambiguous, the surveyor can simply generate another set of random waypoints and add to the survey.

There are normally financial constraints to doing large surveys and a 200 point survey with one-sided confidence interval of around 3 percentage points for disturbance levels in the range of the normal limits (5 to 10%) will give an acceptable level of precision. This means that before a block is called excessively disturbed, the measured disturbance levels will exceed 13% or 8% for the 10% and 5% limits respectively. If a licensee finds themselves in a situation where the lower confidence limit from the survey is slightly higher than the disturbance limit, they can increase the survey size to any size they deem fit to get a more precise measure of disturbance. However, it should be remembered that the most probable level of disturbance is near the mean level determined by the survey. When a block is marginally over the limit the most likely outcome is that more points will narrow the confidence interval around a point close to the original mean.

4. Each point in a stratum or block being surveyed must have the same chance of being sampled. This means that it is not acceptable to survey some arbitrarily chosen subset of the points in a set of random waypoints (e.g. $\frac{1}{2}$ the block) and then stop because it appears the survey will be over or under. However, it is acceptable to do a survey with fewer sample points based on an estimation of a level of disturbance within the block that suggests actual disturbance levels might be considerably greater (>2 times) or less (<0.5 times) than the limit. If a survey with a smaller number of points gives a 90% one-sided-lower confidence limit greater than the disturbance limit, then the block is over. If the disturbance limit is greater than the 90% one-sided-lower-confidence limit and the lower (or upper if the mean is small) confidence interval is $\leq 3\%$ points, then the block is not over.

5. While surveys must be conducted and reported based on entire standards units, cutblock, roadside work area or area of inordinate disturbance as the particular regulatory framework dictates, it is still possible to stratify these survey areas for the purposes of improving the efficiency of the survey, as long as every point in the area being surveyed, has a chance of being surveyed. The techniques for stratifying to improve the efficiency of a survey are described below.

Guidelines for Stratification

Under the Forest Practice Code there was a provision to allow enforcement of soil disturbance limits on areas as small as one hectare. Under FRPA, enforcement of soil disturbance limits is to take place on the NAR of the cutblock. The size of the area on which enforcement can take place is a separate issue from stratifying to improve the efficiency of a survey. A stratified random sample will still report the disturbance level for the entire legal unit that is surveyed, however, not every portion of that unit need be

sampled at the same intensity. The main reason for stratifying to survey is to improve the efficiency of the survey. If, for example, a large portion of the area to be surveyed has

very little disturbance (<2%) and a small proportion of the area (<20% of the area) has high disturbance (>15%), then it is more efficient to sample the heavily compacted area more intensely and the less disturbed area less intensely. This saves considerably on the amount of walking that needs to be done and if one stratum is very lightly disturbed (<2%), there may also be an increase in the power of the survey. If you cannot delineate strata with greatly different levels of disturbance, there is no advantage to stratifying. Strata need to be delineated before the survey begins and the most efficient way to do this is from a high resolution image such as those used for the soils FREP process. Such images can be flown specifically for blocks and this possibility should be considered for blocks where legal action is highly likely. The images also allow precise estimates of area in roads, landings, roadside work area, trails or other features in a block. Strata can also be delineated on a sketch map after an on-site inspection.

To stratify, first the amount of disturbance within each stratum is estimated. For example a stratum could be 10 hectares in size and contain approximately 25% disturbance so the amount of disturbance is $10 \text{ ha} \times 0.25 = 2.5 \text{ ha}$. If another stratum is 50 ha in size but contains only 1% disturbance, then the amount of disturbance in this stratum is $50 \text{ ha} \times 0.01 = 0.5 \text{ ha}$. The proportions of disturbance in each stratum are estimates only and do not have to be determined by measurements but no stratum should ever have zero points. The practical lower limit for estimated disturbance in a stratum is probably around 0.5%. To assign the number of survey points to each stratum the formula is:

$$\text{Points Per Stratum} = \frac{\text{Area Disturbed Per Stratum} \times \text{Total Survey Points}}{\text{Total Area Disturbed}}$$

For our example, to find how many points to put in the 10 ha stratum, the calculation is as follows:

$$\text{Points in 10 ha Stratum} = \frac{2.5 \text{ ha} \times 200 \text{ points}}{2.5 \text{ ha} + 0.5 \text{ ha}} = 167 \text{ points}$$

This leaves 33 points in the big/low disturbance stratum. Surveying will go much more quickly because most of the points are in the small stratum and much closer together. In this case, because the disturbance in the large stratum is so low, there is actually a narrowing of the confidence interval- in other words this survey is more powerful than if the points were randomly and evenly distributed throughout the entire area surveyed.

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage

Roadside work areas, inordinate disturbance and compacted areas are all special survey cases. Roadside work areas have a higher disturbance limit- 25% and so must be tallied

separately from the rest of the NAR. The higher disturbance limit in the roadside work area means that disturbance can be measured with the same confidence with a smaller

number of points. Therefore, we recommend using only 100 points in the RWA. Inordinate Disturbance, Areas of Compacted Soil, Soils That Have Sustained Damage and compacted areas are all types of disturbance that may require rehabilitation if they are identified by a block inspection, or during a survey. The provision for rehabilitating these areas are contained in the Forest Practises Code or FRPA and their supporting documents.

Compacted Areas

The Forest Planning and Practises Regulation (under FRPA) requires the rehabilitation of areas of compacted soil:

5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

(a) the area of compacted soil

(i) was created by activities of the holder,

(ii) is within the net area to be reforested, and

(iii) is a minimum of 1 ha in size;

What constitutes an area of compacted soil under this section of FRPA is not defined but any areas greater than 1ha in size that have more than 25% disturbance, should be documented during the survey for consideration as compacted areas. The potential compacted area should be delineated separately

The provisions for rehabilitating compacted areas and inordinate disturbance are contained in the Forest Practises Code.

47(7) A person who, within an area under a site plan prepared under section 21.1 or silviculture prescription, constructs or modifies a bladed or excavated trail or a corduroyed trail or creates a compacted area, must rehabilitate the area in accordance with the regulations and standards.

In this case, the compacted area refers to an area >100m² and >5m wide that is 100% compacted. For blocks under the CODE or transition CODE, any areas

Inordinate Disturbance

45(3) A person must not carry out a forest practice if he or she knows or should reasonably know that, due to weather conditions or site factors, the carrying out of the forest practice may result, directly or indirectly, in

(a) slumping or sliding of land,

(b) inordinate soil disturbance, or

(c) other significant damage to the environment.

(4) A person who contravenes subsection (1) or (3) must

(a) stop the forest practice in the area affected,

- (b) prevent any further damage to the environment,*
- (c) promptly notify the district manager, and*
- (d) take any remedial measures that the district manager requires*

The Timber Harvesting and Silviculture Practices Regulation defines inordinate disturbance as follows:

53 (1) For the purposes of section 45 (3) (b) of the Act, “**inordinate soil disturbance**” means soil disturbance that

(a) results in the district manager requiring rehabilitation of soil under section 48

(1) of the Act, or

(b) exceeds the soil disturbance limit specified in section 31 of this regulation.

The Forest Practices Code Act of British Columbia section 48(1) reads as follows:

48. (1) If the district manager determines that the area under an operational plan has sustained damage as a result of a forest practice, the district manager may, by written notice, direct the person responsible for the damage to take measures and to pay costs that are necessary to rehabilitate the area to the satisfaction of the district manager and the person must comply with the notice.

The term “sustained damage” is not defined anywhere but the surveyor should provide data to help make the determination of damage. Any areas greater than 1ha in size that have more than 25% disturbance or any areas in the NAR that are unlikely to sustain tree growth, should be documented in the survey.

Steps for determining confidence intervals and number of points required.

Checking soil hazard ratings

RWA, Inordinate Disturbance, Compacted areas

Regulatory Framework.

structures in accordance with the results or strategies specified in the forest stewardship plan or by

, (a), removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,

, (b), de-compacting compacted soils, and

, (c), returning displaced surface soils, retrievable side-cast and berm materials.

, (4) , If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must

, (a), place woody debris on the exposed soils, or

, (b), revegetate the exposed mineral soils.

, (5) , The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

, (a), the area of compacted soil

, (i), was created by activities of the holder,

, (ii), is within the net area to be reforested, and

, (iii), is a minimum of 1 ha in size;

, (b), the holder has not exceeded the limits described in subsection (3);

, (c), rehabilitation would, in the opinion of the minister,

, (i), materially improve the productivity and the hydrologic function of the soil within the area, and

, (ii), not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act.

, (6) , An agreement holder who rehabilitates an area under subsection (4) or (5) must

, (a), remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area,

, (b), de-compact compacted soils, and

, (c), return displaced surface soils, retrievable side-cast and berm materials.

, (7) , If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must

, (a), place woody debris on the exposed soils, or

, (b), revegetate the exposed mineral soils.

Background

After discussing with Mike Boyde of Ft. St. James C&E Field Unit, a soil conservation assessment on CANFOR block No. A33601 CP B66 CB CAR464 was carried out in 3 phases to ensure that logging practices conserved the productivity and hydrologic function of the soil as stated in *Forest Planning and Practices Regulation (FPPR, section 5)*

Phases of assessment consisted of:

- I. Walkthrough inspection in CANFOR;
 - II. Evaluation of soil disturbance; 2012-10-02
 - III. Formal soil conservation survey; 2012-10-02
- ance survey results submitted by photography, and; ng method.

As a result, within this logging block, there were instances of non-compliance with results and strategies described in CANFOR forest stewardship plan for soil conservation in accordance to BC forest practices legislation:

- 1) Under *FPPR* section 35 (3)(b), the amount of soil disturbance within Standard Unit (SU) A exceeded 10% of the area covered by SU A;
- 2) Under *FPPR* 35 (3)(c), the amount of soil disturbance within Roadside Work Areas (RWA's) exceeded 25% of the area covered by the RWA's, and;
- 3) Under *FPPR* 3 (1), for the purpose of section 46 (1) of the *Forest and Range Practices Act* excessive soil disturbance caused by cut-to-length logging practices directly and indirectly resulted in damage to the environment.

Interpretation and discussion of our findings from this assessment are presented below.

Results & Discussion

Cut-To-Length (CTL) operations were utilized to harvest block CAR464 (Figure 1), in which trees are delimbed and cut to length directly at the stump and then, a forwarder transports the logs from the stumps to the road. Recognized as a gentle logging practice, CTL uses less area to move the wood than does whole-tree harvesting however CTL may result into more soil disturbance due to repeated travel on designated trails and log decking areas.

Phase I - Walkthrough inspection

During a walkthrough inspection carried out in 2010, it became apparent that throughout block CAR464, there had been harmful changes to soil. A review of soil disturbance survey results submitted by CANFOR for CAR468 revealed that (i) my counted disturbance greatly exceeds that measured by their surveyor (based on re-surveying 360 survey points by CANFOR, Table 1), (ii) my results point towards disturbance levels over maximum limits set out in the site plan (Appendix 1), and (iii) the survey methodology used i.e. Big Block method with grid centres was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is mostly confined to forwarding trails and RWA's. With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This will result into lower confidence limits and therefore, a false acceptance of in-compliance.

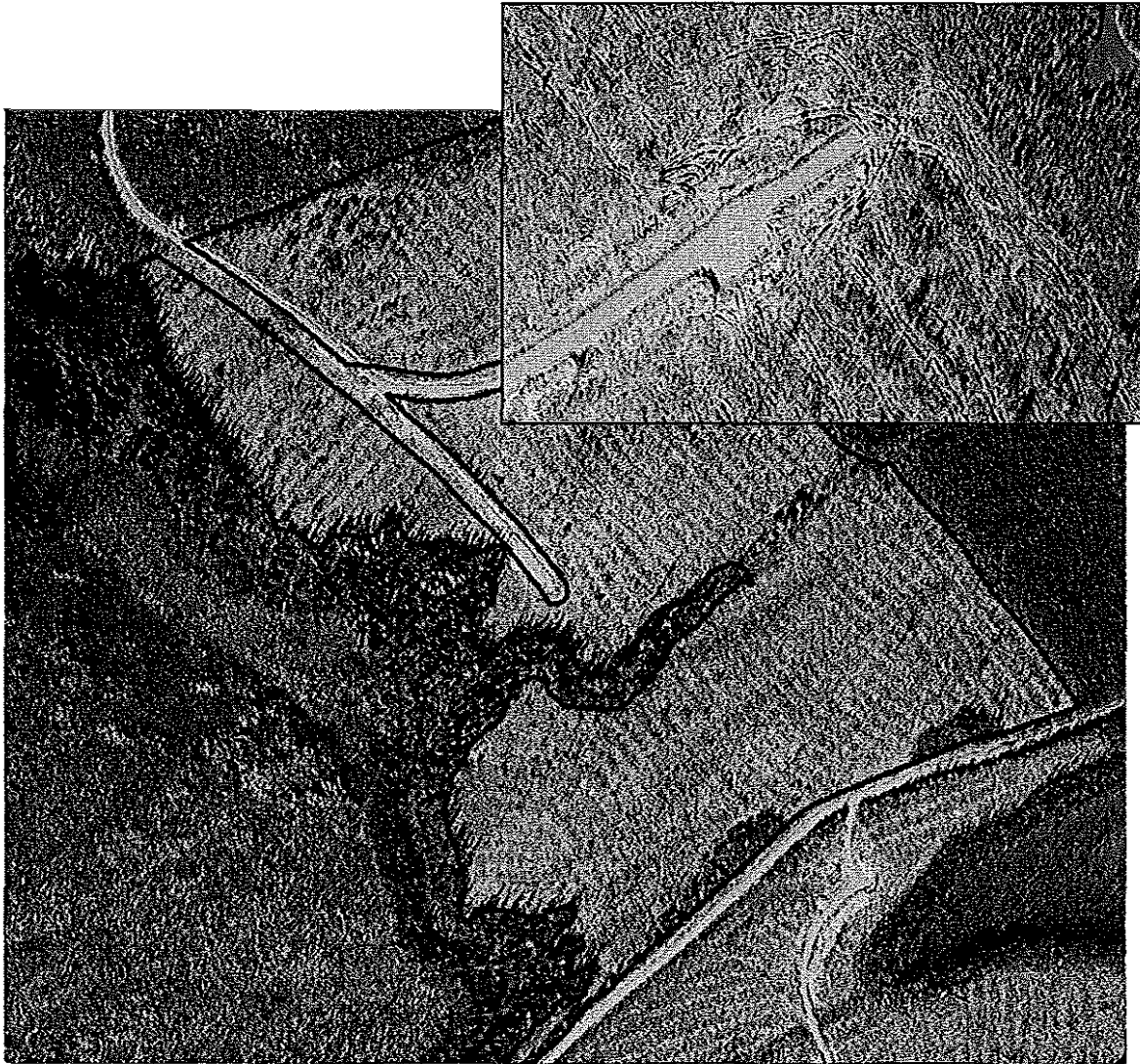


Figure 1. Aerial Photography of block CAR464 (15 cm pixel size). Insert is negative display of

Table 1. Results of soil disturbance percentages from CANFOR report, walkthrough and random point sampling survey in the NAR and RWA's.

	CANFOR	Walkthrough	Random Point Sampling Survey
Areas	%	%	%
NAR	2.9	11.0	25.5
RWA	15.0	42.0	60.5

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic

(code "E") is called when the survey point and sampling window (1m Wide x 2m Long rectangle) show evidence of compaction indicated by increased soils density (Figure 2, coarse blocky/platy structure), puddling or compacted deposits of slash and organic debris. Compaction was assessed by comparing soil structure at survey point to soil conditions of adjacent undisturbed areas (i.e., at similar soil water content). The "natural soil condition" was checked frequently by digging to ascertain compaction during our survey.



Figure 2. Fluffy and loose soil turned into stone like material after trafficking at block CAR464

We could not guarantee the exact location of survey points during our review was that of CANFOR. However discrepancies between their results and the results from our review were large enough that in our opinion, compaction condition of the soil was not properly identified on this block. In one particular area, a transect line crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as "E's".

Similarly to NAR, Big Block method with grid centres was also inappropriate for surveying RWA's because it was not representative of the main disturbance pattern. Some transects ran parallel to soil disturbance almost avoiding it while others skipped the surveyed area (e.g., survey points falling outside RWA or on roads) so CANFOR did not collect enough points to get a reliable estimate of the RWA soil disturbance.

Phase II. Soil disturbance digital mapping

A geo-referenced high resolution aerial photo taken after logging was completed reflected well my biggest concerns in terms of soil disturbances. Ruts/tracks, waterlogged soils and bare soils did clearly stand out in trails and along in-block roads (Figure 1, insert). Where changes to soil was evident, together forwarding trails, RWA's and Permanent Access Structure (PAS) occupied more than 35% (or 12.7 ha) of the total block area (Table 2). Stephane :To expand...

Table 2. The area proportion of NAR and PAS to total cutblock area. NAR contains RWA's, forwarding trails and residual strips.

Block No.	Total cutblock area (ha)	NAR (%)			PAS (%)
		RWA	Trails	Residual strips	
464	36.0	9.4	23.0	64.8	2.8

Phase III – Random Point Sampling Survey

Silt, as determined by the “Hand Test” and relatively few coarse fragments were found almost everywhere in the upper 30 cm of mineral soil along the walk. Although less cohesive than clay, silt-type soil has very little load bearing capacity and is highly susceptible to compaction when wet. Under *FRPR* section 35(1), soil disturbance levels should not exceed, respectively 10% in the NAR and 25% for RWA's in these conditions.

A soil conservation survey based on random point sampling provided statistically valid measurements (more about the survey method in Appendix B) and did confirm the extent to which the block area was in non-compliance with the allowable limits under *FRPR* section 35(3). With this procedure, soil disturbance was measured at GPS points or waypoints randomly located throughout the block as shown on the GPS soil survey map (Figure 3).



Figure 3. GPS soil survey map showing results....

Within the NAR, based on 109 random sample points ($n=109$) the soil disturbance level was 24.8% (Table 1), which exceeds the soil limit of 10%. Likewise, excessive disturbed soils were present within the RWA's. Disturbance measured was 60.5%, which was not within an acceptable limit of 25% for the area covered by RWA's ($n=109$). Repeated Machine Traffic was the most common disturbance type (E)

across the site and this should not be a surprise to anyone considering the presence of finer-textured soils and weather conditions at the time. (Mike, when was this block harvested? Be precise)

Excessive soil disturbance (herein defined as un-rehabilitated temporary access structure, gouges, ruts and scalps and compacted areas under *FPPR* Part 1 – Interpretation section 1) adversely altered ecosystem integrity by altering the way the soil functions on this site and therefore, the capacity of this site to grow forest has been diminished. Results from Phases I, II and III indicated that machine logging traffic lead to changes to: (i) structural properties of the soil as shown by significant amount of ruts and compaction on forwarding trails and within RWA's, (ii) natural drainage patterns that were not maintained as evidenced from ponded water along 4 channels (Figures 4 & 5), and (iii) almost complete loss of forest floor within RWA's that results in loss of habitat for specialist species (e.g., worms, fungi, microbes etc.) important to soil biodiversity.



Figure 4.



Figure 5.

and still to this day are not compatible with the original natural drainage patterns because of poor forwarding trail construction. . Thus, a person can reasonably expect that compaction will be a concern with careless logging. Repeated use of skid trails created too many ruts and disrupted natural drainage patterns near an in-block wetland (Figure 1, 0.8 ha area of wide rutted trail). In these conditions, alternate routes for skidding are a must if you want to prevent soil damage.

This site has very low load-bearing strength materials and of the area under SU 1 which is contrary to the site plan result of 10%. Clay soils hold a large amount of water throughout the year and after prolonged rainfalls, become quickly water logged. In forests, clay soils behave the same way they do in cultivated soils or in urban settings

Conclusion

C&E Ft. St. James Unit concerns that the soil disturbance limits may have been exceeded in block were justified. As confirmed by a formal soil conservation survey, extensive soil compaction occurred when heavy weight loads compressed the soil during operations within the NAR and RWA's.

Please, do not hesitate to contact me for further discussion.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist
BC Forest Service

DRAFT

Appendix A



Report Date 2008/06/25

ORIGINAL

B. AREA UNDER THE PLAN

Applicable Forest Stewardship Plan:

This block has been approved under BC Timber Sales Dawson Creek FDP 2001-2005, and now is in a state of transition meeting FRPA Sec. 195.1. The objectives presented in this Site Plan are consistent with those outlined in Part 4 of the Forest Planning and Practices Regulation.

RESULTS

D. RESULTS OR STRATEGIES

E. STOCKING REQUIREMENTS

F. ADMINISTRATION

PRINTED NAME	PROF'S SIGNATURE and SEAL
MURRAY WARD	
DATE SIGNED	
2009/06/25	
I certify that the work described herein fulfills standards expected of a member of the Association of British Columbia Forest Professionals, and that I did personally supervise the work.	

Map attached forms an integral part of the site plan.

Province of British Columbia

Random Method for Soil Conservation Surveys

Draft version – July 2011

Mike Curran, PhD, PAg, Forest Science and Silviculture Team Leader
(and Research Soil Scientist) Kootenay-Boundary Region, BC Forest
Service, (Ministry of Natural Resource Operations) Nelson, BC

Page 2 of 13

Table of Contents

Introduction.....	3
Measuring Dispersed Disturbance Using a Random Approach	6
Guidelines for Stratification.....	8
Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted	
Areas, Soils That Have Sustained Damage.....	9
Compacted Areas	.. 10

DRAFT

Page 3 of 13

Introduction

The objective set by the BC Government for forest soil management is to “without

unduly reducing the supply of timber from British Columbia's forests, to conserve the productivity and the hydrologic function of soils" (Forest Planning and Practices Regulation). Soil disturbance levels are limited in the FRPA to the following levels:

- (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25% of the area covered by a roadside work area (a roadside work area is defined as the area adjacent to a road where one or both of the following are carried out:
 - (i) decking, processing or loading timber;
 - (ii) piling or disposing of logging debris;

Sensitive soils are soils that, because of their slope gradient, texture class, moisture regime, or organic matter content have the following risk of displacement, surface erosion or compaction:

- (a) for the Interior, a very high hazard;
- (b) for the Coast, a high or very high hazard.

Because the MOF no longer verifies soil hazard ratings in prescriptions, a necessary first step in every survey is to determine the soil hazard rating. The rating determined by the surveyor is then used to determine which soil disturbance categories count, and the disturbance limits for the area to be surveyed.

Soil disturbance is defined as disturbance to the soil in the net area to be reforested in a cutblock because of:

- (a) temporary access structures,
- (b) gouges, ruts and scalps, or
- (c) compacted areas, but does not include the effect on the soil of rehabilitating an area in accordance with section 35 (Section 35 allows for up to 5% of the standards unit to be in excessive disturbance as long as enough of this excess disturbance is rehabilitated so that the disturbance limit is no longer exceeded).

Gouges, ruts, scalps and compacted areas are not defined except in the 2001 Soil Conservation Surveys guidebook. Temporary access structure is defined in regulation as an access structure that is not a gravel pit and does not meet the requirements of a permanent access structure which are:

Page 4 of 13

- (a) at the time of its construction, it is reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the

cutblock, or

(b) it is constructed on or through, or contains, materials unsuitable for the establishment of a commercial crop of trees and is not an excavated or bladed trail, but does not include an area that contained an access structure before rehabilitation of the area under section 36.

An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder:

(a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or

(b) is constructing a temporary access structure and both of the following apply:

(i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area;

(ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such that the agreement holder is in compliance with the limits set out in subsection (3).

Rehabilitation is discussed further in the rehabilitation section below.

There are also limits placed on the amount of permanent access structure allowed in a block. An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless

(a) there is no other practicable option on that cutblock, having regard to

(i) the size, topography and engineering constraints of the cutblock,

(ii) in the case of a road, the safety of road users, or

(iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or

(b) additional permanent access structures are necessary to provide access beyond the cutblock.

If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.

In order to assess whether or not these regulations are being addressed requires definition of terms and a method for measuring the levels of the various disturbances discussed above. This was done in the 2001 Soil Conservation Surveys Guidebook. This guidebook breaks blocks into two categories, small and large and provides two different methods of survey. The big block method was prone to giving large confidence intervals because it utilized a clustered sampling design. The clustered sampling design was a trade-off developed to allow sampling many points in a large block in an efficient manner. The small block method was to have been the preferred method, but when the

apply over a large area.

Advancements in GPS and handheld computer technology mean that options are now available to surveyors that were not available when the last guidebook was written. Sampling theory tells us that completely random sampling is the most consistently successful approach for achieving a truly representative sample of a population with the least number of points sampled. That basic principal is confirmed, in a work recently completed by Thompson et al, for the case involving sampling logging disturbance in cutblocks. The next best design is a completely square grid, which is labour intensive and requires the most of amount of walking to implement. The further the design gets from square, the easier it is to implement, but the higher the risk there is of a nonrepresentative sample if the population being sampled is not evenly distributed. Logging disturbance is typically very non-uniform in distribution and may be clustered or linear and so the orientation of non-square sampling grids in relation to disturbance is always a concern.

Until recently, layout of completely random sampling networks over large areas, using commonly available field equipment, has been very labour intensive. However, using readily available GPS technology, it is now relatively easy to take an unbiased-random sample from cutblocks. The method also has the advantage of very little layout time and less walking (especially backtracking) than would be necessary for sampling on the squarer grid layouts. In addition, the completely random design gives lower variability than grid designs for sampling logging type disturbance (Thompson et al??) and determination of confidence intervals is based on binomial distributions. If more power is needed for a particular survey, it is a simple matter to add more random points and resurvey the area without having to worry about creating new grids or infilling grids. For measuring roads, landings, trails and other distinct features within a block, relatively cheap digital imagery can be used for highly accurate and inexpensive assessment of these features, though the older ground based approaches used in the Soil Conservations Surveys Guidebook, can still be used. A high resolution digital image makes a very good base map for the random survey and wherever possible, the use of these images is encouraged.

This guide book outlines the general procedure for estimating dispersed disturbance levels in cutblocks of all sizes using a random sampling approach. It also describes a method for measuring other disturbance features from digital air photos.

Measuring Dispersed Disturbance Using a Random Approach

There may be many ways to achieve a random survey- this manual outlines one that is

utilizes relatively commonly available technology. The broad steps are as follows:

1. Based on the estimated disturbance levels the number of points that need to be sampled to achieve the desired confidence interval is estimated. For a typical survey of a block with 5% to 10% disturbance, 200 points gives a one sided 90% confidence interval of about 3 percentage points. This means that blocks will be called excessively disturbed if the measured disturbance exceeds 13% for a 10% disturbance limit block or 8% for a 5% limit block. In other words, with a sample size of 200 points on 10% disturbance limit blocks, if the number of disturbed points equals or exceeds 26 counted points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. If the number of disturbed points in a 200 point survey, of a 5% disturbance limit block, equals or exceeds 16 points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. It should not be necessary to survey more than 200 points in a block (or stratum), but if a block (or stratum) is highly disturbed, it may be feasible to survey fewer points. Appendix B shows how to determine confidence intervals for surveys of other numbers of survey points or other levels of disturbance. The higher the disturbance level, the fewer points are needed in the total survey to establish with confidence that the block is over the limit. The size of the block has no bearing on the number of points, but unavoidably, the larger the block, the more time it takes to survey.
2. An appropriate number of random waypoints are generated. There may be other ways to do this, but one method involves creating a shape file of the NAR (survey stratum minus roads, landings or other features which are not part of the NAR). A multipoint polygon is generated in Arcmap using a Random Point-in-Polygon Generation Program (VBA Macro) (Sawada, 2002). The multipoint polygon is converted to waypoints in OziExplorer or other mapping software that has this function.
3. The waypoints and a base map are downloaded onto a GPS unit that is set up to beep when the surveyor passes within 1 metre of the waypoint. The surveyor navigates to the waypoint and the exact observation point is indicated by the precise moment at which the GPS beeps. The observation point is fixed exactly at that moment by some arbitrary locator of the observation point. For example the observation point could be deemed to be located directly below one corner of the GPS unit or at the end of the surveyor's right toe, wherever those are at the moment the GPS beeps. The same locator should be used throughout a survey.
4. The survey progresses by using the built in navigation aids in the GPS to move from waypoint to waypoint. The surveyor is free to select the most efficient route through the points.
5. The data is entered directly into the GPS unit.
6. All of the points generated for a particular survey must be surveyed, i.e. one cannot survey points in a portion of the block and then conclude that the surveyed

Page 7 of 13

area is or is not in compliance. Since disturbance within a cutblock is usually distributed unevenly, the entire set of points must be surveyed before making

judgements about the level of disturbance. However, it is possible to initially do a complete survey with a smaller number of points and if that survey does not have sufficient power to give a clear result, a new set of random points can be generated for the same area and surveyed and the results combined with the previous survey to create a more powerful survey.

7. When the survey is complete, the waypoint file is converted to a spreadsheet file, and the calculations are made on the spreadsheet.

Many different configurations of hardware and software can be used to achieve a random survey and it is not possible to cover all those in this guidebook. Presented in Appendix A is a detailed protocol for a particular set of software and hardware. Potential surveyors who wish to use other software/hardware combinations may find some useful tips in this guidance, but they are not required to use the equipment combination described. The fully random survey needs to meet the following criteria:

1. The observation points must be randomly generated with any point in the survey area having a chance to be surveyed.
2. When the actual observation point is located in the field, it must be selected by following an unbiased and precise rule, such as directly under the GPS at the exact moment the GPR beeps (or some other confining trigger). The surveyor must not adjust the observation point in any way, nor have leeway to select the sampling point from within a broader possible sampling area, e.g., it would be unacceptable to simply select the sampling point from anywhere in front of the surveyor at the point the GPS beeps.
3. When the lower one-sided 90% confidence limit for the measured disturbance level is greater than the disturbance limit, the block is counted as over. Whatever size of survey indicates the block is over the lower 90% confidence limit, is acceptable. For surveys where the disturbance limit is greater than the one-sided 90% lower confidence limit, in order for the block to be considered under the disturbance limit- the lower one-sided 90% confidence interval must be 3 percentage units or less, (see Point 4 below). This is to address the situation where a surveyor might choose to survey fewer points because the disturbance is greatly in excess of the limit. Surveying fewer points means that the confidence interval could be larger if the surveyor overestimated the level of disturbance. This situation would make it more likely that the disturbance limit of a block will lie in the ambiguous zone of the confidence interval (between the lower confidence limit and the measured level of disturbance). Therefore, for blocks with disturbance close to the limit, the surveyor must sample sufficient points to make the lower confidence interval $\leq 3\%$ points. In cases where the measured level of disturbance is $\leq 3\%$, the upper 90% confidence interval must be $\leq 3\%$ points. For disturbance levels greatly above or below the limits, a survey could have fewer than 200 points and still be valid as long as the disturbance limit still fell below the 90% confidence interval (i.e., the block is counted as over). For example, if the actual level of disturbance on a block with a 10% disturbance limit

Page 8 of 13

was 30%, it would take fewer points to establish if the block was in compliance (see below). If the surveyor chooses to do a smaller survey based on an

assumption about the disturbance level that turns out to be incorrect and as a result the outcome of the survey is ambiguous, the surveyor can simply generate another set of random waypoints and add to the survey.

There are normally financial constraints to doing large surveys and a 200 point survey with one-sided confidence interval of around 3 percentage points for disturbance levels in the range of the normal limits (5 to 10%) will give an acceptable level of precision. This means that before a block is called excessively disturbed, the measured disturbance levels will exceed 13% or 8% for the 10% and 5% limits respectively. If a licensee finds themselves in a situation where the lower confidence limit from the survey is slightly higher than the disturbance limit, they can increase the survey size to any size they deem fit to get a more precise measure of disturbance. However, it should be remembered that the most probable level of disturbance is near the mean level determined by the survey. When a block is marginally over the limit the most likely outcome is that more points will narrow the confidence interval around a point close to the original mean.

4. Each point in a stratum or block being surveyed must have the same chance of being sampled. This means that it is not acceptable to survey some arbitrarily chosen subset of the points in a set of random waypoints (e.g. $\frac{1}{2}$ the block) and then stop because it appears the survey will be over or under. However, it is acceptable to do a survey with fewer sample points based on an estimation of a level of disturbance within the block that suggests actual disturbance levels might be considerably greater (>2 times) or less (<0.5 times) than the limit. If a survey with a smaller number of points gives a 90% one-sided-lower confidence limit greater than the disturbance limit, then the block is over. If the disturbance limit is greater than the 90% one-sided-lower-confidence limit and the lower (or upper if the mean is small) confidence interval is $\leq 3\%$ points, then the block is not over.

5. While surveys must be conducted and reported based on entire standards units, cutblock, roadside work area or area of inordinate disturbance as the particular regulatory framework dictates, it is still possible to stratify these survey areas for the purposes of improving the efficiency of the survey, as long as every point in the area being surveyed, has a chance of being surveyed. The techniques for stratifying to improve the efficiency of a survey are described below.

Guidelines for Stratification

Under the Forest Practice Code there was a provision to allow enforcement of soil disturbance limits on areas as small as one hectare. Under FRPA, enforcement of soil disturbance limits is to take place on the NAR of the cutblock. The size of the area on which enforcement can take place is a separate issue from stratifying to improve the efficiency of a survey. A stratified random sample will still report the disturbance level for the entire legal unit that is surveyed, however, not every portion of that unit need be

sampled at the same intensity. The main reason for stratifying to survey is to improve the efficiency of the survey. If, for example, a large portion of the area to be surveyed has

very little disturbance (<2%) and a small proportion of the area (<20% of the area) has high disturbance (>15%), then it is more efficient to sample the heavily compacted area more intensely and the less disturbed area less intensely. This saves considerably on the amount of walking that needs to be done and if one stratum is very lightly disturbed (<2%), there may also be an increase in the power of the survey. If you cannot delineate strata with greatly different levels of disturbance, there is no advantage to stratifying. Strata need to be delineated before the survey begins and the most efficient way to do this is from a high resolution image such as those used for the soils FREP process. Such images can be flown specifically for blocks and this possibility should be considered for blocks where legal action is highly likely. The images also allow precise estimates of area in roads, landings, roadside work area, trails or other features in a block. Strata can also be delineated on a sketch map after an on-site inspection.

To stratify, first the amount of disturbance within each stratum is estimated. For example a stratum could be 10 hectares in size and contain approximately 25% disturbance so the amount of disturbance is $10 \text{ ha} \times 0.25 = 2.5 \text{ ha}$. If another stratum is 50 ha in size but contains only 1% disturbance, then the amount of disturbance in this stratum is $50 \text{ ha} \times 0.01 = 0.5 \text{ ha}$. The proportions of disturbance in each stratum are estimates only and do not have to be determined by measurements but no stratum should ever have zero points. The practical lower limit for estimated disturbance in a stratum is probably around 0.5%. To assign the number of survey points to each stratum the formula is:

$$\text{Points Per Stratum} = \frac{\text{Area Disturbed Per Stratum} \times \text{Total Survey Points}}{\text{Total Area Disturbed}}$$

For our example, to find how many points to put in the 10 ha stratum, the calculation is as follows:

$$\text{Points in 10 ha Stratum} = \frac{2.5 \text{ ha} \times 200 \text{ points}}{2.5 \text{ ha} + 0.5 \text{ ha}} = 167 \text{ points}$$

This leaves 33 points in the big/low disturbance stratum. Surveying will go much more quickly because most of the points are in the small stratum and much closer together. In this case, because the disturbance in the large stratum is so low, there is actually a narrowing of the confidence interval- in other words this survey is more powerful than if the points were randomly and evenly distributed throughout the entire area surveyed.

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage

Roadside work areas, inordinate disturbance and compacted areas are all special survey cases. Roadside work areas have a higher disturbance limit- 25% and so must be tallied

number of points. Therefore, we recommend using only 100 points in the RWA. Inordinate Disturbance, Areas of Compacted Soil, Soils That Have Sustained Damage and compacted areas are all types of disturbance that may require rehabilitation if they are identified by a block inspection, or during a survey. The provision for rehabilitating these areas are contained in the Forest Practises Code or FRPA and their supporting documents.

Compacted Areas

The Forest Planning and Practises Regulation (under FRPA) requires the rehabilitation of areas of compacted soil:

5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

(a) the area of compacted soil

(i) was created by activities of the holder,

(ii) is within the net area to be reforested, and

(iii) is a minimum of 1 ha in size;

What constitutes an area of compacted soil under this section of FRPA is not defined but any areas greater than 1ha in size that have more than 25% disturbance, should be documented during the survey for consideration as compacted areas. The potential compacted area should be delineated separately

The provisions for rehabilitating compacted areas and inordinate disturbance are contained in the Forest Practises Code.

47(7) A person who, within an area under a site plan prepared under section 21.1 or silviculture prescription, constructs or modifies a bladed or excavated trail or a corduroyed trail or creates a compacted area, must rehabilitate the area in accordance with the regulations and standards.

In this case, the compacted area refers to an area >100m² and >5m wide that is 100% compacted. For blocks under the CODE or transition CODE, any areas

Inordinate Disturbance

45(3) A person must not carry out a forest practice if he or she knows or should reasonably know that, due to weather conditions or site factors, the carrying out of the forest practice may result, directly or indirectly, in

(a) slumping or sliding of land,

(b) inordinate soil disturbance, or

(c) other significant damage to the environment.

(4) A person who contravenes subsection (1) or (3) must

(a) stop the forest practice in the area affected,

- (b) prevent any further damage to the environment,*
- (c) promptly notify the district manager, and*
- (d) take any remedial measures that the district manager requires*

The Timber Harvesting and Silviculture Practices Regulation defines inordinate disturbance as follows:

53 (1) For the purposes of section 45 (3) (b) of the Act, “**inordinate soil disturbance**” means soil disturbance that

(a) results in the district manager requiring rehabilitation of soil under section 48

(1) of the Act, or

(b) exceeds the soil disturbance limit specified in section 31 of this regulation.

The Forest Practices Code Act of British Columbia section 48(1) reads as follows:

48. (1) If the district manager determines that the area under an operational plan has sustained damage as a result of a forest practice, the district manager may, by written notice, direct the person responsible for the damage to take measures and to pay costs that are necessary to rehabilitate the area to the satisfaction of the district manager and the person must comply with the notice.

The term “sustained damage” is not defined anywhere but the surveyor should provide data to help make the determination of damage. Any areas greater than 1ha in size that have more than 25% disturbance or any areas in the NAR that are unlikely to sustain tree growth, should be documented in the survey.

Steps for determining confidence intervals and number of points required.

Checking soil hazard ratings

RWA, Inordinate Disturbance, Compacted areas

Regulatory Framework.

structures in accordance with the results or strategies specified in the forest stewardship plan or by

, (a), removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,

, (b), de-compacting compacted soils, and

, (c), returning displaced surface soils, retrievable side-cast and berm materials.

, (4) , If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must

, (a), place woody debris on the exposed soils, or

, (b), revegetate the exposed mineral soils.

, (5) , The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

, (a), the area of compacted soil

, (i), was created by activities of the holder,

, (ii), is within the net area to be reforested, and

, (iii), is a minimum of 1 ha in size;

, (b), the holder has not exceeded the limits described in subsection (3);

, (c), rehabilitation would, in the opinion of the minister,

, (i), materially improve the productivity and the hydrologic function of the soil within the area, and

, (ii), not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act.

, (6) , An agreement holder who rehabilitates an area under subsection (4) or (5) must

, (a), remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area,

, (b), de-compact compacted soils, and

, (c), return displaced surface soils, retrievable side-cast and berm materials.

, (7) , If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must

, (a), place woody debris on the exposed soils, or

, (b), revegetate the exposed mineral soils.

Background

After discussing with Mike Boyde of Ft. St. James C&E Field Unit, a soil conservation assessment on CANFOR block No. A33601 CP B66 CB CAR464 was carried out in 3 phases to ensure that logging practices conserved the productivity and hydrologic function of the soil as stated in *Forest Planning and Practices Regulation (FPPR, section 5)*.

Phases of assessment consisted of:

- I. Walkthrough inspection including checking out soil disturbance survey results submitted by CANFOR;
- II. Evaluation of soil disturbance using high resolution aerial photography, and;
- III. Formal soil conservation survey using random point sampling method.

As a result, within this logging block we found 3 instances of non-compliance with results and strategies described in CANFOR forest stewardship plan for soil conservation in accordance to BC forest practices legislation:

- 1) Under *FPPR* section 35 (3)(b), the amount of soil disturbance within Standard Unit (SU) A exceeded 10% of the area covered by SU A;
- 2) Under *FPPR* 35 (3)(c), the amount of soil disturbance within Roadside Work Areas (RWA's) exceeded 25% of the area covered by the RWA's, and;
- 3) Under *FPPR* 3 (1), for the purpose of section 46 (1) of the *Forest and Range Practices Act* excessive soil disturbance caused by cut-to-length logging practices directly and indirectly resulted in damage to the environment.

Interpretation and discussion of our findings from this assessment are presented below.

Results & Discussion

Cut-To-Length (CTL) operations were utilized to harvest block CAR464 (Figure 1), in which trees are delimbed and cut to length directly at the stump and then, a forwarder transports the logs from the stumps to the road. Recognized as a gentle logging practice, CTL uses less area to move the wood than does whole-tree harvesting however CTL may result into more soil disturbance due to repeated travel on designated trails and log decking areas.

Phase I - Walkthrough inspection

During a walkthrough inspection carried out in 2010, it became apparent that throughout block CAR464, there had been harmful changes to soil. A review of soil disturbance survey results submitted by CANFOR for CAR468 revealed that (i) my counted disturbance greatly exceeds that measured by their surveyor (based on re-surveying 360 survey points by CANFOR, Table 1), (ii) my results point towards disturbance levels over maximum limits set out in the site plan (Appendix 1), and (iii) the survey methodology used i.e. Big Block method with grid centres was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is mostly confined to forwarding trails and RWA's. With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This will result into lower confidence limits and therefore, a false acceptance of in-compliance.



Figure 1. Aerial Photography of block CAR464 in 2010 (1 year post logging, 15 cm pixel size resolution). Insert shows the extent of ruts and ponded water in northwest area.

Table 1. Results of soil disturbance percentages from CANFOR report, walkthrough and random point sampling survey in the NAR and RWA's.

	CANFOR	Walkthrough	Random Point Sampling Survey
Areas	%	%	%
NAR	2.9	11.0	25.5
RWA	15.0	42.0	55.0

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic (code "E") is called when the survey point and sampling window (1m Wide x 2m Long rectangle) show evidence of compaction indicated by increased soils density (Figure 2, coarse blocky/platy structure), puddling or compacted deposits of slash and organic debris. Compaction was assessed by comparing soil structure at survey point to soil conditions of adjacent undisturbed areas (i.e., at similar soil water content). The "natural soil condition" was checked frequently by digging to ascertain compaction during our survey.

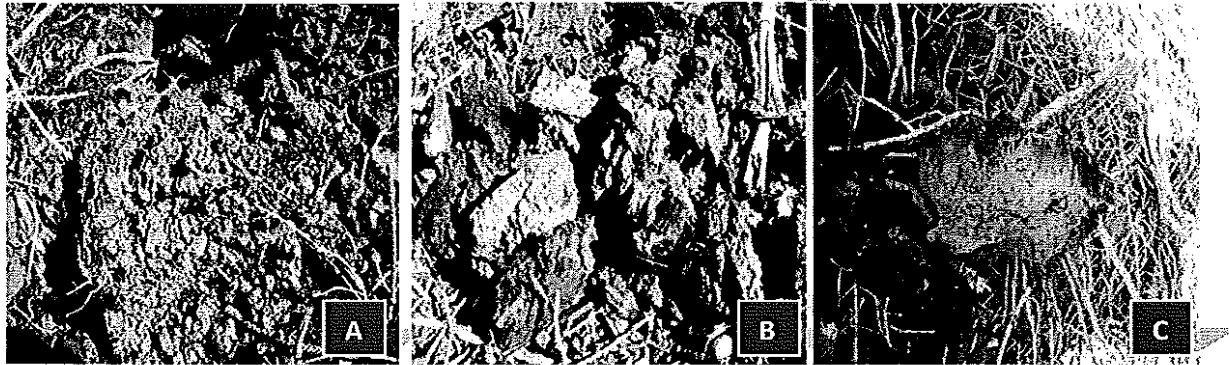


Figure 2. Fluffy and loose soil (A) turned into stone like material (B&C) after trafficking at block CAR464.

We could not guarantee the exact location of survey points during our review was that of CANFOR. However discrepancies between their results and the results from our review were large enough that in our opinion, compaction condition of the soil was not properly identified on this block. In one particular area, a transect line crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as "E's".

Similarly to NAR, Big Block method with grid centres was also inappropriate for surveying RWA's because it was not representative of the main disturbance pattern. Some transects ran parallel to soil disturbance almost avoiding it while others skipped the surveyed area (e.g., survey points falling outside RWA or on roads) so CANFOR did not collect enough points to get a reliable estimate of the RWA soil disturbance.

Phase II. Soil disturbance digital mapping

A geo-referenced high resolution aerial photo taken after logging reflected my biggest concerns in terms of soil disturbances. Ruts, puddles of water and scalped soils did clearly stand out in forwarding trails and along in-block roads (Figure 1). Although machine traffic was limited to tracks areas, the degree of soil disturbance appeared to be very high and appeared to be more than necessary. Where changes to soil was evident, combining in-block roads and off-road traffic represented more than 35% (or 12.7 ha) of the total block area (Table 2).

Table 2. The area proportion of NAR and PAS to total cutblock area. NAR contains RWA's, forwarding trails and residual strips.

Block No.	Total cutblock area (ha)	NAR (%)			PAS (%)
		RWA	Trails	Residual strips	
464	36.0	9.4	23.0	64.8	2.8

Operating machinery has also altered natural drainage patterns on this site. Water ponded on soil surface where track ruts crossed 4 natural seeps and lead to waterlogging or poorly drained soils as illustrated on Figures 3. Still to this day, post-logging drainage patterns are not compatible with the original natural drainage patterns. We also mapped areas of inordinate disturbance where excess disturbances (>30%) on small area are showing "destructive logging". Figure 3 highlights 2 damaged areas (up to 1.4 ha in size) almost completely cleared of forest floor, compacted and in which water drained nowhere due to ruts present everywhere and that run in every directions.

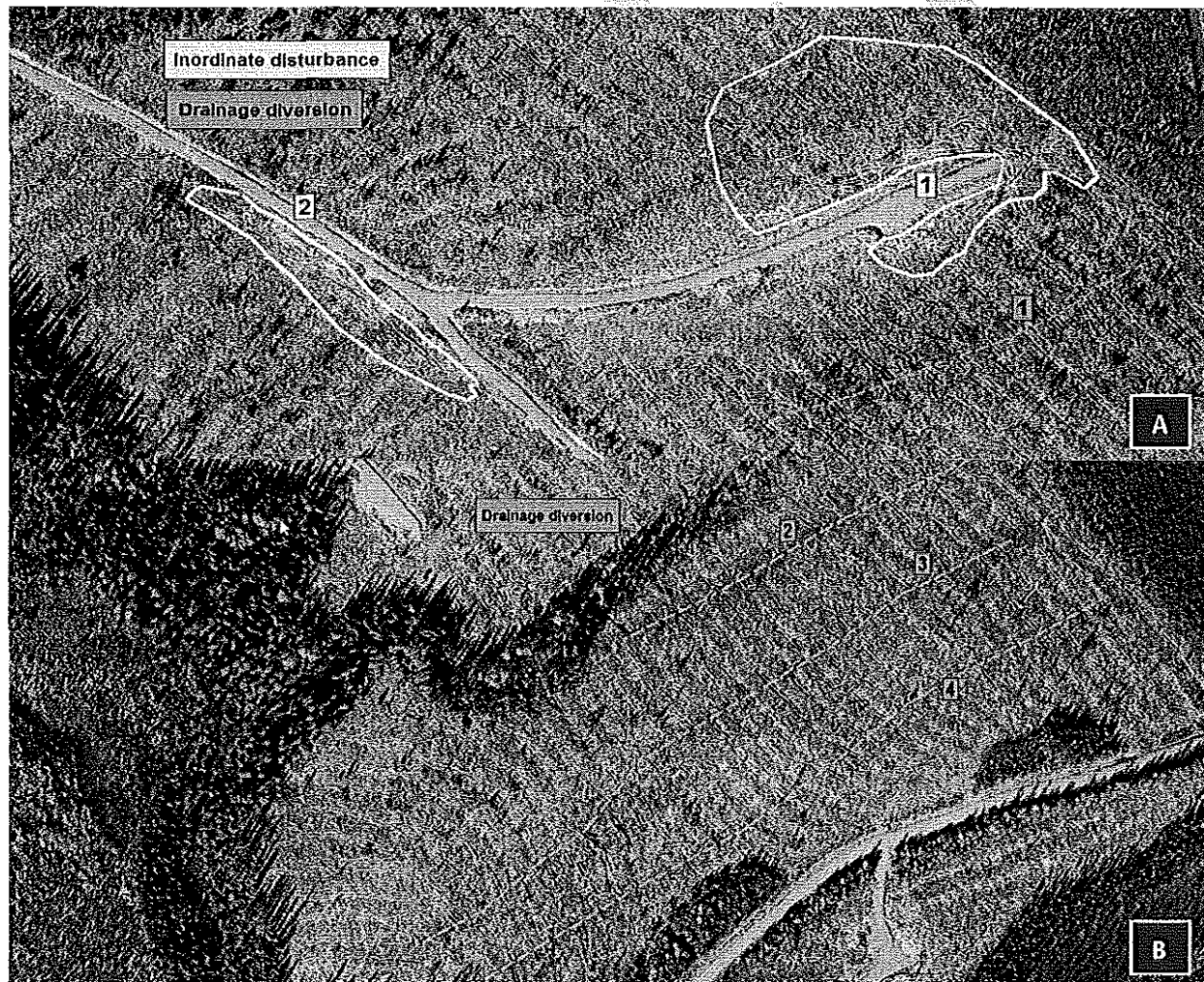


Figure 3. Areas of inordinate disturbance and drainage diversion on block CAR464.

Phase III – Random Point Sampling Survey

Silt, as determined by the “Hand Test” and a few coarse fragments were found almost everywhere in the upper 30 cm of mineral soil along the walk. The site plan has Sandy Loam as dominant soil texture (Appendix A). Although less cohesive than clay, silt-type soil has very little load bearing capacity and is highly susceptible to compaction when wet. Under *FRPR* section 35(1), soil disturbance levels should not exceed, respectively 10% in the NAR and 25% for RWA's in these conditions.

A soil conservation survey based on random point sampling provided statistically valid measurements (more about the survey method in Appendix B) and did confirm the extent to which the block area was in non-compliance with the allowable limits under *FRPR* section 35(3). With this procedure, soil disturbance was measured at GPS points or waypoints randomly located throughout the block as shown on the GPS soil survey map (Figures 4 and 5).



Figure 4. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in NAR. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic and TD = deep wheel track/ruts) or point landing outside of NAR (OUT).

Within the NAR, based on 109 random sample points ($n=109$) the soil disturbance level was 24.8% (Table 1), which exceeds the soil limit of 10%. Likewise, disturbed soils were present within the RWA's (Figure 5). Disturbance measured was 55%, which was not within an acceptable limit of 25% for the area covered by RWA's ($n=109$). Repeated Machine Traffic was the most common disturbance type (E) across the site. Within forwarding trails, compaction explains 53% of all disturbances indicating that like clay, coarser soils with silt when wet will be highly sensitive to machine wheels or tracks. Outside track location i.e. residual strips of vegetation were left intact since there was no ground disturbance in them.

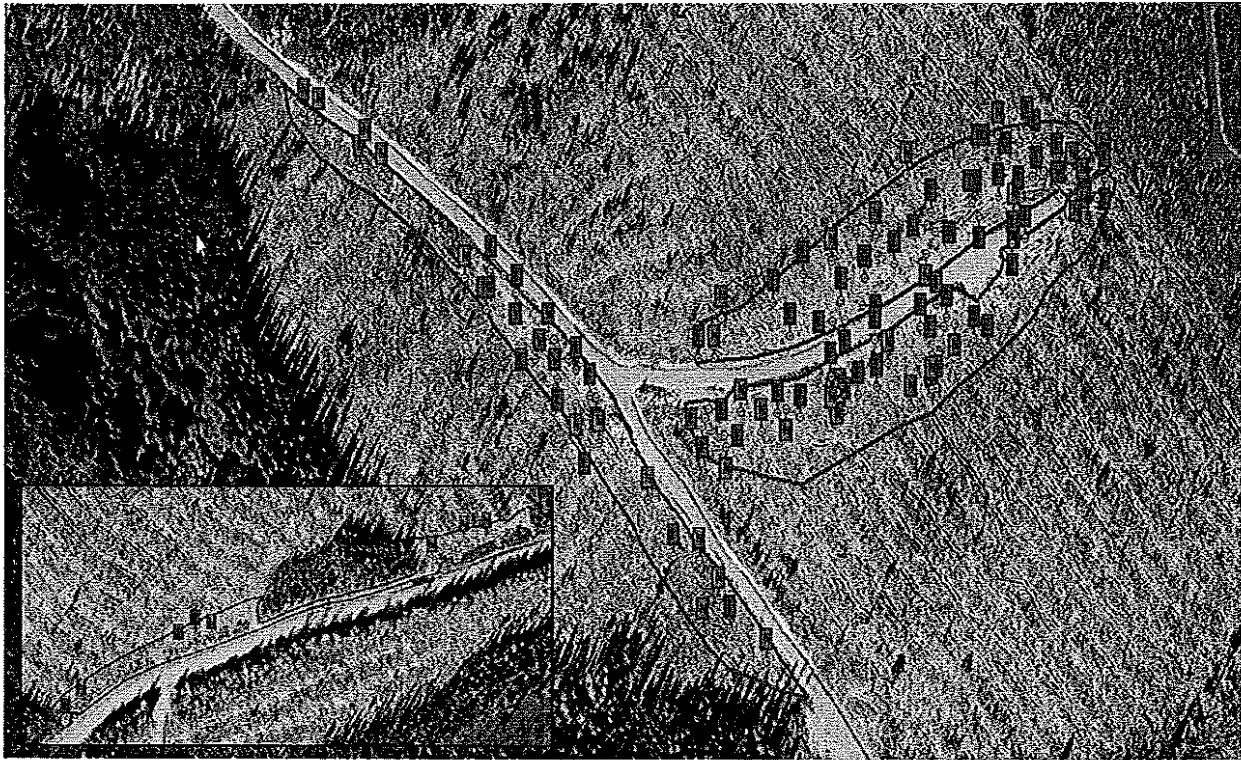


Figure 5. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in NAR. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic, TD = deep wheel/track ruts, V = very wide scalps, G = deep gouges or W = wide gouges).

Summary and Conclusion

C&E Ft. St. James Unit concerns that the soil disturbance limits may have been exceeded in block were justified. As confirmed by a formal soil conservation survey, extensive soil compaction occurred when heavy weight loads compressed the soil during operations within the NAR and RWA's. Indeed, CANFOR has contravened the following 3 provisions under *FPP*: sections 3 (1), 35 (3)(b), and 35 (3)(c).

Excessive soil disturbance (herein defined as un-rehabilitated temporary access structure, gouges, ruts and scalps and compacted areas under *FPPR* Part 1 – Interpretation section 1) has adversely altered ecosystem integrity by altering the way the soil functions on this site and therefore, the capacity of this site to grow forest has been diminished. Results from Assessment Phases I, II and III indicated that machine logging traffic lead to changes to: (i) structural properties of the soil as shown by significant amount of ruts and compaction on forwarding trails and within RWA's, (ii) natural drainage patterns that were not maintained as evidenced from ponded water along 4 channels, and (iii) almost complete loss of forest floor within some areas that results in loss of habitat for specialist species (e.g., worms, fungi, microbes etc.) important to soil biodiversity. Preserving organic matter could also have helped reducing ground disturbance.

Environmental benefits of CTL can be negated when logging occurs over soils that contains much silt and are wet. This site has low load-bearing strength materials when wet. Silty soils drain slowly and after prolonged rainfalls, become quickly water logged. In forests, finer-textured soils behave the same way they do in cultivated soils or in urban settings. Thus, a person can reasonably expect that compaction

will be a concern with careless logging. Proper scheduling with regards to available moisture in the soils, lowering ground pressure by equipment on trafficked trails and better use of slash mats prior to skidding (these need to be removed after logging is completed so it does not hinder growth) are important for soil conservation with CTL.

Please, do not hesitate to contact me for further discussion.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist
BC Forest Service

DRAFT

Appendix A

DRAFT



A33801

Canadian Forest Products Ltd. - Prince George Region

Aug 20, 2007

Site Plan

A. Tenure Identification

Licence	Permit	Block	Operating Area	Opening	Timbermark(s)	Gross Area (ha)	Net Area to Reforest (ha) NAR	District
A40870	B50	CAR464	Mossvale	093J033-	FJ3B50	40.1	35.0	Fort St. James Forest Dist

B. Area Summary and Description for Areas Not Contained Within NAR

Proposed Permanent Access (%)	Max. Permanent Access (%)	Wetland	Water	NP	Immature	NCBr > 4ha	Reserves	Total
2.4	7.0	0.0	0.0	0.0	0.0	0.0	5.1	5.1

C. Stand Level Biodiversity

Biological Diversity (%)
12.7

Biodiversity Comments:

LEAVE TREE SPECIFICATIONS

Biodiversity values will be maintained via external reserves (SU R). SUR consists of a P(Sx) type that is associated with a riparian management area.

The following trees will be retained where present and operationally feasible:

- Acceptable non-merchantable coniferous species in the pole, sapling and regen layers
- Deciduous species (may be stubbed at 3-5 metres)

Retain all Douglas-fir

Leave trees that are cut due to operational or safety constraints will remain on site (dispersed and un-processed). Roadside processing and decking areas will be clearcut.

Prescribed leave trees may be removed for building roads, roadside decking, felling access, skidding access, and safety reasons.

COARSE WOODY DEBRIS

The Coarse Woody Debris (CWD) target for the block is a minimum of 4 logs per hectare (each being a minimum of 2m long and 7.5cm in diameter at one end).

D. Net Area to Reforest (NAR)

SU	Area Description	NAR (ha)	Harvest System
A	SBSmkt - 01 (Minor 00 - 0.5ha)	35.0	Clearcut with reserves
Critical site conditions that affect the timing of operations:			
Comments specific to SU A:			

E. Soil Conservation

SU	HAZARD RATINGS			Maximum Allowable Soil Disturbance (%)	Maximum Allowable Soil Disturbance at Roadside (%)	Maximum Soil Disturbance Temp. Exceeded (%)	Soil Horizon	Soil Texture	Coarse Fragment %
	Soil Compaction	Surface Soil Erosion	Soil Displacement						
A	Moderate	Moderate	Moderate	10.0	25.0	0.0	B	SL	35

Soil Conservation Comments: The soil protection objective is to minimize site disturbance and potential long term productivity losses.

F. Post Harvest Stocking Requirements

Stocking Standard Regime ID	SU	Layer	Assessment Dates			Preferred (P) Species Species - Min. FG Height (m)	Acceptable (A) Species Species - Min. FG Height (m)
			Regen Delay (yrs)	Early FG (yrs)	Late FG (yrs)		
1001476	A	L4	4		20	Fd-1.4/P#-2/Sx-1	

Stocking Standard Regime ID	SU	Layer	Well Spaced Trees (#/ha)			Maximum Coniferous (s/ha)
			Target/Minimum Preferred & Acceptable	Minimum Preferred	Minimum Horizontal Distance (m)	
1001476	A	L4	1200 / 700	700	2.0	10,000

Required Information For Stocking Requirements

G. Assessments

Type	Required	Management Strategies
Visual Impact Assessment	No	This block is not located within a visually sensitive area, therefore no VIA is required.
Archaeological Inventory and Impact Assessment	No	This block was rated as having a moderate likelihood of archaeological potential and therefore an assessment was not conducted. Should any cultural heritage resource features be identified during harvesting or road construction, operations that may negatively impact these resource features will be suspended or modified and appropriate Canfor personnel notified.
Terrain Stability Field Assessment	No	
Recreation Resource	No	No Recreation Site or Trail is within 100m of this block.

H. Riparian Management Strategies

Riparian ID / Lake ID	Riparian Class / Lake Class	RRZ Width (m)	RMZ Width (m)	Management Strategies - RRZ/RMZ
R1	S3	20	20	R1 - S3 is located on the east side of the block and is located a minimum of 30m outside the block boundary. Remaining portions of the RMZ that are within the harvested area of the block will be managed as per the specifications of the adjacent SU due to the presence of mountain pine beetle infested timber. 48
R3	W1	10	40	/ R3 - W1 The RMZ for this feature is entirely outside the block boundary.

FNR-2013-00368, Part 1

Province of British Columbia

Random Method for Soil Conservation Surveys

DRAFT

Draft version – July 2011

Mike Curran, PhD, PAg, Forest Science and Silviculture Team Leader
(and Research Soil Scientist) Kootenay-Boundary Region, BC Forest
Service, (Ministry of Natural Resource Operations) Nelson, BC

Table of Contents

Introduction..... 3

Measuring Dispersed Disturbance Using a Random Approach 6

Guidelines for Stratification..... 8

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted
Areas, Soils That Have Sustained Damage..... 9

Compacted Areas 10

Introduction

The objective set by the BC Government for forest soil management is to “without unduly reducing the supply of timber from British Columbia’s forests, to conserve the productivity and the hydrologic function of soils” (Forest Planning and Practices Regulation). Soil disturbance levels are limited in the FRPA to the following levels:

- (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25% of the area covered by a roadside work area (a roadside work area is defined as the area adjacent to a road where one or both of the following are carried out:

- (i) decking, processing or loading timber;
- (ii) piling or disposing of logging debris;

Sensitive soils are soils that, because of their slope gradient, texture class, moisture regime, or organic matter content have the following risk of displacement, surface erosion or compaction:

- (a) for the Interior, a very high hazard;
- (b) for the Coast, a high or very high hazard.

Because the MOF no longer verifies soil hazard ratings in prescriptions, a necessary first step in every survey is to determine the soil hazard rating. The rating determined by the surveyor is then used to determine which soil disturbance categories count, and the disturbance limits for the area to be surveyed.

Soil disturbance is defined as disturbance to the soil in the net area to be reforested in a cutblock because of:

- (a) temporary access structures,
- (b) gouges, ruts and scalps, or
- (c) compacted areas, but does not include the effect on the soil of rehabilitating an area in accordance with section 35 (Section 35 allows for up to 5% of the standards unit to be in excessive disturbance as long as enough of this excess disturbance is rehabilitated so that the disturbance limit is no longer exceeded).

Gouges, ruts, scalps and compacted areas are not defined except in the 2001 Soil Conservation Surveys guidebook. Temporary access structure is defined in regulation as an access structure that is not a gravel pit and does not meet the requirements of a permanent access structure which are:

(a) at the time of its construction, it is reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the cutblock, or

(b) it is constructed on or through, or contains, materials unsuitable for the establishment of a commercial crop of trees and is not an excavated or bladed trail, but does not include an area that contained an access structure before rehabilitation of the area under section 36.

An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder:

(a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or

(b) is constructing a temporary access structure and both of the following apply:

(i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area;

(ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such that the agreement holder is in compliance with the limits set out in subsection (3).

Rehabilitation is discussed further in the rehabilitation section below.

There are also limits placed on the amount of permanent access structure allowed in a block. An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless

(a) there is no other practicable option on that cutblock, having regard to

(i) the size, topography and engineering constraints of the cutblock,

(ii) in the case of a road, the safety of road users, or

(iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or

(b) additional permanent access structures are necessary to provide access beyond the cutblock.

If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.

In order to assess whether or not these regulations are being addressed requires definition of terms and a method for measuring the levels of the various disturbances discussed above. This was done in the 2001 Soil Conservation Surveys Guidebook. This guidebook breaks blocks into two categories, small and large and provides two different methods of survey. The big block method was prone to giving large confidence intervals because it utilized a clustered sampling design. The clustered sampling design was a trade-off developed to allow sampling many points in a large block in an efficient manner. The small block method was to have been the preferred method, but when the

option of stratifying blocks for compliance assessment was removed, the small block method was not applied directly to big blocks because it is excessively time consuming to apply over a large area.

Advancements in GPS and handheld computer technology mean that options are now available to surveyors that were not available when the last guidebook was written. Sampling theory tells us that completely random sampling is the most consistently successful approach for achieving a truly representative sample of a population with the least number of points sampled. That basic principal is confirmed, in a work recently completed by Thompson et al, for the case involving sampling logging disturbance in cutblocks. The next best design is a completely square grid, which is labour intensive and requires the most of amount of walking to implement. The further the design gets from square, the easier it is to implement, but the higher the risk there is of a nonrepresentative sample if the population being sampled is not evenly distributed. Logging disturbance is typically very non-uniform in distribution and may be clustered or linear and so the orientation of non-square sampling grids in relation to disturbance is always a concern.

Until recently, layout of completely random sampling networks over large areas, using commonly available field equipment, has been very labour intensive. However, using readily available GPS technology, it is now relatively easy to take an unbiased-random sample from cutblocks. The method also has the advantage of very little layout time and less walking (especially backtracking) than would be necessary for sampling on the squarer grid layouts. In addition, the completely random design gives lower variability than grid designs for sampling logging type disturbance (Thompson et al??) and determination of confidence intervals is based on binomial distributions. If more power is needed for a particular survey, it is a simple matter to add more random points and resurvey the area without having to worry about creating new grids or infilling grids. For measuring roads, landings, trails and other distinct features within a block, relatively cheap digital imagery can be used for highly accurate and inexpensive assessment of these features, though the older ground based approaches used in the Soil Conservations Surveys Guidebook, can still be used. A high resolution digital image makes a very good base map for the random survey and wherever possible, the use of these images is encouraged.

This guide book outlines the general procedure for estimating dispersed disturbance levels in cutblocks of all sizes using a random sampling approach. It also describes a method for measuring other disturbance features from digital air photos.

Measuring Dispersed Disturbance Using a Random Approach

There may be many ways to achieve a random survey- this manual outlines one that is utilizes relatively commonly available technology. The broad steps are as follows:

1. Based on the estimated disturbance levels the number of points that need to be sampled to achieve the desired confidence interval is estimated. For a typical survey of a block with 5% to 10% disturbance, 200 points gives a one sided 90% confidence interval of about 3 percentage points. This means that blocks will be called excessively disturbed if the measured disturbance exceeds 13% for a 10% disturbance limit block or 8% for a 5% limit block. In other words, with a sample size of 200 points on 10% disturbance limit blocks, if the number of disturbed points equals or exceeds 26 counted points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. If the number of disturbed points in a 200 point survey, of a 5% disturbance limit block, equals or exceeds 16 points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. It should not be necessary to survey more than 200 points in a block (or stratum), but if a block (or stratum) is highly disturbed, it may be feasible to survey fewer points. Appendix B shows how to determine confidence intervals for surveys of other numbers of survey points or other levels of disturbance. The higher the disturbance level, the fewer points are needed in the total survey to establish with confidence that the block is over the limit. The size of the block has no bearing on the number of points, but unavoidably, the larger the block, the more time it takes to survey.
2. An appropriate number of random waypoints are generated. There may be other ways to do this, but one method involves creating a shape file of the NAR (survey stratum minus roads, landings or other features which are not part of the NAR). A multipoint polygon is generated in Arcmap using a Random Point-in-Polygon Generation Program (VBA Macro) (Sawada, 2002). The multipoint polygon is converted to waypoints in OziExplorer or other mapping software that has this function.
3. The waypoints and a base map are downloaded onto a GPS unit that is set up to beep when the surveyor passes within 1 metre of the waypoint. The surveyor navigates to the waypoint and the exact observation point is indicated by the precise moment at which the GPS beeps. The observation point is fixed exactly at that moment by some arbitrary locator of the observation point. For example the observation point could be deemed to be located directly below one corner of the GPS unit or at the end of the surveyor's right toe, wherever those are at the moment the GPS beeps. The same locator should be used throughout a survey.
4. The survey progresses by using the built in navigation aids in the GPS to move from waypoint to waypoint. The surveyor is free to select the most efficient route through the points.
5. The data is entered directly into the GPS unit.
6. All of the points generated for a particular survey must be surveyed, i.e. one cannot survey points in a portion of the block and then conclude that the surveyed

area is or is not in compliance. Since disturbance within a cutblock is usually distributed unevenly, the entire set of points must be surveyed before making judgements about the level of disturbance. However, it is possible to initially do a complete survey with a smaller number of points and if that survey does not have sufficient power to give a clear result, a new set of random points can be generated for the same area and surveyed and the results combined with the previous survey to create a more powerful survey.

7. When the survey is complete, the waypoint file is converted to a spreadsheet file, and the calculations are made on the spreadsheet.

Many different configurations of hardware and software can be used to achieve a random survey and it is not possible to cover all those in this guidebook. Presented in Appendix A is a detailed protocol for a particular set of software and hardware. Potential surveyors who wish to use other software/hardware combinations may find some useful tips in this guidance, but they are not required to use the equipment combination described. The fully random survey needs to meet the following criteria:

1. The observation points must be randomly generated with any point in the survey area having a chance to be surveyed.

2. When the actual observation point is located in the field, it must be selected by following an unbiased and precise rule, such as directly under the GPS at the exact moment the GPR beeps (or some other confining trigger). The surveyor must not adjust the observation point in any way, nor have leeway to select the sampling point from within a broader possible sampling area, e.g., it would be unacceptable to simply select the sampling point from anywhere in front of the surveyor at the point the GPS beeps.

3. When the lower one-sided 90% confidence limit for the measured disturbance level is greater than the disturbance limit, the block is counted as over. Whatever size of survey indicates the block is over the lower 90% confidence limit, is acceptable. For surveys where the disturbance limit is greater than the one-sided 90% lower confidence limit, in order for the block to be considered under the disturbance limit- the lower one-sided 90% confidence interval must be 3 percentage units or less, (see Point 4 below). This is to address the situation where a surveyor might choose to survey fewer points because the disturbance is greatly in excess of the limit. Surveying fewer points means that the confidence interval could be larger if the surveyor overestimated the level of disturbance. This situation would make it more likely that the disturbance limit of a block will lie in the ambiguous zone of the confidence interval (between the lower confidence limit and the measured level of disturbance). Therefore, for blocks with disturbance close to the limit, the surveyor must sample sufficient points to make the lower confidence interval $\leq 3\%$ points. In cases where the measured level of disturbance is $\leq 3\%$, the upper 90% confidence interval must be $\leq 3\%$ points. For disturbance levels greatly above or below the limits, a survey could have fewer than 200 points and still be valid as long as the disturbance limit still fell below the 90% confidence interval (i.e., the block is counted as over). For example, if the actual level of disturbance on a block with a 10% disturbance limit

was 30%, it would take fewer points to establish if the block was in compliance (see below). If the surveyor chooses to do a smaller survey based on an assumption about the disturbance level that turns out to be incorrect and as a result the outcome of the survey is ambiguous, the surveyor can simply generate another set of random waypoints and add to the survey.

There are normally financial constraints to doing large surveys and a 200 point survey with one-sided confidence interval of around 3 percentage points for disturbance levels in the range of the normal limits (5 to 10%) will give an acceptable level of precision. This means that before a block is called excessively disturbed, the measured disturbance levels will exceed 13% or 8% for the 10% and 5% limits respectively. If a licensee finds themselves in a situation where the lower confidence limit from the survey is slightly higher than the disturbance limit, they can increase the survey size to any size they deem fit to get a more precise measure of disturbance. However, it should be remembered that the most probable level of disturbance is near the mean level determined by the survey. When a block is marginally over the limit the most likely outcome is that more points will narrow the confidence interval around a point close to the original mean.

4. Each point in a stratum or block being surveyed must have the same chance of being sampled. This means that it is not acceptable to survey some arbitrarily chosen subset of the points in a set of random waypoints (e.g. $\frac{1}{2}$ the block) and then stop because it appears the survey will be over or under. However, it is acceptable to do a survey with fewer sample points based on an estimation of a level of disturbance within the block that suggests actual disturbance levels might be considerably greater (>2 times) or less (<0.5 times) than the limit. If a survey with a smaller number of points gives a 90% one-sided-lower confidence limit greater than the disturbance limit, then the block is over. If the disturbance limit is greater than the 90% one-sided-lower-confidence limit and the lower (or upper if the mean is small) confidence interval is $\leq 3\%$ points, then the block is not over.

5. While surveys must be conducted and reported based on entire standards units, cutblock, roadside work area or area of inordinate disturbance as the particular regulatory framework dictates, it is still possible to stratify these survey areas for the purposes of improving the efficiency of the survey, as long as every point in the area being surveyed, has a chance of being surveyed. The techniques for stratifying to improve the efficiency of a survey are described below.

Guidelines for Stratification

Under the Forest Practice Code there was a provision to allow enforcement of soil disturbance limits on areas as small as one hectare. Under FRPA, enforcement of soil disturbance limits is to take place on the NAR of the cutblock. The size of the area on which enforcement can take place is a separate issue from stratifying to improve the efficiency of a survey. A stratified random sample will still report the disturbance level for the entire legal unit that is surveyed, however, not every portion of that unit need be

sampled at the same intensity. The main reason for stratifying to survey is to improve the efficiency of the survey. If, for example, a large portion of the area to be surveyed has very little disturbance (<2%) and a small proportion of the area (<20% of the area) has high disturbance (>15%), then it is more efficient to sample the heavily compacted area more intensely and the less disturbed area less intensely. This saves considerably on the amount of walking that needs to be done and if one stratum is very lightly disturbed (<2%), there may also be an increase in the power of the survey. If you cannot delineate strata with greatly different levels of disturbance, there is no advantage to stratifying. Strata need to be delineated before the survey begins and the most efficient way to do this is from a high resolution image such as those used for the soils FREP process. Such images can be flown specifically for blocks and this possibility should be considered for blocks where legal action is highly likely. The images also allow precise estimates of area in roads, landings, roadside work area, trails or other features in a block. Strata can also be delineated on a sketch map after an on-site inspection.

To stratify, first the amount of disturbance within each stratum is estimated. For example a stratum could be 10 hectares in size and contain approximately 25% disturbance so the amount of disturbance is $10 \text{ ha} \times 0.25 = 2.5 \text{ ha}$. If another stratum is 50 ha in size but contains only 1% disturbance, then the amount of disturbance in this stratum is $50 \text{ ha} \times 0.01 = 0.5 \text{ ha}$. The proportions of disturbance in each stratum are estimates only and do not have to be determined by measurements but no stratum should ever have zero points. The practical lower limit for estimated disturbance in a stratum is probably around 0.5%.

To assign the number of survey points to each stratum the formula is:

$$\text{Points Per Stratum} = \frac{\text{Area Disturbed Per Stratum} \times \text{Total Survey Points}}{\text{Total Area Disturbed}}$$

For our example, to find how many points to put in the 10 ha stratum, the calculation is as follows:

$$\text{Points in 10 ha Stratum} = \frac{2.5 \text{ ha} \times 200 \text{ points}}{2.5 \text{ ha} + 0.5 \text{ ha}} = 167 \text{ points}$$

This leaves 33 points in the big/low disturbance stratum. Surveying will go much more quickly because most of the points are in the small stratum and much closer together. In this case, because the disturbance in the large stratum is so low, there is actually a narrowing of the confidence interval- in other words this survey is more powerful than if the points were randomly and evenly distributed throughout the entire area surveyed.

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil

Compacted Areas, Soils That Have Sustained Damage

Roadside work areas, inordinate disturbance and compacted areas are all special survey cases. Roadside work areas have a higher disturbance limit- 25% and so must be tallied

separately from the rest of the NAR. The higher disturbance limit in the roadside work area means that disturbance can be measured with the same confidence with a smaller number of points. Therefore, we recommend using only 100 points in the RWA. Inordinate Disturbance, Areas of Compacted Soil, Soils That Have Sustained Damage and compacted areas are all types of disturbance that may require rehabilitation if they are identified by a block inspection, or during a survey. The provision for rehabilitating these areas are contained in the Forest Practises Code or FRPA and their supporting documents.

Compacted Areas

The Forest Planning and Practises Regulation (under FRPA) requires the rehabilitation of areas of compacted soil:

5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

(a) the area of compacted soil

(i) was created by activities of the holder,

(ii) is within the net area to be reforested, and

(iii) is a minimum of 1 ha in size;

What constitutes an area of compacted soil under this section of FRPA is not defined but any areas greater than 1ha in size that have more than 25% disturbance, should be documented during the survey for consideration as compacted areas. The potential compacted area should be delineated separately

The provisions for rehabilitating compacted areas and inordinate disturbance are contained in the Forest Practises Code.

47(7) A person who, within an area under a site plan prepared under section 21.1 or silviculture prescription, constructs or modifies a bladed or excavated trail or a corduroyed trail or creates a compacted area, must rehabilitate the area in accordance with the regulations and standards.

In this case, the compacted area refers to an area >100m² and >5m wide that is 100% compacted. For blocks under the CODE or transition CODE, any areas

Inordinate Disturbance

45(3) A person must not carry out a forest practice if he or she knows or should reasonably know that, due to weather conditions or site factors, the carrying out of the forest practice may result, directly or indirectly, in

(a) slumping or sliding of land,

(b) inordinate soil disturbance, or

(c) other significant damage to the environment.

(4) A person who contravenes subsection (1) or (3) must

(a) stop the forest practice in the area affected,

(b) prevent any further damage to the environment,

(c) promptly notify the district manager, and

(d) take any remedial measures that the district manager requires

The Timber Harvesting and Silviculture Practices Regulation defines inordinate disturbance as follows:

53 (1) For the purposes of section 45 (3) (b) of the Act, “**inordinate soil disturbance**” means soil disturbance that

(a) results in the district manager requiring rehabilitation of soil under section 48

(1) of the Act, or

(b) exceeds the soil disturbance limit specified in section 31 of this regulation.

The Forest Practices Code Act of British Columbia section 48(1) reads as follows:

48. (1) If the district manager determines that the area under an operational plan has sustained damage as a result of a forest practice, the district manager may, by written notice, direct the person responsible for the damage to take measures and to pay costs that are necessary to rehabilitate the area to the satisfaction of the district manager and the person must comply with the notice.

The term “sustained damage” is not defined anywhere but the surveyor should provide data to help make the determination of damage. Any areas greater than 1ha in size that have more than 25% disturbance or any areas in the NAR that are unlikely to sustain tree growth, should be documented in the survey.

Steps for determining confidence intervals and number of points required.

Checking soil hazard ratings

RWA, Inordinate Disturbance, Compacted areas

Regulatory Framework.

Rehab stuff

- , (3) , An agreement holder may rehabilitate an area occupied by permanent access structures in accordance with the results or strategies specified in the forest stewardship plan or by
 - , (a), removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compacting compacted soils, and
 - , (c), returning displaced surface soils, retrievable side-cast and berm materials.
- , (4) , If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.
- , (5) , The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:
 - , (a), the area of compacted soil
 - , (i), was created by activities of the holder,
 - , (ii), is within the net area to be reforested, and
 - , (iii), is a minimum of 1 ha in size;
 - , (b), the holder has not exceeded the limits described in subsection (3);
 - , (c), rehabilitation would, in the opinion of the minister,
 - , (i), materially improve the productivity and the hydrologic function of the soil within the area, and
 - , (ii), not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act.
- , (6) , An agreement holder who rehabilitates an area under subsection (4) or (5) must
 - , (a), remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compact compacted soils, and
 - , (c), return displaced surface soils, retrievable side-cast and berm materials.
- , (7) , If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.

Background

After discussing with Mike Boyde of Ft. St. James C&E Field Unit, a soil conservation assessment on CANFOR block No. A33601 CP B66 CB CAR464 was carried out in 3 phases to ensure that logging practices conserved the productivity and hydrologic function of the soil as stated in *Forest Planning and Practices Regulation (FPPR, section 5)*.

Phases of assessment consisted of:

- I. Walkthrough inspection including checking out soil disturbance survey results submitted by CANFOR;
- II. Evaluation of soil disturbance using high resolution aerial photography, and;
- III. Formal soil conservation survey using random point sampling method.

As a result, within this logging block we found 3 instances of non-compliance with results and strategies described in CANFOR Forest Stewardship Plan for soil conservation in accordance to legislated BC forest practices requirements:

- 1) Under *Forest and Range Practices Act (FRPA)* section 21 (1), the intended results for soils within the Net Area to be Reforested and Roadside Work Areas (RWA's) set out in the FSP were not achieved.
- 2) Under *FRPA* section 46 (1), soil disturbance from cut-to-length logging practices directly and indirectly resulted in damage to the environment.), soil disturbance as defined under section 3 (1)

Interpretation and discussion of our findings from this assessment are presented below.

Results & Discussion

Cut-To-Length (CTL) operations were utilized to harvest block CAR464 (Figure 1), in which trees are delimbed and cut to length directly at the stump and then, a forwarder transports the logs from the stumps to the road. Recognized as a gentle logging practice, CTL uses less area to move the wood than does whole-tree harvesting however CTL may result into more soil disturbance due to repeated travel on designated trails and log decking areas.

Phase I - Walkthrough inspection

During a walkthrough inspection carried out in 2010, it became apparent that throughout block CAR464, there had been harmful changes to soil. A review of soil disturbance survey results submitted by CANFOR for CAR468 revealed that (i) my counted disturbance greatly exceeds that measured by their surveyor (Table 1), (ii) my results point towards disturbance levels over maximum limits set out in the site plan (Appendix 1), and (iii) the survey methodology used i.e. Big Block method with grid centres was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is mostly confined to forwarding trails and RWA's. With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This will result into lower confidence limits and therefore, a false acceptance of in-compliance.



Figure 1. Aerial Photography of block CAR464 in 2010 (1 year post logging, 15 cm pixel size resolution). Insert shows the extent of ruts and ponded water in northwest area.

Table 1. Results of soil disturbance percentages from CANFOR survey report, walkthrough and random point sampling survey for NAR and RWA's.

Areas	CANFOR ^a	Walkthrough	Random Point Sampling Survey ^a
	%	%	%
NAR	3.9	11.0	19.4
RWA	7.2	42.0	48.9

^a CANFOR and Random Point Survey results are Lower Confidence Limits

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic

(code "E") is called when the survey point and sampling window (1m Wide x 2m Long rectangle) show evidence of compaction indicated by increased soils density (Figure 2, coarse blocky/platy structure), puddling or compacted deposits of slash and organic debris. Compaction was assessed by comparing soil structure at survey point to soil conditions of adjacent undisturbed areas (i.e., at similar soil water content). The "natural soil condition" was checked frequently by digging to ascertain compaction during our survey.

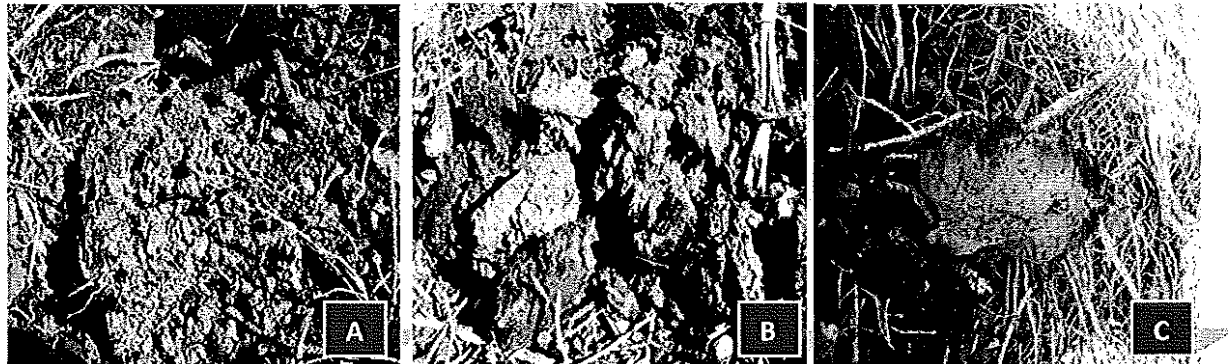


Figure 2. Fluffy and loose soil (A) turned into stone like material (B&C) after trafficking at block CAR464.

In table 1, disturbance % from the walkthrough were rough estimates of the mean %, and simply calculated from dividing the number of points with counted disturbance by the total number of points re-measured (a re-survey of 360 points done by CANFOR). We could not guarantee the exact location of survey points during our review was that of CANFOR. However discrepancies between their results and the results from our review were large enough that in our opinion, compaction condition of the soil was not properly identified on this block. In one particular area, a transect line crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as "E's".

Similarly to NAR, Big Block method with grid centres was also inappropriate for surveying RWA's because it was not representative of the main disturbance pattern. Some transects ran parallel to soil disturbance almost avoiding it while others skipped the surveyed area (e.g., survey points falling outside RWA or on roads) so CANFOR did not collect enough points to get a reliable estimate of the RWA soil disturbance.

Phase II. Soil disturbance digital mapping

A geo-referenced high resolution aerial photo taken after logging reflected my biggest concerns in terms of damage to soils. Soil disturbances such as ruts, waterlogging and scalped soils did clearly stand out in forwarding trails and along in-block roads (Figure 1). Although machine traffic was limited to tracks areas, overall the degree of soil disturbance appeared to be very high. Combining in-block roads and off-road traffic disturbance represented more than 35% (or 12.7 ha) of the total block area (Table 2). In my opinion, this was the result of excessive or a more than necessary amount of logging and was not planned with an eye to maintain site productivity but providing the lowest cost to extract timber.

Table 2. The area proportion of NAR and PAS to total cutblock area. NAR contains RWA's, forwarding trails and residual strips.

Block No.	Total cutblock area (ha)	NAR (%)			PAS (%)
		RWA	Trails	Residual strips	
464	36.0	9.4	23.5	64.8	2.8

Operating machinery has also altered natural drainage patterns on this site. Water ponded on soil surface where track ruts crossed 4 natural seeps and lead to waterlogging or poorly drained soils as illustrated on Figures 3. Three years post-logging, drainage patterns were not compatible with the original natural drainage patterns. We also mapped areas of inordinate disturbance or destructive logging where soil disturbances exceed 30% of the total area are showing "destructive logging". Figure 3 highlights 2 damaged areas (up to 1.4 ha in size) almost completely cleared of forest floor, compacted and in which water drained nowhere due to ruts present everywhere and that run in every directions. This initial damage assessment was validated on the ground.

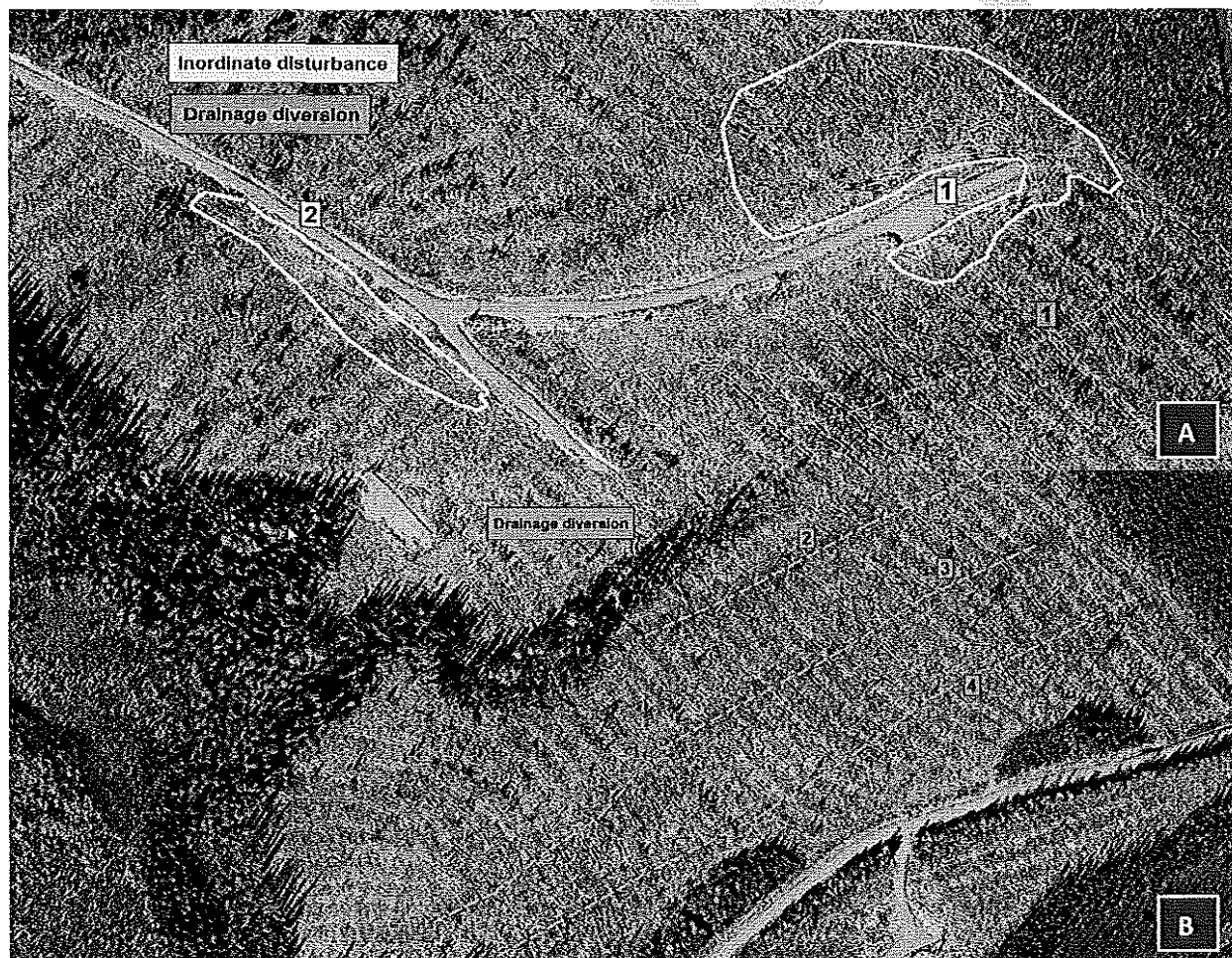


Figure 3. Areas of inordinate disturbance and drainage diversion on block CAR464.

Phase III – Random Point Sampling Survey

Silt, as determined by the “Hand Test” and a few coarse fragments were found almost everywhere in the upper 30 cm of mineral soil along the walk. The site plan has Sandy Loam as dominant soil texture (Appendix A). Although less cohesive than clay, silt-type soil has very little load bearing capacity and is highly susceptible to compaction when wet. Under *FPPR* section 35(1), soil disturbance levels should not exceed, respectively 10% in the NAR and 25% for RWA’s in these conditions.

A soil conservation survey based on random point sampling provided statistically valid measurements (more about the survey method in Appendix B) and did confirm the extent to which the block area was in non-compliance with the allowable limits under CANFOR FSP. With this procedure, soil disturbance was measured at GPS points or waypoints randomly located throughout the block as shown on the GPS soil survey map (Figures 4 and 5).

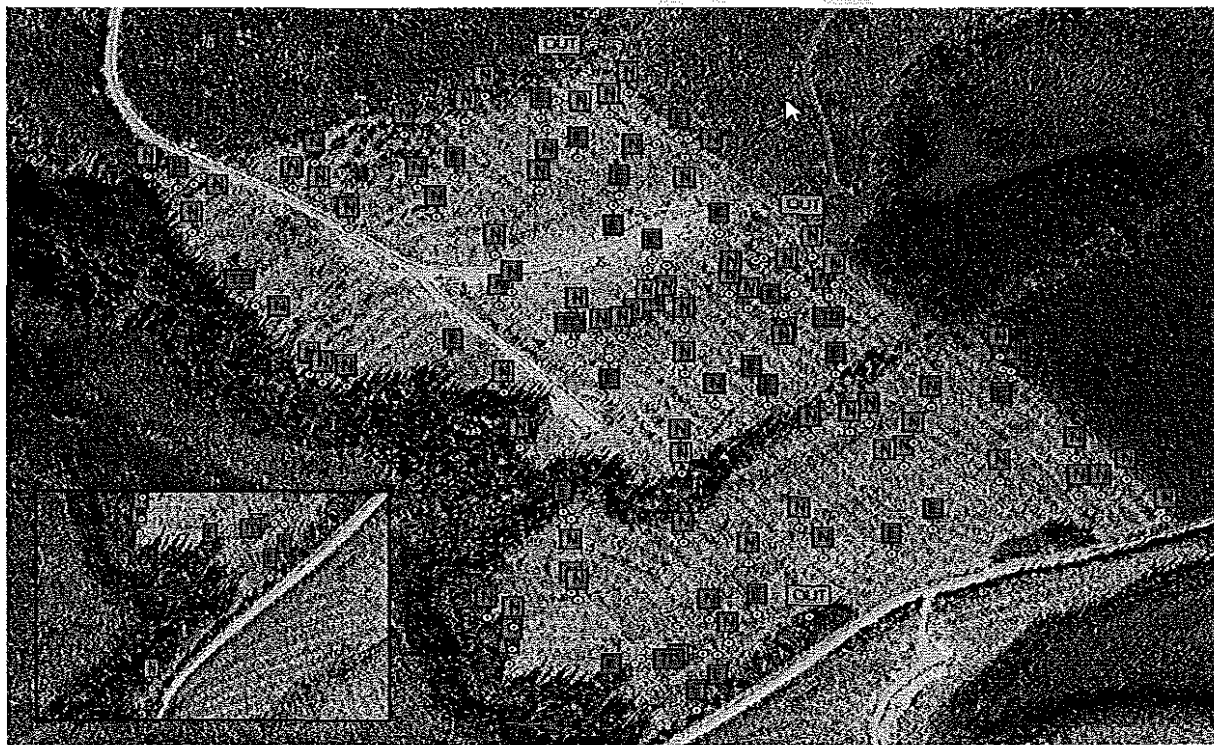


Figure 4. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in NAR. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic and TD = deep wheel track/ruts) or point landing outside of NAR (OUT).

Within the NAR, based on 109 random sample points ($n=109$) the soil disturbance level was 19.4% (Table 1), which exceeds the soil limit of 10%. Likewise, disturbed soils were present within the RWA's (Figure 5). Disturbance measured was 48.9%, which was not within an acceptable limit of 25% for the area covered by RWA's ($n=109$). Repeated Machine Traffic was the most common disturbance type (E) across the site. Within forwarding trails, compaction explained 53% of all disturbances indicating that like clay, coarser soils with silt when wet will be highly sensitive to machine wheels or tracks. Outside track location i.e. residual strips of vegetation were left intact since there was no ground disturbance in them.

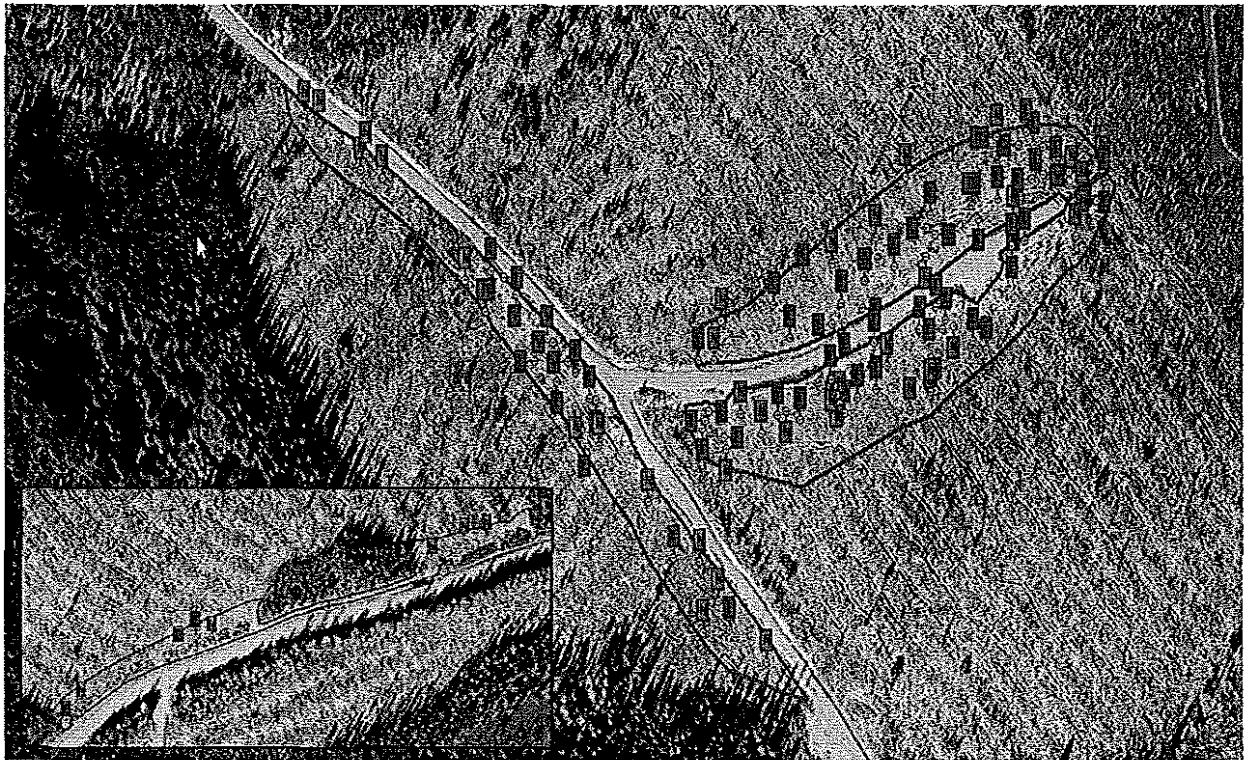


Figure 5. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in RWA's. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic, TD = deep wheel/track ruts, V = very wide scalps, G = deep gouges or W = wide gouges).

Conclusion

C&E Ft. St. James Unit concerns that the soil disturbance limits may have been exceeded in block were justified. As confirmed by a formal soil conservation survey, extensive soil compaction occurred when heavy weight loads compressed the soil during operations within the NAR and RWA's. Indeed, CANFOR has contravened the following 2 provisions under *FRPA*: sections 21 (1) and 46 (1).

Excessive soil disturbance (herein defined as un-rehabilitated temporary access structure, gouges, ruts and scalps and compacted areas under *FPFR* Part 1 – Interpretation section 1) has adversely altered ecosystem integrity by altering the way the soil functions on this site and therefore, the capacity of this site to grow forest has been diminished. Combined results from Assessment Phases I, II and III indicated that machine logging traffic lead to changes to: (i) structural properties of the soil as shown by significant amount of ruts and compaction on forwarding trails and within RWA's, (ii) natural drainage patterns that were not maintained as evidenced from ponded water along 4 channels, and (iii) almost complete loss of forest floor within some areas that results in loss of habitat for specialist species (e.g., worms, fungi, microbes etc.) important to soil biodiversity. Preserving organic matter could also have helped reducing ground disturbance.

Environmental benefits of CTL can be negated when logging occurs over soils that contains much silt and are wet. This site has low load-bearing strength materials when wet. Silty soils drain slowly and after prolonged rainfalls, become quickly water logged. In forests, finer-textured soils behave the same way they do in cultivated soils or in urban settings. Thus, a person can reasonably expect that compaction

will be a concern with careless logging. If someone had paid any attention to weather and moisture in the soil prior to logging, there is no doubt that this damage could have been avoided.

Proper scheduling with regards to available moisture in the soils, lowering ground pressure by equipment on trafficked trails and better use of slash mats prior to skidding (these need to be removed after logging is completed so it does not hinder growth) are important for soil conservation with CTL.

Please, do not hesitate to contact me for further discussion.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist
BC Forest Service

DRAFT

Appendix A

DRAFT



A33801

Canadian Forest Products Ltd. - Prince George Region

Aug 20, 2007

Site Plan

A. Tenure Identification

Licence	Permit	Block	Operating Area	Opening	Timbermark(s)	Gross Area (ha)	Net Area to Reforest (ha) NAR	District
A40875	B66	CAR464	Mossvale	063J033-	FJ3B66	40.1	35.0	Fort St. James Forest Dist

B. Area Summary and Description for Areas Not Contained Within NAR

Proposed Permanent Access (%)	Max. Permanent Access (%)	Wetland	Water	NP	Immature	HCB > 4ha	Reserves	Total
2.4	7.0	0.0	0.0	0.0	0.0	0.0	5.1	5.1

C. Stand Level Biodiversity

Biological Diversity (%)
12.7

Biodiversity Comments:

LEAVE TREE SPECIFICATIONS

Biodiversity values will be maintained via external reserves (SU R). SUR consists of a P(Sx) type that is associated with a riparian management area.

The following trees will be retained where present and operationally feasible:

- Acceptable non-merchantable coniferous species in the pole, sapling and regen layers
- Deciduous species (may be stubbed at 3-5 metres)

Retain all Douglas-fir

Leave trees that are cut due to operational or safety constraints will remain on site (dispersed and un-processed). Roadside processing and decking areas will be clearcut.

Prescribed leave trees may be removed for building roads, roadside decking, felling access, skidding access, and safety reasons.

COARSE WOODY DEBRIS

The Coarse Woody Debris (CWD) target for the block is a minimum of 4 logs per hectare (each being a minimum of 2m long and 7.5cm in diameter at one end).

D. Net Area to Reforest (NAR)

SU	Area Description	NAR (ha)	Harvest System
A	SBSmk1 - 01 (Minor 09, 0.5ha)	35.0	Clearcut with reserves
Critical site conditions that affect the timing of operations:			
Comments specific to SU A:			

E. Soil Conservation

SU	HAZARD RATINGS			Maximum Allowable Soil Disturbance (%)	Maximum Allowable Soil Disturbance at Roadside (%)	Maximum Soil Disturbance Temp. Exceeded (%)	Soil Horizon	Soil Texture	Coarse Fragment %
	Soil Compaction	Surface Soil Erosion	Soil Displacement						
A	Moderate	Moderate	Moderate	10.0	25.0	0.0	B	SL	35

Soil Conservation Comments: The soil protection objective is to minimize site disturbance and potential long term productivity losses.

F. Post Harvest Stocking Requirements

Stocking Standard Regime ID	SU	Layer	Assessment Dates			Preferred (P) Species Species - Min. FG Height (m)	Acceptable (A) Species Species - Min. FG Height (m)
			Regen Delay (yrs)	Early FG (yrs)	Late FG (yrs)		
1001476	A	L4	4		20	Fdl-1.4/PJL-2/Sx-1	

Stocking Standard Regime ID	SU	Layer	Well Spaced Trees (#/ha)			Maximum Coniferous (s/ha)
			Target/Minimum Preferred & Acceptable	Minimum Preferred	Minimum Horizontal Distance (m)	
1001476	A	L4	1200 / 700	700	2.0	10,000

Required Information For Stocking Requirements

G. Assessments

Type	Required	Management Strategies
Visual Impact Assessment	No	This block is not located within a visually sensitive area, therefore no VIA is required.
Archaeological Inventory and Impact Assessment	No	This block was rated as having a moderate likelihood of archaeological potential and therefore an assessment was not conducted. Should any cultural heritage resource features be identified during harvesting or road construction, operations that may negatively impact these resource features will be suspended or modified and appropriate Canfor personnel notified.
Terrain Stability Field Assessment	No	
Recreation Resource	No	No Recreation Site or Trail is within 100m of this block.

H. Riparian Management Strategies

Riparian ID / Lake ID	Riparian Class / Lake Class	RRZ Width (m)	RMZ Width (m)	Management Strategies - RRZ/RMZ
R1	S3	20	20	R1 - S3 is located on the east side of the block and is located a minimum of 30m outside the block boundary. Remaining portions of the RMZ that are within the harvested area of the block will be managed as per the specifications of the adjacent SU due to the presence of mountain pine beetle infested timber. 69
R3	W1	10	40	/ R3 - W1 The RMZ for this feature is entirely outside the block boundary.

FNR-2013-00368 Part 1

Province of British Columbia

Random Method for Soil Conservation Surveys

Draft version – July 2011

Mike Curran, PhD, PAg, Forest Science and Silviculture Team Leader
(and Research Soil Scientist) Kootenay-Boundary Region, BC Forest
Service, (Ministry of Natural Resource Operations) Nelson, BC

Table of Contents

Introduction..... 3

Measuring Dispersed Disturbance Using a Random Approach 6

Guidelines for Stratification..... 8

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted
Areas, Soils That Have Sustained Damage..... 9

Compacted Areas 10

Introduction

The objective set by the BC Government for forest soil management is to “without unduly reducing the supply of timber from British Columbia’s forests, to conserve the productivity and the hydrologic function of soils” (Forest Planning and Practices Regulation). Soil disturbance levels are limited in the FRPA to the following levels:

- (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25% of the area covered by a roadside work area (a roadside work area is defined as the area adjacent to a road where one or both of the following are carried out:

- (i) decking, processing or loading timber;
- (ii) piling or disposing of logging debris;

Sensitive soils are soils that, because of their slope gradient, texture class, moisture regime, or organic matter content have the following risk of displacement, surface erosion or compaction:

- (a) for the Interior, a very high hazard;
- (b) for the Coast, a high or very high hazard.

Because the MOF no longer verifies soil hazard ratings in prescriptions, a necessary first step in every survey is to determine the soil hazard rating. The rating determined by the surveyor is then used to determine which soil disturbance categories count, and the disturbance limits for the area to be surveyed.

Soil disturbance is defined as disturbance to the soil in the net area to be reforested in a cutblock because of:

- (a) temporary access structures,
- (b) gouges, ruts and scalps, or
- (c) compacted areas, but does not include the effect on the soil of rehabilitating an area in accordance with section 35 (Section 35 allows for up to 5% of the standards unit to be in excessive disturbance as long as enough of this excess disturbance is rehabilitated so that the disturbance limit is no longer exceeded).

Gouges, ruts, scalps and compacted areas are not defined except in the 2001 Soil Conservation Surveys guidebook. Temporary access structure is defined in regulation as an access structure that is not a gravel pit and does not meet the requirements of a permanent access structure which are:

(a) at the time of its construction, it is reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the cutblock, or

(b) it is constructed on or through, or contains, materials unsuitable for the establishment of a commercial crop of trees and is not an excavated or bladed trail, but does not include an area that contained an access structure before rehabilitation of the area under section 36.

An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder:

(a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or

(b) is constructing a temporary access structure and both of the following apply:

(i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area;

(ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such that the agreement holder is in compliance with the limits set out in subsection (3).

Rehabilitation is discussed further in the rehabilitation section below.

There are also limits placed on the amount of permanent access structure allowed in a block. An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless

(a) there is no other practicable option on that cutblock, having regard to

(i) the size, topography and engineering constraints of the cutblock,

(ii) in the case of a road, the safety of road users, or

(iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or

(b) additional permanent access structures are necessary to provide access beyond the cutblock.

If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.

In order to assess whether or not these regulations are being addressed requires definition of terms and a method for measuring the levels of the various disturbances discussed above. This was done in the 2001 Soil Conservation Surveys Guidebook. This guidebook breaks blocks into two categories, small and large and provides two different methods of survey. The big block method was prone to giving large confidence intervals because it utilized a clustered sampling design. The clustered sampling design was a trade-off developed to allow sampling many points in a large block in an efficient manner. The small block method was to have been the preferred method, but when the

option of stratifying blocks for compliance assessment was removed, the small block method was not applied directly to big blocks because it is excessively time consuming to apply over a large area.

Advancements in GPS and handheld computer technology mean that options are now available to surveyors that were not available when the last guidebook was written. Sampling theory tells us that completely random sampling is the most consistently successful approach for achieving a truly representative sample of a population with the least number of points sampled. That basic principal is confirmed, in a work recently completed by Thompson et al, for the case involving sampling logging disturbance in cutblocks. The next best design is a completely square grid, which is labour intensive and requires the most of amount of walking to implement. The further the design gets from square, the easier it is to implement, but the higher the risk there is of a nonrepresentative sample if the population being sampled is not evenly distributed. Logging disturbance is typically very non-uniform in distribution and may be clustered or linear and so the orientation of non-square sampling grids in relation to disturbance is always a concern.

Until recently, layout of completely random sampling networks over large areas, using commonly available field equipment, has been very labour intensive. However, using readily available GPS technology, it is now relatively easy to take an unbiased-random sample from cutblocks. The method also has the advantage of very little layout time and less walking (especially backtracking) than would be necessary for sampling on the squarer grid layouts. In addition, the completely random design gives lower variability than grid designs for sampling logging type disturbance (Thompson et al??) and determination of confidence intervals is based on binomial distributions. If more power is needed for a particular survey, it is a simple matter to add more random points and resurvey the area without having to worry about creating new grids or infilling grids. For measuring roads, landings, trails and other distinct features within a block, relatively cheap digital imagery can be used for highly accurate and inexpensive assessment of these features, though the older ground based approaches used in the Soil Conservations Surveys Guidebook, can still be used. A high resolution digital image makes a very good base map for the random survey and wherever possible, the use of these images is encouraged.

This guide book outlines the general procedure for estimating dispersed disturbance levels in cutblocks of all sizes using a random sampling approach. It also describes a method for measuring other disturbance features from digital air photos.

Measuring Dispersed Disturbance Using a Random Approach

There may be many ways to achieve a random survey- this manual outlines one that is utilizes relatively commonly available technology. The broad steps are as follows:

1. Based on the estimated disturbance levels the number of points that need to be sampled to achieve the desired confidence interval is estimated. For a typical survey of a block with 5% to 10% disturbance, 200 points gives a one sided 90% confidence interval of about 3 percentage points. This means that blocks will be called excessively disturbed if the measured disturbance exceeds 13% for a 10% disturbance limit block or 8% for a 5% limit block. In other words, with a sample size of 200 points on 10% disturbance limit blocks, if the number of disturbed points equals or exceeds 26 counted points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. If the number of disturbed points in a 200 point survey, of a 5% disturbance limit block, equals or exceeds 16 points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. It should not be necessary to survey more than 200 points in a block (or stratum), but if a block (or stratum) is highly disturbed, it may be feasible to survey fewer points. Appendix B shows how to determine confidence intervals for surveys of other numbers of survey points or other levels of disturbance. The higher the disturbance level, the fewer points are needed in the total survey to establish with confidence that the block is over the limit. The size of the block has no bearing on the number of points, but unavoidably, the larger the block, the more time it takes to survey.
2. An appropriate number of random waypoints are generated. There may be other ways to do this, but one method involves creating a shape file of the NAR (survey stratum minus roads, landings or other features which are not part of the NAR). A multipoint polygon is generated in Arcmap using a Random Point-in-Polygon Generation Program (VBA Macro) (Sawada, 2002). The multipoint polygon is converted to waypoints in OziExplorer or other mapping software that has this function.
3. The waypoints and a base map are downloaded onto a GPS unit that is set up to beep when the surveyor passes within 1 metre of the waypoint. The surveyor navigates to the waypoint and the exact observation point is indicated by the precise moment at which the GPS beeps. The observation point is fixed exactly at that moment by some arbitrary locator of the observation point. For example the observation point could be deemed to be located directly below one corner of the GPS unit or at the end of the surveyor's right toe, wherever those are at the moment the GPS beeps. The same locator should be used throughout a survey.
4. The survey progresses by using the built in navigation aids in the GPS to move from waypoint to waypoint. The surveyor is free to select the most efficient route through the points.
5. The data is entered directly into the GPS unit.
6. All of the points generated for a particular survey must be surveyed, i.e. one cannot survey points in a portion of the block and then conclude that the surveyed

area is or is not in compliance. Since disturbance within a cutblock is usually distributed unevenly, the entire set of points must be surveyed before making judgements about the level of disturbance. However, it is possible to initially do a complete survey with a smaller number of points and if that survey does not have sufficient power to give a clear result, a new set of random points can be generated for the same area and surveyed and the results combined with the previous survey to create a more powerful survey.

7. When the survey is complete, the waypoint file is converted to a spreadsheet file, and the calculations are made on the spreadsheet.

Many different configurations of hardware and software can be used to achieve a random survey and it is not possible to cover all those in this guidebook. Presented in Appendix A is a detailed protocol for a particular set of software and hardware. Potential surveyors who wish to use other software/hardware combinations may find some useful tips in this guidance, but they are not required to use the equipment combination described. The fully random survey needs to meet the following criteria:

1. The observation points must be randomly generated with any point in the survey area having a chance to be surveyed.

2. When the actual observation point is located in the field, it must be selected by following an unbiased and precise rule, such as directly under the GPS at the exact moment the GPR beeps (or some other confining trigger). The surveyor must not adjust the observation point in any way, nor have leeway to select the sampling point from within a broader possible sampling area, e.g., it would be unacceptable to simply select the sampling point from anywhere in front of the surveyor at the point the GPS beeps.

3. When the lower one-sided 90% confidence limit for the measured disturbance level is greater than the disturbance limit, the block is counted as over. Whatever size of survey indicates the block is over the lower 90% confidence limit, is acceptable. For surveys where the disturbance limit is greater than the one-sided 90% lower confidence limit, in order for the block to be considered under the disturbance limit- the lower one-sided 90% confidence interval must be 3 percentage units or less, (see Point 4 below). This is to address the situation where a surveyor might choose to survey fewer points because the disturbance is greatly in excess of the limit. Surveying fewer points means that the confidence interval could be larger if the surveyor overestimated the level of disturbance. This situation would make it more likely that the disturbance limit of a block will lie in the ambiguous zone of the confidence interval (between the lower confidence limit and the measured level of disturbance). Therefore, for blocks with disturbance close to the limit, the surveyor must sample sufficient points to make the lower confidence interval $\leq 3\%$ points. In cases where the measured level of disturbance is $\leq 3\%$, the upper 90% confidence interval must be $\leq 3\%$ points. For disturbance levels greatly above or below the limits, a survey could have fewer than 200 points and still be valid as long as the disturbance limit still fell below the 90% confidence interval (i.e., the block is counted as over). For example, if the actual level of disturbance on a block with a 10% disturbance limit

was 30%, it would take fewer points to establish if the block was in compliance (see below). If the surveyor chooses to do a smaller survey based on an assumption about the disturbance level that turns out to be incorrect and as a result the outcome of the survey is ambiguous, the surveyor can simply generate another set of random waypoints and add to the survey.

There are normally financial constraints to doing large surveys and a 200 point survey with one-sided confidence interval of around 3 percentage points for disturbance levels in the range of the normal limits (5 to 10%) will give an acceptable level of precision. This means that before a block is called excessively disturbed, the measured disturbance levels will exceed 13% or 8% for the 10% and 5% limits respectively. If a licensee finds themselves in a situation where the lower confidence limit from the survey is slightly higher than the disturbance limit, they can increase the survey size to any size they deem fit to get a more precise measure of disturbance. However, it should be remembered that the most probable level of disturbance is near the mean level determined by the survey. When a block is marginally over the limit the most likely outcome is that more points will narrow the confidence interval around a point close to the original mean.

4. Each point in a stratum or block being surveyed must have the same chance of being sampled. This means that it is not acceptable to survey some arbitrarily chosen subset of the points in a set of random waypoints (e.g. ½ the block) and then stop because it appears the survey will be over or under. However, it is acceptable to do a survey with fewer sample points based on an estimation of a level of disturbance within the block that suggests actual disturbance levels might be considerably greater (>2 times) or less (<0.5 times) than the limit. If a survey with a smaller number of points gives a 90% one-sided-lower confidence limit greater than the disturbance limit, then the block is over. If the disturbance limit is greater than the 90% one-sided-lower-confidence limit and the lower (or upper if the mean is small) confidence interval is ≤ 3% points, then the block is not over.

5. While surveys must be conducted and reported based on entire standards units, cutblock, roadside work area or area of inordinate disturbance as the particular regulatory framework dictates, it is still possible to stratify these survey areas for the purposes of improving the efficiency of the survey, as long as every point in the area being surveyed, has a chance of being surveyed. The techniques for stratifying to improve the efficiency of a survey are described below.

Guidelines for Stratification

Under the Forest Practice Code there was a provision to allow enforcement of soil disturbance limits on areas as small as one hectare. Under FRPA, enforcement of soil disturbance limits is to take place on the NAR of the cutblock. The size of the area on which enforcement can take place is a separate issue from stratifying to improve the efficiency of a survey. A stratified random sample will still report the disturbance level for the entire legal unit that is surveyed, however, not every portion of that unit need be

sampled at the same intensity. The main reason for stratifying to survey is to improve the efficiency of the survey. If, for example, a large portion of the area to be surveyed has very little disturbance (<2%) and a small proportion of the area (<20% of the area) has high disturbance (>15%), then it is more efficient to sample the heavily compacted area more intensely and the less disturbed area less intensely. This saves considerably on the amount of walking that needs to be done and if one stratum is very lightly disturbed (<2%), there may also be an increase in the power of the survey. If you cannot delineate strata with greatly different levels of disturbance, there is no advantage to stratifying. Strata need to be delineated before the survey begins and the most efficient way to do this is from a high resolution image such as those used for the soils FREP process. Such images can be flown specifically for blocks and this possibility should be considered for blocks where legal action is highly likely. The images also allow precise estimates of area in roads, landings, roadside work area, trails or other features in a block. Strata can also be delineated on a sketch map after an on-site inspection.

To stratify, first the amount of disturbance within each stratum is estimated. For example a stratum could be 10 hectares in size and contain approximately 25% disturbance so the amount of disturbance is $10 \text{ ha} \times 0.25 = 2.5 \text{ ha}$. If another stratum is 50 ha in size but contains only 1% disturbance, then the amount of disturbance in this stratum is $50 \text{ ha} \times 0.01 = 0.5 \text{ ha}$. The proportions of disturbance in each stratum are estimates only and do not have to be determined by measurements but no stratum should ever have zero points. The practical lower limit for estimated disturbance in a stratum is probably around 0.5%.

To assign the number of survey points to each stratum the formula is:

$$\text{Points Per Stratum} = \frac{\text{Area Disturbed Per Stratum} \times \text{Total Survey Points}}{\text{Total Area Disturbed}}$$

For our example, to find how many points to put in the 10 ha stratum, the calculation is as follows:

$$\text{Points in 10 ha Stratum} = \frac{2.5 \text{ ha} \times 200 \text{ points}}{2.5 \text{ ha} + 0.5 \text{ ha}} = 167 \text{ points}$$

This leaves 33 points in the big/low disturbance stratum. Surveying will go much more quickly because most of the points are in the small stratum and much closer together. In this case, because the disturbance in the large stratum is so low, there is actually a narrowing of the confidence interval- in other words this survey is more powerful than if the points were randomly and evenly distributed throughout the entire area surveyed.

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage

Roadside work areas, inordinate disturbance and compacted areas are all special survey cases. Roadside work areas have a higher disturbance limit- 25% and so must be tallied

separately from the rest of the NAR. The higher disturbance limit in the roadside work area means that disturbance can be measured with the same confidence with a smaller number of points. Therefore, we recommend using only 100 points in the RWA. Inordinate Disturbance, Areas of Compacted Soil, Soils That Have Sustained Damage and compacted areas are all types of disturbance that may require rehabilitation if they are identified by a block inspection, or during a survey. The provision for rehabilitating these areas are contained in the Forest Practises Code or FRPA and their supporting documents.

Compacted Areas

The Forest Planning and Practises Regulation (under FRPA) requires the rehabilitation of areas of compacted soil:

5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

(a) the area of compacted soil

(i) was created by activities of the holder,

(ii) is within the net area to be reforested, and

(iii) is a minimum of 1 ha in size;

What constitutes an area of compacted soil under this section of FRPA is not defined but any areas greater than 1ha in size that have more than 25% disturbance, should be documented during the survey for consideration as compacted areas. The potential compacted area should be delineated separately

The provisions for rehabilitating compacted areas and inordinate disturbance are contained in the Forest Practises Code.

47(7) A person who, within an area under a site plan prepared under section 21.1 or silviculture prescription, constructs or modifies a bladed or excavated trail or a corduroyed trail or creates a compacted area, must rehabilitate the area in accordance with the regulations and standards.

In this case, the compacted area refers to an area >100m² and >5m wide that is 100% compacted. For blocks under the CODE or transition CODE, any areas

Inordinate Disturbance

45(3) A person must not carry out a forest practice if he or she knows or should reasonably know that, due to weather conditions or site factors, the carrying out of the forest practice may result, directly or indirectly, in

(a) slumping or sliding of land,

(b) inordinate soil disturbance, or

(c) other significant damage to the environment.

- (4) A person who contravenes subsection (1) or (3) must*
(a) stop the forest practice in the area affected,
(b) prevent any further damage to the environment,
(c) promptly notify the district manager, and
(d) take any remedial measures that the district manager requires

The Timber Harvesting and Silviculture Practices Regulation defines inordinate disturbance as follows:

53 (1) For the purposes of section 45 (3) (b) of the Act, **“inordinate soil disturbance”** means soil disturbance that

- (a) results in the district manager requiring rehabilitation of soil under section 48 (1) of the Act, or
(b) exceeds the soil disturbance limit specified in section 31 of this regulation.

The Forest Practices Code Act of British Columbia section 48(1) reads as follows:

48. (1) If the district manager determines that the area under an operational plan has sustained damage as a result of a forest practice, the district manager may, by written notice, direct the person responsible for the damage to take measures and to pay costs that are necessary to rehabilitate the area to the satisfaction of the district manager and the person must comply with the notice.

The term “sustained damage” is not defined anywhere but the surveyor should provide data to help make the determination of damage. Any areas greater than 1ha in size that have more than 25% disturbance or any areas in the NAR that are unlikely to sustain tree growth, should be documented in the survey.

Steps for determining confidence intervals and number of points required.

Checking soil hazard ratings

RWA, Inordinate Disturbance, Compacted areas

Regulatory Framework.

Rehab stuff

- , (3) , An agreement holder may rehabilitate an area occupied by permanent access structures in accordance with the results or strategies specified in the forest stewardship plan or by
 - , (a), removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compacting compacted soils, and
 - , (c), returning displaced surface soils, retrievable side-cast and berm materials.
- , (4) , If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.
- , (5) , The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:
 - , (a), the area of compacted soil
 - , (i), was created by activities of the holder,
 - , (ii), is within the net area to be reforested, and
 - , (iii), is a minimum of 1 ha in size;
 - , (b), the holder has not exceeded the limits described in subsection (3);
 - , (c), rehabilitation would, in the opinion of the minister,
 - , (i), materially improve the productivity and the hydrologic function of the soil within the area, and
 - , (ii), not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act.
- , (6) , An agreement holder who rehabilitates an area under subsection (4) or (5) must
 - , (a), remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compact compacted soils, and
 - , (c), return displaced surface soils, retrievable side-cast and berm materials.
- , (7) , If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.

Background

After discussing with Mike Boyde of Ft. St. James C&E Field Unit, a soil conservation assessment on CANFOR block No. A33601 CP B66 CB CAR464 was carried out in 3 phases to ensure that logging practices conserved the productivity and hydrologic function of the soil as stated in *Forest Planning and Practices Regulation (FPPR, section 5)*.

Phases of assessment consisted of:

- I. Walkthrough inspection including checking out soil disturbance survey results submitted by CANFOR;
- II. Evaluation of soil disturbance using high resolution aerial photography, and;
- III. Formal soil conservation survey using random point sampling method.

As a result, within this logging block we found 3 instances of non-compliance with results and strategies described in CANFOR Forest Stewardship Plan (FSP) for soil conservation in accordance to legislated BC forest practices requirements:

- 1) Under *Forest and Range Practices Act (FRPA)* section 21 (1), the intended results for soils within the Net Area to be Reforested and Roadside Work Areas (RWA's) set out in the FSP were not achieved.
- 2) Under *FRPA* section 46 (1), soil disturbance from cut-to-length logging practices directly and indirectly resulted in damage to the environment.

Interpretation and discussion of our findings from this assessment are presented below.

Results & Discussion

Cut-To-Length (CTL) operations were utilized to harvest block CAR464 (Figures 1 and 2), in which trees are delimbed and cut to length directly at the stump and then, a forwarder transports the logs from the stumps to the road. Recognized as a gentle logging practice, CTL uses less area to move the wood than does whole-tree harvesting however CTL may result in more soil disturbance due to repeated travel on designated trails and log decking areas.



Figure 1. Layout of typical forwarding trail bordered by 2 residual strips (left) and cut-to-length logs decked on roadside work area (right) from the Teardrop Area.

Phase I - Walkthrough inspection

During a walkthrough inspection carried out in 2010, it became apparent that throughout block CAR464, there had been harmful changes to soil. A review of soil disturbance survey results submitted by CANFOR for CAR464 revealed that (i) my counted disturbance greatly exceeds that measured by their surveyor (Table 1), (ii) my results point towards disturbance levels over maximum limits set out in the site plan (Appendix 1), and (iii) the survey methodology used i.e. Big Block method with grid centres was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is mostly confined to forwarding trails and RWA's. With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This will result into Lower Confidence Limits (LCL) and therefore, a false acceptance of in-compliance.

A LCL defines a disturbance value that must be lower than a benchmark (herein, soil limit of 10%) to meet soil conservation objectives. If above this benchmark, the LCL indicates a non-compliance with the FSP (can also be called the "audit value").

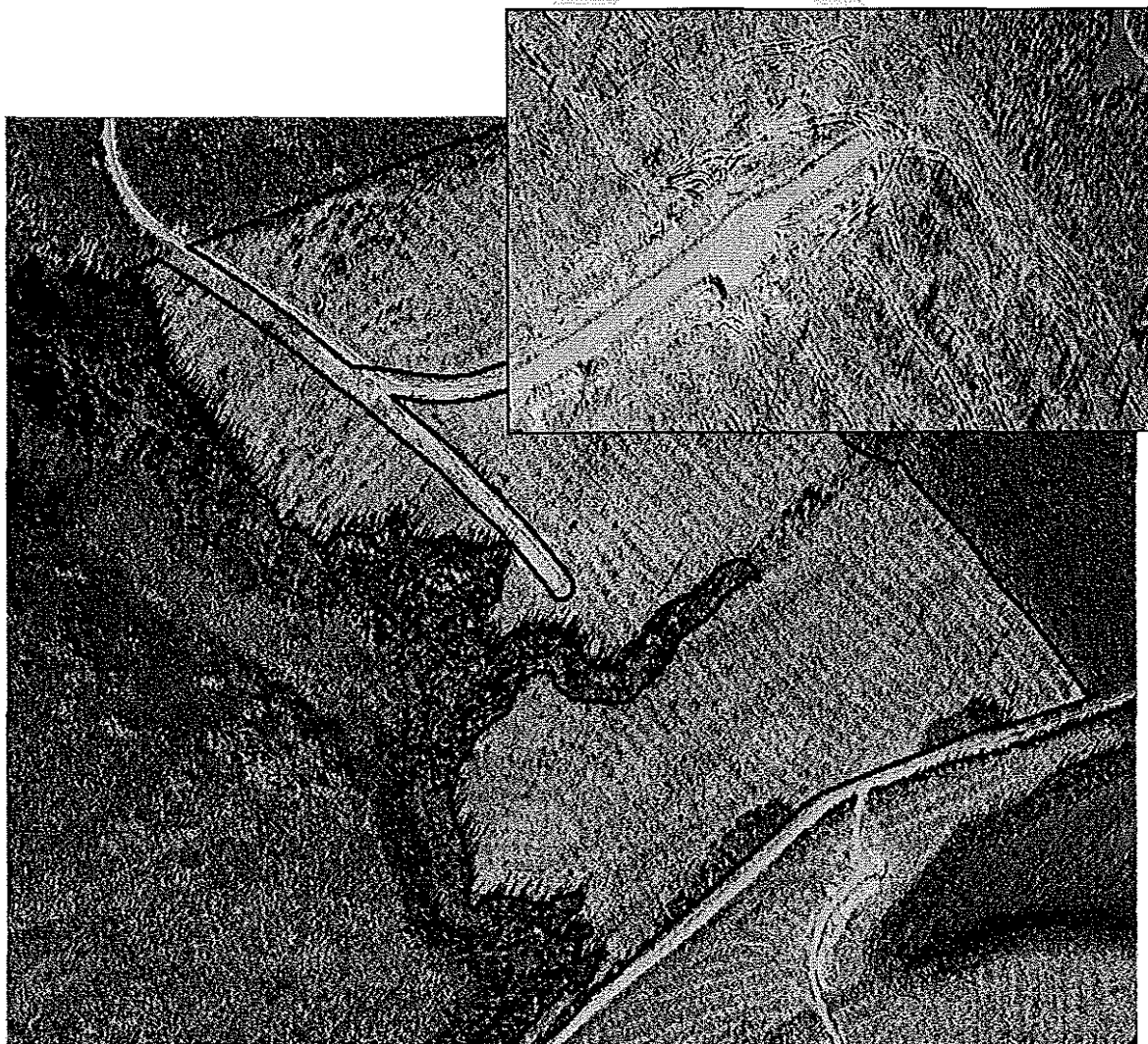


Figure 2. Aerial Photography of block CAR464 in 2010 (1 year post logging, 15 cm pixel size resolution). Insert shows the extent of ruts and ponded water in northwest area.

Table 1. Results of Mean and Lower Confidence Limit for soil disturbance from CANFOR survey report, walkthrough and random point sampling survey for NAR and RWA's.

	CANFOR	Walkthrough ^a	Random Point Sampling Survey
Areas	%	%	%
NAR	5.5 (3.9)	15.0	24.8 (19.4)
RWA	15.3 (7.2)	42.0	55.0 (48.9)

^a Walkthrough results are the mean % only

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic (code "E") is called when the survey point and sampling window (1m Wide x 2m Long rectangle) show evidence of compaction indicated by increased soils density (Figure 3, coarse blocky/platy structure), puddling or compacted deposits of slash and organic debris. Compaction was assessed by comparing soil structure at survey point to soil conditions of adjacent undisturbed areas (i.e., at similar soil water content). The "natural soil condition" was checked frequently by digging to ascertain compaction during our survey.

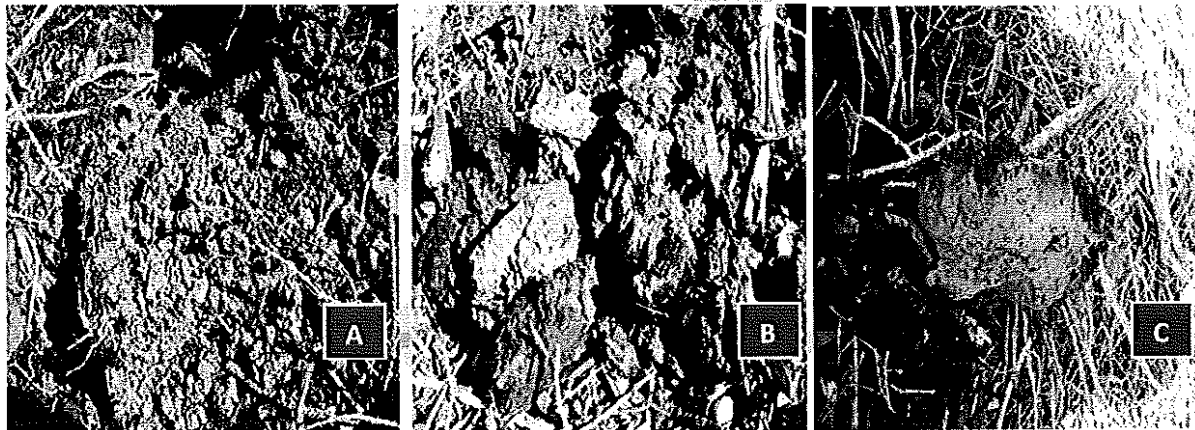


Figure 3. Fluffy and loose soil (A) turned into stone like material (B&C) after trafficking at block CAR464.

In table 1, disturbance % from the walkthrough were rough estimates of the mean %, and simply calculated from dividing the number of points with counted disturbance by the total number of points re-measured (a re-survey of 394 points originally done by CANFOR). We could not guarantee the exact location of survey points during our review was that of CANFOR. However discrepancies between their results and the results from our review were large enough that in our opinion, compaction condition of the soil was not properly identified on this block. In one particular area, a transect line crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as "E's".

Similarly to NAR, Big Block method with grid centres was also inappropriate for surveying RWA's because it was not representative of the main disturbance pattern. Some transects ran parallel to soil disturbance almost avoiding it while others skipped the surveyed area (e.g., survey points falling outside RWA or on roads) so CANFOR did not collect enough points to get a reliable estimate of the RWA soil disturbance.

Phase II. Soil disturbance digital mapping

A geo-referenced high resolution aerial photo taken after logging reflected my biggest concerns in terms of damage to soils (Figure 2). Soil disturbances such as ruts, waterlogging and scalped soils did clearly stand out in forwarding trails and along in-block roads. Although machine traffic was limited to tracks areas, overall the degree of soil disturbance appeared to be very high. Combining in-block roads and off-road traffic disturbance represented more than 35% (or 12.7 ha) of the total block area (Table 2). In my opinion, this was the result of excessive or a more than necessary amount of logging and was not planned with an eye to maintain site productivity but providing the lowest cost to extract timber.

Table 2. The area proportion of NAR and PAS to total cutblock area. NAR contains RWA's, forwarding trails and residual strips.

Block No.	Total cutblock area (ha)	NAR (%)			PAS (%)
		RWA	Trails	Residual strips	
464	36.0	9.4	23.5	64.8	2.8

Operating machinery has also altered natural drainage patterns on this site. Water ponded on soil surface where track ruts crossed 4 natural seeps and lead to waterlogging or poorly drained soils as illustrated on Figures 4. Three years post-logging, drainage patterns were not compatible with the original natural drainage patterns. We also mapped areas of inordinate disturbance where soil disturbances exceed 30% of the total area and looked somewhat like the moon. Figure 4 highlights 2 damaged areas (up to 1.4 ha in size) almost completely cleared of forest floor, compacted and in which water drained nowhere due to ruts present everywhere and that run in every directions. This initial damage assessment was validated on the ground.



Figure 4. Areas of inordinate disturbance and drainage diversion on block CAR464.

Phase III – Random Point Sampling Survey

Silty Loam (SiL) and Loam (L) soils, as determined by the “Hand Test” and a few coarse fragments were found almost everywhere in the upper 30 cm of mineral soil along the walk. When squeezed in your fist, moist SiL and L will form a ball. The site plan has Sandy Loam as dominant soil texture (Appendix A), which in my opinion underestimated the amount of fines. Although less cohesive than clay, silt-type soil has very little load bearing capacity and is highly susceptible to compaction when wet. Under *FPPR* section 35(1), soil disturbance levels should not exceed, respectively 10% in the NAR and 25% for RWA’s in these conditions.

A soil conservation survey based on random point sampling provided statistically valid measurements (more about the survey method in Appendix B) and did confirm the extent to which the block area was in non-compliance with the allowable limits under CANFOR FSP. With this procedure, soil disturbance was measured at GPS points or waypoints randomly located throughout the block as shown on the GPS soil survey map (Figures 5 and 6).



Figure 5. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in NAR. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic and TD = deep wheel track/ruts) or point landing outside of NAR (OUT).

Within the NAR, based on 109 random sample points (n=109) the survey results showed a LCL of 19.4% as soil disturbance level (Table 1), which exceeds the soil limit of 10%. Likewise, disturbed soils were present within the RWA's (Figure 5). Disturbance measured was 48.9% (LCL), which was not within an acceptable limit of 25% for the area covered by RWA's (n=109). Repeated Machine Traffic was the most common disturbance type (E) across the site. Within forwarding trails, compaction explained 53% of all disturbances indicating that like clay, coarser soils with silt when wet will be highly sensitive to machine wheels or tracks (Figure 6). Outside track location i.e. residual strips of vegetation were left intact since there was no ground disturbance in them.

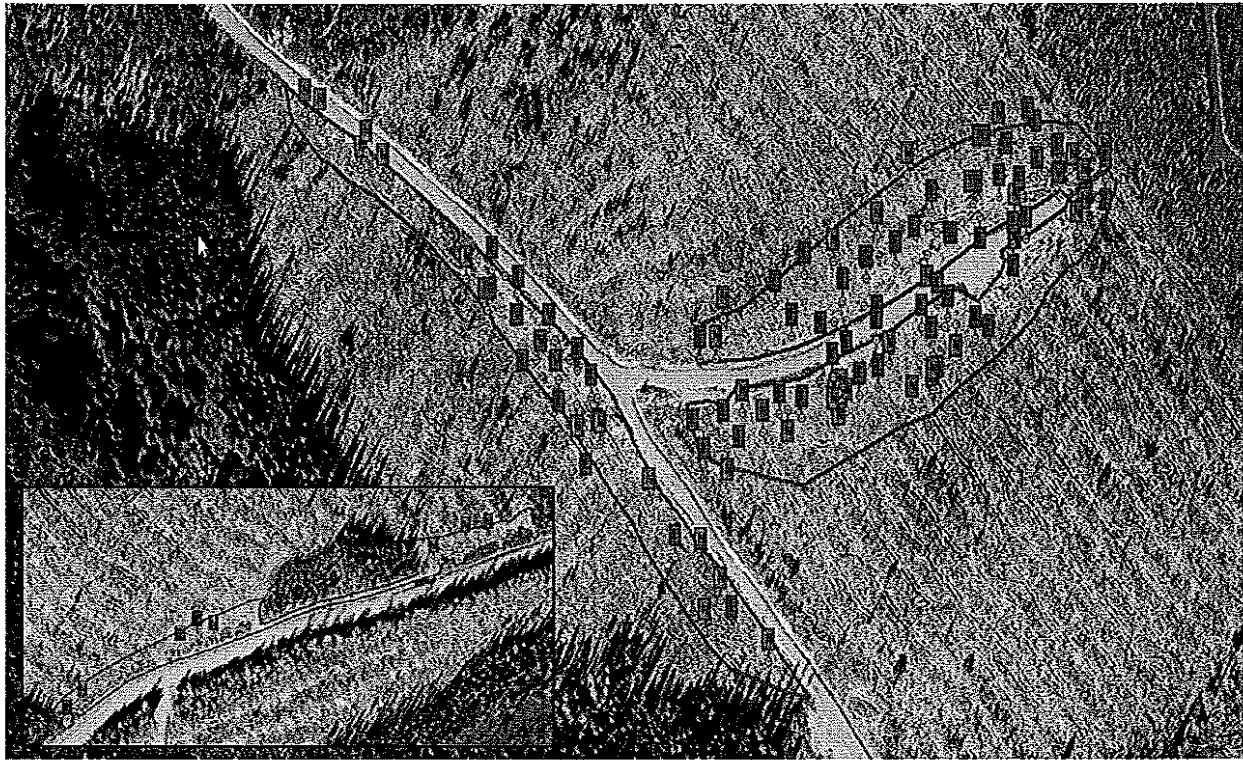


Figure 5. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in RWA's. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic, TD = deep wheel/track ruts, V = very wide scalps, G = deep gouges or W = wide gouges).



Figure 6. Un-rehabilitated corduroy trails and ruts in forwarding trails interspaced with residual trips on a similar block from the Teardrop Area.

Conclusion

C&E Ft. St. James Unit concerns that the soil disturbance limits may have been exceeded in block were justified. As confirmed by a formal soil conservation survey, extensive soil compaction occurred when heavy weight loads compressed the soil during operations within the NAR and RWA's. Indeed, CANFOR has contravened the following 2 provisions under *FRPA*: sections 21 (1) and 46 (1).

Excessive soil disturbance (herein defined as un-rehabilitated temporary access structure, gouges, ruts and scalps and compacted areas under *FPPR* Part 1 – Interpretation section 1) has adversely altered ecosystem integrity by altering the way the soil functions on this site and therefore, the capacity of this site to grow forest has been diminished. Combined results from Assessment Phases I, II and III indicated that machine logging traffic lead to changes to: (i) structural properties of the soil as shown by significant amount of ruts and compaction on forwarding trails and within RWA's, (ii) natural drainage patterns that were not maintained as evidenced from ponded water along 4 channels, and (iii) almost complete loss of forest floor within some areas that results in loss of habitat for specialist species (e.g., worms, fungi, microbes etc.) important to soil biodiversity. Preserving organic matter could also have helped reducing ground disturbance.

Environmental benefits of CTL can be negated when logging occurs over soils that contains much silt and are wet. This site has low load-bearing strength materials when wet. Silty soils drain slowly and after prolonged rainfalls, become quickly water logged. In forests, finer-textured soils behave the same way they do in cultivated soils or in urban settings. Thus, a person can reasonably expect that compaction will be a concern with careless logging. If someone had paid any attention to weather and moisture in the soil prior to logging, there is no doubt that this damage could have been avoided.

Proper scheduling with regards to available moisture in the soils, lowering ground pressure by equipment on trafficked trails and better use of slash mats prior to skidding (these need to be removed after logging is completed so it does not hinder growth) are important for soil conservation with CTL.

Please, do not hesitate to contact me for further discussion.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist
BC Forest Service

DRAFT

Appendix A



A33801

Canadian Forest Products Ltd. - Prince George Region

Aug 20, 2007

Site Plan

A. Tenure Identification

Licence	Permit	Block	Operating Area	Opening	Timbermark(s)	Gross Area (ha)	Net Area to Reforest (ha) NAR	District
A40875	B66	CAR464	Mossvale	093J033-	FJ3B66	40.1	35.0	Fort St. James Forest Dist

B. Area Summary and Description for Areas Not Contained Within NAR

Proposed Permanent Access (%)	Max. Permanent Access (%)	Wetland	Water	NP	Immature	NCB > 4ha	Reserves	Total
2.4	7.0	0.0	0.0	0.0	0.0	0.0	5.1	5.1

C. Stand Level Biodiversity

Biological Diversity (%)
12.7

Biodiversity Comments:

LEAVE TREE SPECIFICATIONS

Biodiversity values will be maintained via external reserves (SU R). SUR consists of a PI(Sx) type that is associated with a riparian management area.

The following trees will be retained where present and operationally feasible:

- Acceptable non-merchantable coniferous species in the pole, sapling and regen layers
- Deciduous species (may be stubbed at 3-5 metres)

Retain all Douglas -fir

Leave trees that are cut due to operational or safety constraints will remain on site (dispersed and un-processed). Roadside processing and decking areas will be clearcut.

Prescribed leave trees may be removed for building roads, roadside decking, felling access, skidding access, and safety reasons.

COARSE WOODY DEBRIS

The Coarse Woody Debris (CWD) target for the block is a minimum of 4 logs per hectare (each being a minimum of 2m long and 7.5cm in diameter at one end).

D. Net Area to Reforest (NAR)

SU	Area Description	NAR (ha)	Harvest System
A	SBSmk1 - 01 (Minor 09, 0.5ha)	35.0	Clearcut with reserves
Critical site conditions that affect the timing of operations:			
Comments specific to SU A:			

E. Soil Conservation

SU	HAZARD RATINGS			Maximum Allowable Soil Disturbance (%)	Maximum Allowable Soil Disturbance at Roadside (%)	Maximum Soil Disturbance Temp. Exceeded (%)	Soil Horizon	Soil Texture	Coarse Fragment %
	Soil Compaction	Surface Soil Erosion	Soil Displacement						
A	Moderate	Moderate	Moderate	10.0	25.0	0.0	B	SL	35

Soil Conservation Comments: The soil protection objective is to minimize site disturbance and potential long term productivity losses.

F. Post Harvest Stocking Requirements

Stocking Standard Regime ID	SU	Layer	Assessment Dates			Preferred (P) Species Species - Min. FG Height (m)	Acceptable (A) Species Species - Min. FG Height (m)
			Regen Delay (yrs)	Early FG (yrs)	Late FG (yrs)		
1001476	A	L4	4		20	Fdi-1.4/PI-2/Sx-1	

Stocking Standard Regime ID	SU	Layer	Well Spaced Trees (#/ha)			Maximum Coniferous (#/ha)
			Target/Minimum Preferred & Acceptable	Minimum Preferred	Minimum Horizontal Distance (m)	
1001476	A	L4	1200 / 700	700	2.0	10,000

Required Information For Stocking Requirements

G. Assessments

Type	Required	Management Strategies
Visual Impact Assessment	No	This block is not located within a visually sensitive area, therefore no VIA is required.
Archaeological Inventory and Impact Assessment	No	This block was rated as having a moderate likelihood of archaeological potential and therefore an assessment was not conducted. Should any cultural heritage resource features be identified during harvesting or road construction, operations that may negatively impact these resource features will be suspended or modified and appropriate Canfor personnel notified.
Terrain Stability Field Assessment	No	
Recreation Resource	No	No Recreation Site or Trail is within 100m of this block.

H. Riparian Management Strategies

Riparian ID / Lake ID	Riparian Class / Lake Class	RRZ Width (m)	RMZ Width (m)	Management Strategies - RRZ/RMZ
R1	S3	20	20	R1 - S3 is located on the east side of the block and is located a minimum of 30m outside the block boundary. Remaining portions of the RMZ that are within the harvested area of the block will be managed as per the specifications of the adjacent SU due to the presence of mountain pine beetle infestation.
R3	W1	10	40	R3 - W1 The RMZ for this feature is entirely outside the block boundary.

Province of British Columbia

Random Method for Soil Conservation Surveys

DRAFT

Draft version – July 2011

Mike Curran, PhD, PAg, Forest Science and Silviculture Team Leader
(and Research Soil Scientist) Kootenay-Boundary Region, BC Forest
Service, (Ministry of Natural Resource Operations) Nelson, BC

Table of Contents

Introduction..... 3

Measuring Dispersed Disturbance Using a Random Approach 6

Guidelines for Stratification..... 8

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted
Areas, Soils That Have Sustained Damage..... 9

Compacted Areas 10

Introduction

The objective set by the BC Government for forest soil management is to “without unduly reducing the supply of timber from British Columbia’s forests, to conserve the productivity and the hydrologic function of soils” (Forest Planning and Practices Regulation). Soil disturbance levels are limited in the FRPA to the following levels:

- (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25% of the area covered by a roadside work area (a roadside work area is defined as the area adjacent to a road where one or both of the following are carried out:

- (i) decking, processing or loading timber;
- (ii) piling or disposing of logging debris;

Sensitive soils are soils that, because of their slope gradient, texture class, moisture regime, or organic matter content have the following risk of displacement, surface erosion or compaction:

- (a) for the Interior, a very high hazard;
- (b) for the Coast, a high or very high hazard.

Because the MOF no longer verifies soil hazard ratings in prescriptions, a necessary first step in every survey is to determine the soil hazard rating. The rating determined by the surveyor is then used to determine which soil disturbance categories count, and the disturbance limits for the area to be surveyed.

Soil disturbance is defined as disturbance to the soil in the net area to be reforested in a cutblock because of:

- (a) temporary access structures,
- (b) gouges, ruts and scalps, or
- (c) compacted areas, but does not include the effect on the soil of rehabilitating an area in accordance with section 35 (Section 35 allows for up to 5% of the standards unit to be in excessive disturbance as long as enough of this excess disturbance is rehabilitated so that the disturbance limit is no longer exceeded).

Gouges, ruts, scalps and compacted areas are not defined except in the 2001 Soil Conservation Surveys guidebook. Temporary access structure is defined in regulation as an access structure that is not a gravel pit and does not meet the requirements of a permanent access structure which are:

(a) at the time of its construction, it is reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the cutblock, or

(b) it is constructed on or through, or contains, materials unsuitable for the establishment of a commercial crop of trees and is not an excavated or bladed trail, but does not include an area that contained an access structure before rehabilitation of the area under section 36.

An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder:

(a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or

(b) is constructing a temporary access structure and both of the following apply:

(i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area;

(ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such that the agreement holder is in compliance with the limits set out in subsection (3).

Rehabilitation is discussed further in the rehabilitation section below.

There are also limits placed on the amount of permanent access structure allowed in a block. An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless

(a) there is no other practicable option on that cutblock, having regard to

(i) the size, topography and engineering constraints of the cutblock,

(ii) in the case of a road, the safety of road users, or

(iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or

(b) additional permanent access structures are necessary to provide access beyond the cutblock.

If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.

In order to assess whether or not these regulations are being addressed requires definition of terms and a method for measuring the levels of the various disturbances discussed above. This was done in the 2001 Soil Conservation Surveys Guidebook. This guidebook breaks blocks into two categories, small and large and provides two different methods of survey. The big block method was prone to giving large confidence intervals because it utilized a clustered sampling design. The clustered sampling design was a trade-off developed to allow sampling many points in a large block in an efficient manner. The small block method was to have been the preferred method, but when the

option of stratifying blocks for compliance assessment was removed, the small block method was not applied directly to big blocks because it is excessively time consuming to apply over a large area.

Advancements in GPS and handheld computer technology mean that options are now available to surveyors that were not available when the last guidebook was written. Sampling theory tells us that completely random sampling is the most consistently successful approach for achieving a truly representative sample of a population with the least number of points sampled. That basic principal is confirmed, in a work recently completed by Thompson et al, for the case involving sampling logging disturbance in cutblocks. The next best design is a completely square grid, which is labour intensive and requires the most of amount of walking to implement. The further the design gets from square, the easier it is to implement, but the higher the risk there is of a nonrepresentative sample if the population being sampled is not evenly distributed. Logging disturbance is typically very non-uniform in distribution and may be clustered or linear and so the orientation of non-square sampling grids in relation to disturbance is always a concern.

Until recently, layout of completely random sampling networks over large areas, using commonly available field equipment, has been very labour intensive. However, using readily available GPS technology, it is now relatively easy to take an unbiased-random sample from cutblocks. The method also has the advantage of very little layout time and less walking (especially backtracking) than would be necessary for sampling on the squarer grid layouts. In addition, the completely random design gives lower variability than grid designs for sampling logging type disturbance (Thompson et al??) and determination of confidence intervals is based on binomial distributions. If more power is needed for a particular survey, it is a simple matter to add more random points and resurvey the area without having to worry about creating new grids or infilling grids. For measuring roads, landings, trails and other distinct features within a block, relatively cheap digital imagery can be used for highly accurate and inexpensive assessment of these features, though the older ground based approaches used in the Soil Conservations Surveys Guidebook, can still be used. A high resolution digital image makes a very good base map for the random survey and wherever possible, the use of these images is encouraged.

This guide book outlines the general procedure for estimating dispersed disturbance levels in cutblocks of all sizes using a random sampling approach. It also describes a method for measuring other disturbance features from digital air photos.

Measuring Dispersed Disturbance Using a Random Approach

There may be many ways to achieve a random survey- this manual outlines one that is utilizes relatively commonly available technology. The broad steps are as follows:

1. Based on the estimated disturbance levels the number of points that need to be sampled to achieve the desired confidence interval is estimated. For a typical survey of a block with 5% to 10% disturbance, 200 points gives a one sided 90% confidence interval of about 3 percentage points. This means that blocks will be called excessively disturbed if the measured disturbance exceeds 13% for a 10% disturbance limit block or 8% for a 5% limit block. In other words, with a sample size of 200 points on 10% disturbance limit blocks, if the number of disturbed points equals or exceeds 26 counted points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. If the number of disturbed points in a 200 point survey, of a 5% disturbance limit block, equals or exceeds 16 points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. It should not be necessary to survey more than 200 points in a block (or stratum), but if a block (or stratum) is highly disturbed, it may be feasible to survey fewer points. Appendix B shows how to determine confidence intervals for surveys of other numbers of survey points or other levels of disturbance. The higher the disturbance level, the fewer points are needed in the total survey to establish with confidence that the block is over the limit. The size of the block has no bearing on the number of points, but unavoidably, the larger the block, the more time it takes to survey.
2. An appropriate number of random waypoints are generated. There may be other ways to do this, but one method involves creating a shape file of the NAR (survey stratum minus roads, landings or other features which are not part of the NAR). A multipoint polygon is generated in Arcmap using a Random Point-in-Polygon Generation Program (VBA Macro) (Sawada, 2002). The multipoint polygon is converted to waypoints in OziExplorer or other mapping software that has this function.
3. The waypoints and a base map are downloaded onto a GPS unit that is set up to beep when the surveyor passes within 1 metre of the waypoint. The surveyor navigates to the waypoint and the exact observation point is indicated by the precise moment at which the GPS beeps. The observation point is fixed exactly at that moment by some arbitrary locator of the observation point. For example the observation point could be deemed to be located directly below one corner of the GPS unit or at the end of the surveyor's right toe, wherever those are at the moment the GPS beeps. The same locator should be used throughout a survey.
4. The survey progresses by using the built in navigation aids in the GPS to move from waypoint to waypoint. The surveyor is free to select the most efficient route through the points.
5. The data is entered directly into the GPS unit.
6. All of the points generated for a particular survey must be surveyed, i.e. one cannot survey points in a portion of the block and then conclude that the surveyed

area is or is not in compliance. Since disturbance within a cutblock is usually distributed unevenly, the entire set of points must be surveyed before making judgements about the level of disturbance. However, it is possible to initially do a complete survey with a smaller number of points and if that survey does not have sufficient power to give a clear result, a new set of random points can be generated for the same area and surveyed and the results combined with the previous survey to create a more powerful survey.

7. When the survey is complete, the waypoint file is converted to a spreadsheet file, and the calculations are made on the spreadsheet.

Many different configurations of hardware and software can be used to achieve a random survey and it is not possible to cover all those in this guidebook. Presented in Appendix A is a detailed protocol for a particular set of software and hardware. Potential surveyors who wish to use other software/hardware combinations may find some useful tips in this guidance, but they are not required to use the equipment combination described. The fully random survey needs to meet the following criteria:

1. The observation points must be randomly generated with any point in the survey area having a chance to be surveyed.

2. When the actual observation point is located in the field, it must be selected by following an unbiased and precise rule, such as directly under the GPS at the exact moment the GPR beeps (or some other confining trigger). The surveyor must not adjust the observation point in any way, nor have leeway to select the sampling point from within a broader possible sampling area, e.g., it would be unacceptable to simply select the sampling point from anywhere in front of the surveyor at the point the GPS beeps.

3. When the lower one-sided 90% confidence limit for the measured disturbance level is greater than the disturbance limit, the block is counted as over. Whatever size of survey indicates the block is over the lower 90% confidence limit, is acceptable. For surveys where the disturbance limit is greater than the one-sided 90% lower confidence limit, in order for the block to be considered under the disturbance limit- the lower one-sided 90% confidence interval must be 3 percentage units or less, (see Point 4 below). This is to address the situation where a surveyor might choose to survey fewer points because the disturbance is greatly in excess of the limit. Surveying fewer points means that the confidence interval could be larger if the surveyor overestimated the level of disturbance. This situation would make it more likely that the disturbance limit of a block will lie in the ambiguous zone of the confidence interval (between the lower confidence limit and the measured level of disturbance). Therefore, for blocks with disturbance close to the limit, the surveyor must sample sufficient points to make the lower confidence interval $\leq 3\%$ points. In cases where the measured level of disturbance is $\leq 3\%$, the upper 90% confidence interval must be $\leq 3\%$ points. For disturbance levels greatly above or below the limits, a survey could have fewer than 200 points and still be valid as long as the disturbance limit still fell below the 90% confidence interval (i.e., the block is counted as over). For example, if the actual level of disturbance on a block with a 10% disturbance limit

was 30%, it would take fewer points to establish if the block was in compliance (see below). If the surveyor chooses to do a smaller survey based on an assumption about the disturbance level that turns out to be incorrect and as a result the outcome of the survey is ambiguous, the surveyor can simply generate another set of random waypoints and add to the survey.

There are normally financial constraints to doing large surveys and a 200 point survey with one-sided confidence interval of around 3 percentage points for disturbance levels in the range of the normal limits (5 to 10%) will give an acceptable level of precision. This means that before a block is called excessively disturbed, the measured disturbance levels will exceed 13% or 8% for the 10% and 5% limits respectively. If a licensee finds themselves in a situation where the lower confidence limit from the survey is slightly higher than the disturbance limit, they can increase the survey size to any size they deem fit to get a more precise measure of disturbance. However, it should be remembered that the most probably level of disturbance is near the mean level determined by the survey. When a block is marginally over the limit the most likely outcome is that more points will narrow the confidence interval around a point close to the original mean.

4. Each point in a stratum or block being surveyed must have the same chance of being sampled. This means that it is not acceptable to survey some arbitrarily chosen subset of the points in a set of random waypoints (e.g. $\frac{1}{2}$ the block) and then stop because it appears the survey will be over or under. However, it is acceptable to do a survey with fewer sample points based on an estimation of a level of disturbance within the block that suggests actual disturbance levels might be considerably greater (>2 times) or less (<0.5 times) than the limit. If a survey with a smaller number of points gives a 90% one-sided-lower confidence limit greater than the disturbance limit, then the block is over. If the disturbance limit is greater than the 90% one-sided-lower-confidence limit and the lower (or upper if the mean is small) confidence interval is $\leq 3\%$ points, then the block is not over.

5. While surveys must be conducted and reported based on entire standards units, cutblock, roadside work area or area of inordinate disturbance as the particular regulatory framework dictates, it is still possible to stratify these survey areas for the purposes of improving the efficiency of the survey, as long as every point in the area being surveyed, has a chance of being surveyed. The techniques for stratifying to improve the efficiency of a survey are described below.

Guidelines for Stratification

Under the Forest Practice Code there was a provision to allow enforcement of soil disturbance limits on areas as small as one hectare. Under FRPA, enforcement of soil disturbance limits is to take place on the NAR of the cutblock. The size of the area on which enforcement can take place is a separate issue from stratifying to improve the efficiency of a survey. A stratified random sample will still report the disturbance level for the entire legal unit that is surveyed, however, not every portion of that unit need be

sampled at the same intensity. The main reason for stratifying to survey is to improve the efficiency of the survey. If, for example, a large portion of the area to be surveyed has very little disturbance (<2%) and a small proportion of the area (<20% of the area) has high disturbance (>15%), then it is more efficient to sample the heavily compacted area more intensely and the less disturbed area less intensely. This saves considerably on the amount of walking that needs to be done and if one stratum is very lightly disturbed (<2%), there may also be an increase in the power of the survey. If you cannot delineate strata with greatly different levels of disturbance, there is no advantage to stratifying. Strata need to be delineated before the survey begins and the most efficient way to do this is from a high resolution image such as those used for the soils FREP process. Such images can be flown specifically for blocks and this possibility should be considered for blocks where legal action is highly likely. The images also allow precise estimates of area in roads, landings, roadside work area, trails or other features in a block. Strata can also be delineated on a sketch map after an on-site inspection.

To stratify, first the amount of disturbance within each stratum is estimated. For example a stratum could be 10 hectares in size and contain approximately 25% disturbance so the amount of disturbance is $10 \text{ ha} \times 0.25 = 2.5 \text{ ha}$. If another stratum is 50 ha in size but contains only 1% disturbance, then the amount of disturbance in this stratum is $50 \text{ ha} \times 0.01 = 0.5 \text{ ha}$. The proportions of disturbance in each stratum are estimates only and do not have to be determined by measurements but no stratum should ever have zero points. The practical lower limit for estimated disturbance in a stratum is probably around 0.5%.

To assign the number of survey points to each stratum the formula is:

$$\text{Points Per Stratum} = \frac{\text{Area Disturbed Per Stratum} \times \text{Total Survey Points}}{\text{Total Area Disturbed}}$$

For our example, to find how many points to put in the 10 ha stratum, the calculation is as follows:

$$\text{Points in 10 ha Stratum} = \frac{2.5 \text{ ha} \times 200 \text{ points}}{2.5 \text{ ha} + 0.5 \text{ ha}} = 167 \text{ points}$$

This leaves 33 points in the big/low disturbance stratum. Surveying will go much more quickly because most of the points are in the small stratum and much closer together. In this case, because the disturbance in the large stratum is so low, there is actually a narrowing of the confidence interval- in other words this survey is more powerful than if the points were randomly and evenly distributed throughout the entire area surveyed.

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage

Roadside work areas, inordinate disturbance and compacted areas are all special survey cases. Roadside work areas have a higher disturbance limit- 25% and so must be tallied

separately from the rest of the NAR. The higher disturbance limit in the roadside work area means that disturbance can be measured with the same confidence with a smaller number of points. Therefore, we recommend using only 100 points in the RWA. Inordinate Disturbance, Areas of Compacted Soil, Soils That Have Sustained Damage and compacted areas are all types of disturbance that may require rehabilitation if they are identified by a block inspection, or during a survey. The provision for rehabilitating these areas are contained in the Forest Practises Code or FRPA and their supporting documents.

Compacted Areas

The Forest Planning and Practises Regulation (under FRPA) requires the rehabilitation of areas of compacted soil:

5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

(a) the area of compacted soil

(i) was created by activities of the holder,

(ii) is within the net area to be reforested, and

(iii) is a minimum of 1 ha in size;

What constitutes an area of compacted soil under this section of FRPA is not defined but any areas greater than 1ha in size that have more than 25% disturbance, should be documented during the survey for consideration as compacted areas. The potential compacted area should be delineated separately

The provisions for rehabilitating compacted areas and inordinate disturbance are contained in the Forest Practises Code.

47(7) A person who, within an area under a site plan prepared under section 21.1 or silviculture prescription, constructs or modifies a bladed or excavated trail or a corduroyed trail or creates a compacted area, must rehabilitate the area in accordance with the regulations and standards.

In this case, the compacted area refers to an area >100m² and >5m wide that is 100% compacted. For blocks under the CODE or transition CODE, any areas

Inordinate Disturbance

45(3) A person must not carry out a forest practice if he or she knows or should reasonably know that, due to weather conditions or site factors, the carrying out of the forest practice may result, directly or indirectly, in

(a) slumping or sliding of land,

(b) inordinate soil disturbance, or

(c) other significant damage to the environment.

- (4) *A person who contravenes subsection (1) or (3) must*
(a) *stop the forest practice in the area affected,*
(b) *prevent any further damage to the environment,*
(c) *promptly notify the district manager, and*
(d) *take any remedial measures that the district manager requires*

The Timber Harvesting and Silviculture Practices Regulation defines inordinate disturbance as follows:

53 (1) For the purposes of section 45 (3) (b) of the Act, “**inordinate soil disturbance**” means soil disturbance that

- (a) results in the district manager requiring rehabilitation of soil under section 48 (1) of the Act, or
(b) exceeds the soil disturbance limit specified in section 31 of this regulation.

The Forest Practices Code Act of British Columbia section 48(1) reads as follows:

48. (1) If the district manager determines that the area under an operational plan has sustained damage as a result of a forest practice, the district manager may, by written notice, direct the person responsible for the damage to take measures and to pay costs that are necessary to rehabilitate the area to the satisfaction of the district manager and the person must comply with the notice.

The term “sustained damage” is not defined anywhere but the surveyor should provide data to help make the determination of damage. Any areas greater than 1ha in size that have more than 25% disturbance or any areas in the NAR that are unlikely to sustain tree growth, should be documented in the survey.

Steps for determining confidence intervals and number of points required.

Checking soil hazard ratings

RWA, Inordinate Disturbance, Compacted areas

Regulatory Framework.

Rehab stuff

- , (3) , An agreement holder may rehabilitate an area occupied by permanent access structures in accordance with the results or strategies specified in the forest stewardship plan or by
 - , (a), removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compacting compacted soils, and
 - , (c), returning displaced surface soils, retrievable side-cast and berm materials.
- , (4) , If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.
- , (5) , The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:
 - , (a), the area of compacted soil
 - , (i), was created by activities of the holder,
 - , (ii), is within the net area to be reforested, and
 - , (iii), is a minimum of 1 ha in size;
 - , (b), the holder has not exceeded the limits described in subsection (3);
 - , (c), rehabilitation would, in the opinion of the minister,
 - , (i), materially improve the productivity and the hydrologic function of the soil within the area, and
 - , (ii), not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act.
- , (6) , An agreement holder who rehabilitates an area under subsection (4) or (5) must
 - , (a), remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compact compacted soils, and
 - , (c), return displaced surface soils, retrievable side-cast and berm materials.
- , (7) , If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.

Background

After discussing with Mike Boyde of Ft. St. James C&E Field Unit, a soil conservation assessment on CANFOR block No. A33601 CP B66 CB CAR464 was carried out in 3 phases to ensure that logging practices conserved the productivity and hydrologic function of the soil as stated in *Forest Planning and Practices Regulation (FPPR, section 5)*.

Phases of assessment consisted of:

- I. Walkthrough inspection including checking out soil disturbance survey results submitted by CANFOR;
- II. Evaluation of soil disturbance using high resolution aerial photography, and;
- III. Formal soil conservation survey using random point sampling method.

As a result, within this logging block we found 2 instances of non-compliance with results and strategies described in CANFOR Forest Stewardship Plan (FSP, Appendix A – Objectives for soils) for soil conservation in accordance to legislated BC forest practices requirements:

- 1) Under *Forest and Range Practices Act (FRPA)* section 21 (1), the intended results for soils within the Net Area to be Reforested and Roadside Work Areas (RWA's) set out in the FSP were not achieved;

And CANFOR contravenes,

- 2) Under *FRPA* section 46 (1), soil disturbance from cut-to-length logging practices directly and indirectly resulted in damage to the environment.

Interpretation and discussion of our findings from this assessment are presented below.

Results & Discussion

Cut-To-Length (CTL) operations were utilized to harvest block CAR464 (Figures 1 and 2), in which trees are delimbed and cut to length directly at the stump and then, a forwarder transports the logs from the stumps to the road. Recognized as a gentle logging practice, CTL uses less area to move the wood than does whole-tree harvesting however CTL may result into more soil disturbance due to repeated travel on designated trails and log decking areas.



Figure 1. Layout of typical forwarding trail bordered by 2 residual strips (left) and cut-to-length logs decked on roadside work area (right) from the Mossvale Operating Area.

Phase I - Walkthrough inspection

During a walkthrough inspection carried out in 2010, it became apparent that throughout block CAR464, there had been harmful changes to soil. A review of soil disturbance survey results submitted by CANFOR for CAR464 revealed that (i) my counted disturbance greatly exceeds that measured by their surveyor (Table 1), (ii) my results point towards disturbance levels over maximum limits set out in the site plan (Appendix B), and (iii) the survey methodology used by CANFOR i.e. Big Block method with grid centres was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is mostly confined to forwarding trails and RWA's. With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This will result into a Lower Confidence Limits (LCL) and therefore, a false acceptance of in-compliance.

A LCL defines a disturbance value that must be lower than a benchmark (herein, soil limit of 10%) to meet soil conservation objectives. If above this benchmark, the LCL indicates a non-compliance with the FSP (can also be called the "audit value").



Figure 2. Aerial Photography of block CAR464 in 2010 (1 year post logging, 15 cm pixel size resolution). Insert shows the extent of ruts and ponded water in northwest area.

Table 1. Results of Mean and Lower Confidence Limit for soil disturbance from CANFOR survey report, walkthrough and random point sampling survey for NAR and RWA's.

	CANFOR	Walkthrough ^a	Random Point Sampling Survey
Areas	%	%	%
NAR	5.5 (3.9)	15.0	24.8 (19.4)
RWA	15.3 (7.2)	42.0	55.0 (48.9)

^a Walkthrough results are the mean % only

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic (code "E") is called when the survey point and sampling window (1m Wide x 2m Long rectangle) show evidence of compaction indicated by increased soils density (Figure 3, coarse blocky/platy structure), puddling or compacted deposits of slash and organic debris. Compaction was assessed by comparing soil structure at survey point to soil conditions of adjacent undisturbed areas (i.e., at similar soil water content). The "natural soil condition" was checked frequently by digging to ascertain compaction during our survey.

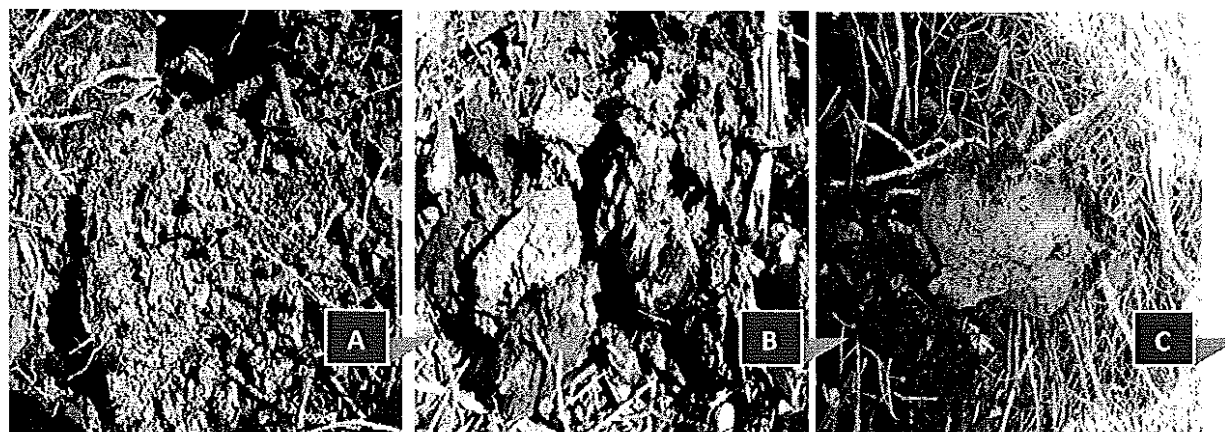


Figure 3. Fluffy and loose soil (A) turned into stone like material (B&C) after trafficking at block CAR464.

In table 1, disturbance % from the walkthrough were rough estimates of the mean % and simply calculated from dividing the number of points with counted disturbance by the total number of points re-measured (a re-survey of 394 points originally done by CANFOR). We could not guarantee the exact location of survey points during our review was that of CANFOR. However discrepancies between their results and the results from our review were large enough that in our opinion, compaction condition of the soil was not properly identified on this block. In one particular area, a transect line crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as "E's".

Similarly to NAR, Big Block method with grid centres was also inappropriate for surveying RWA's because it was not representative of the main disturbance pattern. Some transects ran parallel to soil disturbance almost avoiding it while others skipped the surveyed area (e.g., survey points falling outside RWA or on roads) so CANFOR did not collect enough points to get a reliable estimate of the RWA soil disturbance.

Phase II. Soil disturbance digital mapping

A geo-referenced high resolution aerial photo taken after logging reflected my biggest concerns in terms of damage to soils (Figure 2). Soil disturbances such as ruts, waterlogging and scalped soils did clearly stand out in forwarding trails and along in-block roads. Although machine traffic was limited to tracks areas, overall the degree of soil disturbance appeared to be very high. Combining in-block roads and off-road traffic disturbance represented more than 35% (or 12.7 ha) of the total block area (Table 2). In my opinion, this was the result of excessive or a more than necessary amount of logging and was not planned with an eye to maintain site productivity but providing the lowest cost to extract timber.

Table 2. The area proportion of NAR and PAS to total cutblock area. NAR contains RWA's, forwarding trails and residual strips.

Block No.	Total cutblock area (ha)	NAR (%)			PAS (%)
		RWA	Trails	Residual strips	
464	36.0	9.4	23.5	64.8	2.8

Operating machinery has also altered natural drainage patterns on this site and therefore, adversely influenced how water is supplied to plant growth. Water ponded on soil surface where track ruts crossed 4 natural seeps and lead to waterlogging or poorly drained soils as illustrated on Figures 4. Three years post-logging, drainage patterns were not compatible with the original natural drainage patterns. We also mapped areas of inordinate disturbance where soil disturbances exceeded 30% of the total area and looked almost deprived of live. Figure 4 highlights 2 damaged areas (up to 1.4 ha in size) almost completely cleared of forest floor, compacted and in which water drained nowhere due to ruts present everywhere and that run in every directions. This initial damage assessment was validated on the ground.



Figure 4. Areas of inordinate disturbance and drainage diversion on block CAR464.

Phase III – Random Point Sampling Survey

Silty Loam (SiL) and Loam (L) soils, as determined by the “Hand Test” and a few coarse fragments were found almost everywhere in the upper 30 cm of mineral soil along the walk. When squeezed in your fist, moist SiL and L will form a ball. However, CANFOR for CAR464 site plan has Sandy Loam as dominant soil texture (Appendix B), which in my opinion underestimated the amount of fines as well as the hazard rating for soil compaction (High instead of Moderate). That said, the soil conservation assessment was based on sites where compaction hazard was moderate. Although less cohesive than clay, silt-type soil has very little load bearing capacity and is highly susceptible to compaction when wet. Under the FSP consistent with *FPPR* section 35(1), soil disturbance levels should not exceed, respectively 10% in the NAR and 25% for RWA’s in these conditions.

A soil conservation survey based on random point sampling provided statistically valid measurements (more about the survey method in Appendix C) and did confirm the extent to which the block area was in non-compliance with the allowable limits under CANFOR FSP. With this procedure, soil disturbance was measured at GPS points or waypoints randomly located throughout the block as shown on the GPS soil survey map (Figures 5 and 6).



Figure 5. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in NAR. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic and TD = deep wheel track/ruts) or point landing outside of NAR (OUT).

Within the NAR, based on 109 random sample points ($n=109$) the survey results showed a LCL of 19.4% as soil disturbance level (Table 1), which exceeds the soil limit of 10%. Likewise, disturbed soils were present within the RWA's (Figure 6). Disturbance measured was 48.9% (LCL), which was not within an acceptable limit of 25% for the area covered by RWA's ($n=109$). Repeated Machine Traffic was the most common disturbance type (E) across the site. Within forwarding trails, compaction explained 53% of all disturbances. This indicates that like clay, coarser soils with silt when wet are highly sensitive to machine wheels or tracks (Figure 7). Outside track location i.e. residual strips of vegetation were left intact since there was no ground disturbance in them.

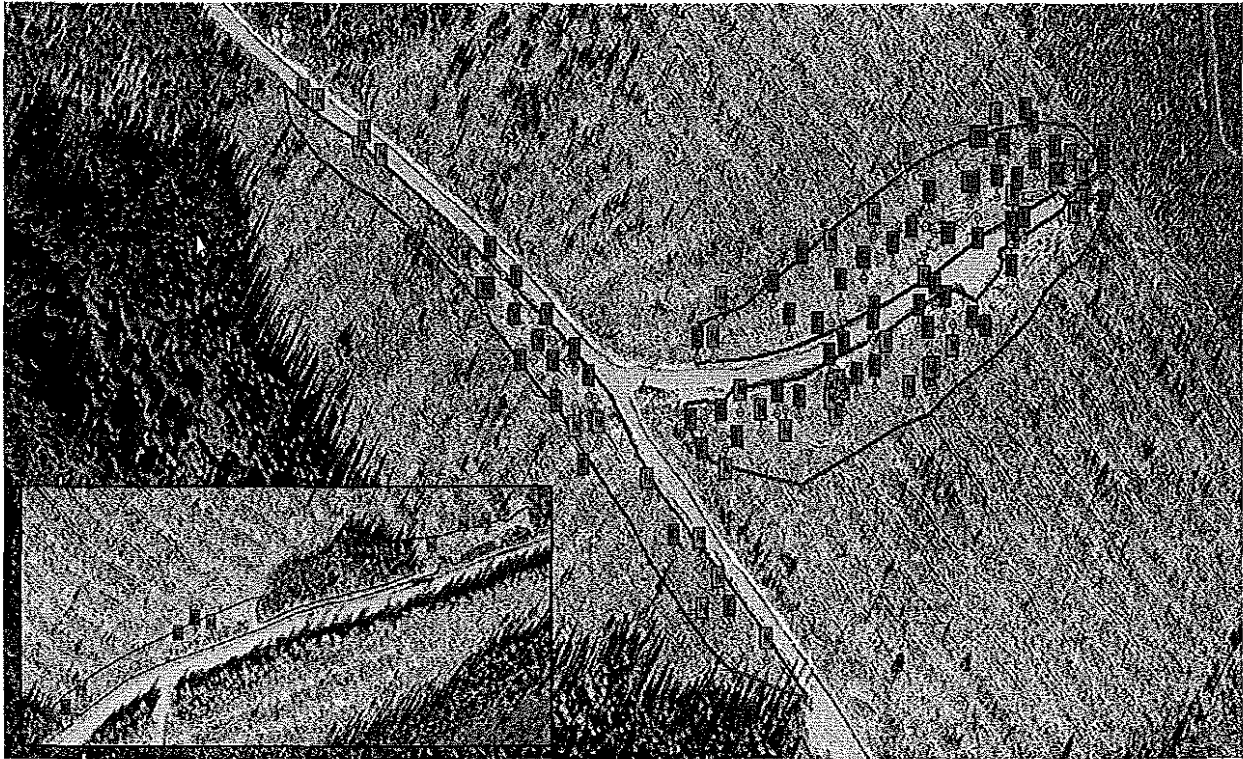


Figure 6. GPS soil survey map showing soil disturbance results at random locations (or waypoints) in RWA's. Insert shows southwest end of the block. Waypoints are identified as non-counted disturbance (N), counted disturbance (E = repeated machine traffic, TD = deep wheel/track ruts, V = very wide scalps, G = deep gouges or W = wide gouges).



Figure 7. Un-rehabilitated corduroy trails and ruts in forwarding trails interspaced with residual strips on a similar block from the Mossvale Operating Area.

Conclusion

C&E Ft. St. James Unit concerns that the soil disturbance limits may have been exceeded in block were justified. As confirmed by a formal soil conservation survey (Phase III), extensive soil compaction occurred when heavy weight loads compressed the soil during operations within the NAR and RWA's. Indeed, CANFOR has contravened section 5 under the FSP.

Excessive soil disturbance (herein defined as un-rehabilitated temporary access structure, gouges, ruts and scalps and compacted areas under *FPPR* Part 1 – Interpretation section 1) has also adversely altered ecosystem integrity by altering the way the soil functions on this site and therefore, the capacity of this site to grow forest has been diminished. Combined results from Assessment Phases I, II and III indicated that machine logging traffic lead to changes to: (i) structural properties of the soil as shown by significant amount of ruts and compaction on forwarding trails and within RWA's, (ii) natural drainage patterns that were not maintained as evidenced from ponded water along 4 channels, and (iii) almost complete loss of forest floor within some areas that results in loss of habitat for specialist species (e.g., worms, fungi, microbes etc.) important to soil biodiversity. Preserving organic matter could also have helped reducing ground disturbance.

Environmental benefits of CTL can be negated when logging occurs over soils that contains much silt and are wet. This site has low load-bearing strength materials when wet. Silty soils drain slowly and after prolonged rainfalls, become quickly water logged. In forests, finer-textured soils behave the same way they do in cultivated soils or in urban settings. Thus, a person can reasonably expect that compaction will be a concern with careless logging. If someone had paid any attention to weather and moisture in the soil prior to logging, there is no doubt that this damage could have been avoided.

Proper scheduling with regards to available moisture in the soils, lowering ground pressure by equipment on trafficked trails and better use of slash mats prior to skidding (these need to be removed after logging is completed so it does not hinder growth) are important for soil conservation with CTL.

Please, do not hesitate to contact me for further discussion.

Sincerely,

Stéphane Dubé, M.Sc. RPF
Soil Scientist
BC Forest Service

Appendix A

Excerpt from CANFOR FSP

5.5 Objectives Set by Government for Soils

- 5.5.1 For the objective for soils that is set out in Section 5 of the FPPR, the holder adopts, as a result/strategy, Section 35 and 36 and consistent with 12(2) of the FPPR as those sections were on the date of this FSP was submitted for approval.

Appendix B



A33801

Canadian Forest Products Ltd. - Prince George Region

Aug 20, 2007

Site Plan

A. Tenure Identification

Licence	Permit	Block	Operating Area	Opening	Timbermark(s)	Gross Area (ha)	Net Area to Reforest (ha) NAR	District
A40876	B66	CAR464	Mossvale	093J033-	FJ3B66	40.1	35.0	Fort St. James Forest Dist.

B. Area Summary and Description for Areas Not Contained Within NAR

Proposed Permanent Access (%)	Max. Permanent Access (%)	Wetland	Water	NP	Immature	NCR > 4ha	Reserves	Total
2.4	7.0	0.0	0.0	0.0	0.0	0.0	6.1	5.1

C. Stand Level Biodiversity

Biological Diversity (%)
12.7

Biodiversity Comments:

LEAVE TREE SPECIFICATIONS

Biodiversity values will be maintained via external reserves (SU R). SUR consists of a P(Sx) type that is associated with a riparian management area.

The following trees will be retained where present and operationally feasible:

- Acceptable non-merchantable coniferous species in the pole, sapling and regen layers
- Deciduous species (may be stubbed at 3-5 metres)

Retain all Douglas-fir

Leave trees that are cut due to operational or safety constraints will remain on site (dispersed and un-processed). Roadside processing and decking areas will be clearcut.

Prescribed leave trees may be removed for building roads, roadside decking, felling access, skidding access, and safety reasons.

COARSE WOODY DEBRIS

The Coarse Woody Debris (CWD) target for the block is a minimum of 4 logs per hectare (each being a minimum of 2m long and 7.5cm in diameter at one end).

D. Net Area to Reforest (NAR)

SU	Area Description	NAR (ha)	Harvest System
A	SBSmk1 - 01 (Minor 09, 0.5ha)	35.0	Clearcut with reserves
Critical site conditions that affect the timing of operations:			
Comments specific to SU A:			

E. Soil Conservation

SU	HAZARD RATINGS			Maximum Allowable Soil Disturbance (%)	Maximum Allowable Soil Disturbance at Roadside (%)	Maximum Soil Disturbance Temp. Exceeded (%)	Soil Horizon	Soil Texture	Coarse Fragment %
	Soil Compaction	Surface Soil Erosion	Soil Displacement						
A	Moderate	Moderate	Moderate	10.0	25.0	0.0	B	SL	35

Soil Conservation Comments: The soil protection objective is to minimize site disturbance and potential long term productivity losses.

F. Post Harvest Stocking Requirements

Stocking Standard Regime ID	SU	Layer	Assessment Dates			Preferred (P) Species Species - Min. FG Height (m)	Acceptable (A) Species Species - Min. FG Height (m)
			Regen Delay (yrs)	Early FG (yrs)	Late FG (yrs)		
1001476	A	L4	4		20	Fd1-1.4/P1-2/Sx-1	

Stocking Standard Regime ID	SU	Layer	Well Spaced Trees (Rha)			Maximum Coniferous (s/ha)
			Target/Minimum Preferred & Acceptable	Minimum Preferred	Minimum Horizontal Distance (m)	
1001476	A	L4	1200 / 700	700	2.0	10,000

Required Information For Stocking Requirements

G. Assessments

Type	Required	Management Strategies
Visual Impact Assessment	No	This block is not located within a visually sensitive area, therefore no VIA is required.
Archaeological Inventory and Impact Assessment	No	This block was rated as having a moderate likelihood of archaeological potential and therefore an assessment was not conducted. Should any cultural heritage resource features be identified during harvesting or road construction, operations that may negatively impact these resource features will be suspended or modified and appropriate Canfor personnel notified.
Terrain Stability Field Assessment	No	
Recreation Resource	No	No Recreation Site or Trail is within 100m of this block.

H. Riparian Management Strategies

Riparian ID / Lake ID	Riparian Class / Lake Class	RRZ Width (m)	RMZ Width (m)	Management Strategies - RRZ/RMZ
R1	S3	20	20	R1 - S3 is located on the east side of the block and is located a minimum of 30m outside the block boundary. Remaining portions of the RMZ that are within the harvested area of the block will be managed as per the specifications of the adjacent SU due to the presence of mountain pine beetle infested Regime 115
R3	W1	10	40	/ R3 - W1 The RMZ for this feature is entirely outside the block boundary.

FNR-2013-00368 Part 1

Appendix C

Province of British Columbia

Random Method for Soil Conservation Surveys

Draft version – July 2011

Mike Curran, PhD, PAg, Forest Science and Silviculture Team Leader
(and Research Soil Scientist) Kootenay-Boundary Region, BC Forest
Service, (Ministry of Natural Resource Operations) Nelson, BC

Table of Contents

Introduction.....	3
Measuring Dispersed Disturbance Using a Random Approach	6
Guidelines for Stratification.....	8
Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage.....	9
Compacted Areas	10

Introduction

The objective set by the BC Government for forest soil management is to “without unduly reducing the supply of timber from British Columbia’s forests, to conserve the productivity and the hydrologic function of soils” (Forest Planning and Practices Regulation). Soil disturbance levels are limited in the FRPA to the following levels:

- (a) if the standards unit is predominantly comprised of sensitive soils, 5% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (b) if the standards unit is not predominantly comprised of sensitive soils, 10% of the area covered by the standards unit, excluding any area covered by a roadside work area;
- (c) 25% of the area covered by a roadside work area (a roadside work area is defined as the area adjacent to a road where one or both of the following are carried out:

- (i) decking, processing or loading timber;
- (ii) piling or disposing of logging debris;

Sensitive soils are soils that, because of their slope gradient, texture class, moisture regime, or organic matter content have the following risk of displacement, surface erosion or compaction:

- (a) for the Interior, a very high hazard;
- (b) for the Coast, a high or very high hazard.

Because the MOF no longer verifies soil hazard ratings in prescriptions, a necessary first step in every survey is to determine the soil hazard rating. The rating determined by the surveyor is then used to determine which soil disturbance categories count, and the disturbance limits for the area to be surveyed.

Soil disturbance is defined as disturbance to the soil in the net area to be reforested in a cutblock because of:

- (a) temporary access structures,
- (b) gouges, ruts and scalps, or
- (c) compacted areas, but does not include the effect on the soil of rehabilitating an area in accordance with section 35 (Section 35 allows for up to 5% of the standards unit to be in excessive disturbance as long as enough of this excess disturbance is rehabilitated so that the disturbance limit is no longer exceeded).

Gouges, ruts, scalps and compacted areas are not defined except in the 2001 Soil Conservation Surveys guidebook. Temporary access structure is defined in regulation as an access structure that is not a gravel pit and does not meet the requirements of a permanent access structure which are:

(a) at the time of its construction, it is reasonably expected to provide access for timber harvesting and other activities that are not wholly contained in the cutblock, or

(b) it is constructed on or through, or contains, materials unsuitable for the establishment of a commercial crop of trees and is not an excavated or bladed trail, but does not include an area that contained an access structure before rehabilitation of the area under section 36.

An agreement holder may cause soil disturbance that exceeds the limits specified in subsection (3) if the holder:

(a) is removing infected stumps or salvaging windthrow and the additional disturbance is the minimum necessary, or

(b) is constructing a temporary access structure and both of the following apply:

(i) the limit set out in subsection (3) (a) or (b), as applicable, is not exceeded by more than 5% of the area covered by the standards unit, excluding the area covered by a roadside work area;

(ii) before the regeneration date, a sufficient amount of the area within the standards unit is rehabilitated such that the agreement holder is in compliance with the limits set out in subsection (3).

Rehabilitation is discussed further in the rehabilitation section below.

There are also limits placed on the amount of permanent access structure allowed in a block. An agreement holder must ensure that the area in a cutblock that is occupied by permanent access structures built by the holder or used by the holder does not exceed 7% of the cutblock, unless

(a) there is no other practicable option on that cutblock, having regard to

(i) the size, topography and engineering constraints of the cutblock,

(ii) in the case of a road, the safety of road users, or

(iii) the requirement in selection harvesting systems for excavated or bladed trails or other logging trails, or

(b) additional permanent access structures are necessary to provide access beyond the cutblock.

If an agreement holder exceeds the limit for permanent access structures described in subsection (1) for either of the reasons set out in that subsection, the holder must ensure that the limit is exceeded as little as practicable.

In order to assess whether or not these regulations are being addressed requires definition of terms and a method for measuring the levels of the various disturbances discussed above. This was done in the 2001 Soil Conservation Surveys Guidebook. This guidebook breaks blocks into two categories, small and large and provides two different methods of survey. The big block method was prone to giving large confidence intervals because it utilized a clustered sampling design. The clustered sampling design was a trade-off developed to allow sampling many points in a large block in an efficient manner. The small block method was to have been the preferred method, but when the

option of stratifying blocks for compliance assessment was removed, the small block method was not applied directly to big blocks because it is excessively time consuming to apply over a large area.

Advancements in GPS and handheld computer technology mean that options are now available to surveyors that were not available when the last guidebook was written. Sampling theory tells us that completely random sampling is the most consistently successful approach for achieving a truly representative sample of a population with the least number of points sampled. That basic principal is confirmed, in a work recently completed by Thompson et al, for the case involving sampling logging disturbance in cutblocks. The next best design is a completely square grid, which is labour intensive and requires the most of amount of walking to implement. The further the design gets from square, the easier it is to implement, but the higher the risk there is of a nonrepresentative sample if the population being sampled is not evenly distributed. Logging disturbance is typically very non-uniform in distribution and may be clustered or linear and so the orientation of non-square sampling grids in relation to disturbance is always a concern.

Until recently, layout of completely random sampling networks over large areas, using commonly available field equipment, has been very labour intensive. However, using readily available GPS technology, it is now relatively easy to take an unbiased-random sample from cutblocks. The method also has the advantage of very little layout time and less walking (especially backtracking) than would be necessary for sampling on the squarer grid layouts. In addition, the completely random design gives lower variability than grid designs for sampling logging type disturbance (Thompson et al??) and determination of confidence intervals is based on binomial distributions. If more power is needed for a particular survey, it is a simple matter to add more random points and resurvey the area without having to worry about creating new grids or infilling grids. For measuring roads, landings, trails and other distinct features within a block, relatively cheap digital imagery can be used for highly accurate and inexpensive assessment of these features, though the older ground based approaches used in the Soil Conservations Surveys Guidebook, can still be used. A high resolution digital image makes a very good base map for the random survey and wherever possible, the use of these images is encouraged.

This guide book outlines the general procedure for estimating dispersed disturbance levels in cutblocks of all sizes using a random sampling approach. It also describes a method for measuring other disturbance features from digital air photos.

Measuring Dispersed Disturbance Using a Random Approach

There may be many ways to achieve a random survey- this manual outlines one that is utilizes relatively commonly available technology. The broad steps are as follows:

1. Based on the estimated disturbance levels the number of points that need to be sampled to achieve the desired confidence interval is estimated. For a typical survey of a block with 5% to 10% disturbance, 200 points gives a one sided 90% confidence interval of about 3 percentage points. This means that blocks will be called excessively disturbed if the measured disturbance exceeds 13% for a 10% disturbance limit block or 8% for a 5% limit block. In other words, with a sample size of 200 points on 10% disturbance limit blocks, if the number of disturbed points equals or exceeds 26 counted points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. If the number of disturbed points in a 200 point survey, of a 5% disturbance limit block, equals or exceeds 16 points, then the one-sided 90% lower confidence limit of the measured disturbance in the block is higher than the maximum. It should not be necessary to survey more than 200 points in a block (or stratum), but if a block (or stratum) is highly disturbed, it may be feasible to survey fewer points. Appendix B shows how to determine confidence intervals for surveys of other numbers of survey points or other levels of disturbance. The higher the disturbance level, the fewer points are needed in the total survey to establish with confidence that the block is over the limit. The size of the block has no bearing on the number of points, but unavoidably, the larger the block, the more time it takes to survey.
2. An appropriate number of random waypoints are generated. There may be other ways to do this, but one method involves creating a shape file of the NAR (survey stratum minus roads, landings or other features which are not part of the NAR). A multipoint polygon is generated in Arcmap using a Random Point-in-Polygon Generation Program (VBA Macro) (Sawada, 2002). The multipoint polygon is converted to waypoints in OziExplorer or other mapping software that has this function.
3. The waypoints and a base map are downloaded onto a GPS unit that is set up to beep when the surveyor passes within 1 metre of the waypoint. The surveyor navigates to the waypoint and the exact observation point is indicated by the precise moment at which the GPS beeps. The observation point is fixed exactly at that moment by some arbitrary locator of the observation point. For example the observation point could be deemed to be located directly below one corner of the GPS unit or at the end of the surveyor's right toe, wherever those are at the moment the GPS beeps. The same locator should be used throughout a survey.
4. The survey progresses by using the built in navigation aids in the GPS to move from waypoint to waypoint. The surveyor is free to select the most efficient route through the points.
5. The data is entered directly into the GPS unit.
6. All of the points generated for a particular survey must be surveyed, i.e. one cannot survey points in a portion of the block and then conclude that the surveyed

area is or is not in compliance. Since disturbance within a cutblock is usually distributed unevenly, the entire set of points must be surveyed before making judgements about the level of disturbance. However, it is possible to initially do a complete survey with a smaller number of points and if that survey does not have sufficient power to give a clear result, a new set of random points can be generated for the same area and surveyed and the results combined with the previous survey to create a more powerful survey.

7. When the survey is complete, the waypoint file is converted to a spreadsheet file, and the calculations are made on the spreadsheet.

Many different configurations of hardware and software can be used to achieve a random survey and it is not possible to cover all those in this guidebook. Presented in Appendix A is a detailed protocol for a particular set of software and hardware. Potential surveyors who wish to use other software/hardware combinations may find some useful tips in this guidance, but they are not required to use the equipment combination described. The fully random survey needs to meet the following criteria:

1. The observation points must be randomly generated with any point in the survey area having a chance to be surveyed.

2. When the actual observation point is located in the field, it must be selected by following an unbiased and precise rule, such as directly under the GPS at the exact moment the GPR beeps (or some other confining trigger). The surveyor must not adjust the observation point in any way, nor have leeway to select the sampling point from within a broader possible sampling area, e.g., it would be unacceptable to simply select the sampling point from anywhere in front of the surveyor at the point the GPS beeps.

3. When the lower one-sided 90% confidence limit for the measured disturbance level is greater than the disturbance limit, the block is counted as over. Whatever size of survey indicates the block is over the lower 90% confidence limit, is acceptable. For surveys where the disturbance limit is greater than the one-sided 90% lower confidence limit, in order for the block to be considered under the disturbance limit- the lower one-sided 90% confidence interval must be 3 percentage units or less, (see Point 4 below). This is to address the situation where a surveyor might choose to survey fewer points because the disturbance is greatly in excess of the limit. Surveying fewer points means that the confidence interval could be larger if the surveyor overestimated the level of disturbance. This situation would make it more likely that the disturbance limit of a block will lie in the ambiguous zone of the confidence interval (between the lower confidence limit and the measured level of disturbance). Therefore, for blocks with disturbance close to the limit, the surveyor must sample sufficient points to make the lower confidence interval $\leq 3\%$ points. In cases where the measured level of disturbance is $\leq 3\%$, the upper 90% confidence interval must be $\leq 3\%$ points. For disturbance levels greatly above or below the limits, a survey could have fewer than 200 points and still be valid as long as the disturbance limit still fell below the 90% confidence interval (i.e., the block is counted as over). For example, if the actual level of disturbance on a block with a 10% disturbance limit

was 30%, it would take fewer points to establish if the block was in compliance (see below). If the surveyor chooses to do a smaller survey based on an assumption about the disturbance level that turns out to be incorrect and as a result the outcome of the survey is ambiguous, the surveyor can simply generate another set of random waypoints and add to the survey.

There are normally financial constraints to doing large surveys and a 200 point survey with one-sided confidence interval of around 3 percentage points for disturbance levels in the range of the normal limits (5 to 10%) will give an acceptable level of precision. This means that before a block is called excessively disturbed, the measured disturbance levels will exceed 13% or 8% for the 10% and 5% limits respectively. If a licensee finds themselves in a situation where the lower confidence limit from the survey is slightly higher than the disturbance limit, they can increase the survey size to any size they deem fit to get a more precise measure of disturbance. However, it should be remembered that the most probable level of disturbance is near the mean level determined by the survey. When a block is marginally over the limit the most likely outcome is that more points will narrow the confidence interval around a point close to the original mean.

4. Each point in a stratum or block being surveyed must have the same chance of being sampled. This means that it is not acceptable to survey some arbitrarily chosen subset of the points in a set of random waypoints (e.g. ½ the block) and then stop because it appears the survey will be over or under. However, it is acceptable to do a survey with fewer sample points based on an estimation of a level of disturbance within the block that suggests actual disturbance levels might be considerably greater (>2 times) or less (<0.5 times) than the limit. If a survey with a smaller number of points gives a 90% one-sided-lower confidence limit greater than the disturbance limit, then the block is over. If the disturbance limit is greater than the 90% one-sided-lower-confidence limit and the lower (or upper if the mean is small) confidence interval is $\leq 3\%$ points, then the block is not over.

5. While surveys must be conducted and reported based on entire standards units, cutblock, roadside work area or area of inordinate disturbance as the particular regulatory framework dictates, it is still possible to stratify these survey areas for the purposes of improving the efficiency of the survey, as long as every point in the area being surveyed, has a chance of being surveyed. The techniques for stratifying to improve the efficiency of a survey are described below.

Guidelines for Stratification

Under the Forest Practice Code there was a provision to allow enforcement of soil disturbance limits on areas as small as one hectare. Under FRPA, enforcement of soil disturbance limits is to take place on the NAR of the cutblock. The size of the area on which enforcement can take place is a separate issue from stratifying to improve the efficiency of a survey. A stratified random sample will still report the disturbance level for the entire legal unit that is surveyed, however, not every portion of that unit need be

sampled at the same intensity. The main reason for stratifying to survey is to improve the efficiency of the survey. If, for example, a large portion of the area to be surveyed has very little disturbance (<2%) and a small proportion of the area (<20% of the area) has high disturbance (>15%), then it is more efficient to sample the heavily compacted area more intensely and the less disturbed area less intensely. This saves considerably on the amount of walking that needs to be done and if one stratum is very lightly disturbed (<2%), there may also be an increase in the power of the survey. If you cannot delineate strata with greatly different levels of disturbance, there is no advantage to stratifying. Strata need to be delineated before the survey begins and the most efficient way to do this is from a high resolution image such as those used for the soils FREP process. Such images can be flown specifically for blocks and this possibility should be considered for blocks where legal action is highly likely. The images also allow precise estimates of area in roads, landings, roadside work area, trails or other features in a block. Strata can also be delineated on a sketch map after an on-site inspection.

To stratify, first the amount of disturbance within each stratum is estimated. For example a stratum could be 10 hectares in size and contain approximately 25% disturbance so the amount of disturbance is $10 \text{ ha} \times 0.25 = 2.5 \text{ ha}$. If another stratum is 50 ha in size but contains only 1% disturbance, then the amount of disturbance in this stratum is $50 \text{ ha} \times 0.01 = 0.5 \text{ ha}$. The proportions of disturbance in each stratum are estimates only and do not have to be determined by measurements but no stratum should ever have zero points. The practical lower limit for estimated disturbance in a stratum is probably around 0.5%.

To assign the number of survey points to each stratum the formula is:

$$\text{Points Per Stratum} = \frac{\text{Area Disturbed Per Stratum} \times \text{Total Survey Points}}{\text{Total Area Disturbed}}$$

For our example, to find how many points to put in the 10 ha stratum, the calculation is as follows:

$$\text{Points in 10 ha Stratum} = \frac{2.5 \text{ ha} \times 200 \text{ points}}{2.5 \text{ ha} + 0.5 \text{ ha}} = 167 \text{ points}$$

This leaves 33 points in the big/low disturbance stratum. Surveying will go much more quickly because most of the points are in the small stratum and much closer together. In this case, because the disturbance in the large stratum is so low, there is actually a narrowing of the confidence interval- in other words this survey is more powerful than if the points were randomly and evenly distributed throughout the entire area surveyed.

Roadside Work Areas, Inordinate Disturbance, Areas of Compacted Soil Compacted Areas, Soils That Have Sustained Damage

Roadside work areas, inordinate disturbance and compacted areas are all special survey cases. Roadside work areas have a higher disturbance limit- 25% and so must be tallied

separately from the rest of the NAR. The higher disturbance limit in the roadside work area means that disturbance can be measured with the same confidence with a smaller number of points. Therefore, we recommend using only 100 points in the RWA. Inordinate Disturbance, Areas of Compacted Soil, Soils That Have Sustained Damage and compacted areas are all types of disturbance that may require rehabilitation if they are identified by a block inspection, or during a survey. The provision for rehabilitating these areas are contained in the Forest Practises Code or FRPA and their supporting documents.

Compacted Areas

The Forest Planning and Practises Regulation (under FRPA) requires the rehabilitation of areas of compacted soil:

5) The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:

(a) the area of compacted soil

(i) was created by activities of the holder,

(ii) is within the net area to be reforested, and

(iii) is a minimum of 1 ha in size;

What constitutes an area of compacted soil under this section of FRPA is not defined but any areas greater than 1ha in size that have more than 25% disturbance, should be documented during the survey for consideration as compacted areas. The potential compacted area should be delineated separately

The provisions for rehabilitating compacted areas and inordinate disturbance are contained in the Forest Practises Code.

47(7) A person who, within an area under a site plan prepared under section 21.1 or silviculture prescription, constructs or modifies a bladed or excavated trail or a corduroyed trail or creates a compacted area, must rehabilitate the area in accordance with the regulations and standards.

In this case, the compacted area refers to an area >100m² and >5m wide that is 100% compacted. For blocks under the CODE or transition CODE, any areas

Inordinate Disturbance

45(3) A person must not carry out a forest practice if he or she knows or should reasonably know that, due to weather conditions or site factors, the carrying out of the forest practice may result, directly or indirectly, in

(a) slumping or sliding of land,

(b) inordinate soil disturbance, or

(c) other significant damage to the environment.

(4) A person who contravenes subsection (1) or (3) must

(a) stop the forest practice in the area affected,

(b) prevent any further damage to the environment,

(c) promptly notify the district manager, and

(d) take any remedial measures that the district manager requires

The Timber Harvesting and Silviculture Practices Regulation defines inordinate disturbance as follows:

53 (1) For the purposes of section 45 (3) (b) of the Act, “**inordinate soil disturbance**” means soil disturbance that

(a) results in the district manager requiring rehabilitation of soil under section 48

(1) of the Act, or

(b) exceeds the soil disturbance limit specified in section 31 of this regulation.

The Forest Practices Code Act of British Columbia section 48(1) reads as follows:

48. (1) If the district manager determines that the area under an operational plan has sustained damage as a result of a forest practice, the district manager may, by written notice, direct the person responsible for the damage to take measures and to pay costs that are necessary to rehabilitate the area to the satisfaction of the district manager and the person must comply with the notice.

The term “sustained damage” is not defined anywhere but the surveyor should provide data to help make the determination of damage. Any areas greater than 1ha in size that have more than 25% disturbance or any areas in the NAR that are unlikely to sustain tree growth, should be documented in the survey.

Steps for determining confidence intervals and number of points required.

Checking soil hazard ratings

RWA, Inordinate Disturbance, Compacted areas

Regulatory Framework.

Rehab stuff

- , (3) , An agreement holder may rehabilitate an area occupied by permanent access structures in accordance with the results or strategies specified in the forest stewardship plan or by
 - , (a), removing or redistributing woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, as necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compacting compacted soils, and
 - , (c), returning displaced surface soils, retrievable side-cast and berm materials.
- , (4) , If an agreement holder rehabilitates an area under subsection (3) (a) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.
- , (5) , The minister may require an agreement holder to rehabilitate an area of compacted soil if all of the following apply:
 - , (a), the area of compacted soil
 - , (i), was created by activities of the holder,
 - , (ii), is within the net area to be reforested, and
 - , (iii), is a minimum of 1 ha in size;
 - , (b), the holder has not exceeded the limits described in subsection (3);
 - , (c), rehabilitation would, in the opinion of the minister,
 - , (i), materially improve the productivity and the hydrologic function of the soil within the area, and
 - , (ii), not create an unacceptable risk of further damage or harm to, or impairment of, forest resource values related to one or more of the subjects listed in section 149 (1) of the Act.
- , (6) , An agreement holder who rehabilitates an area under subsection (4) or (5) must
 - , (a), remove or redistribute woody materials that are exposed on the surface of the area and are concentrating subsurface moisture, to the extent necessary to limit the concentration of subsurface moisture on the area,
 - , (b), de-compact compacted soils, and
 - , (c), return displaced surface soils, retrievable side-cast and berm materials.
- , (7) , If an agreement holder rehabilitates an area under subsection (4) or (5) and erosion of exposed soil from the area would cause sediment to enter a stream, wetland or lake, or a material adverse effect in relation to one or more of the subjects listed in section 149 (1) of the Act, the agreement holder, unless placing debris or revegetation would not materially reduce the likelihood of erosion, must
 - , (a), place woody debris on the exposed soils, or
 - , (b), revegetate the exposed mineral soils.

Journal of
Applied Remote Sensing

**Monitoring soil disturbance on salvaged
areas within the mountain pine beetle
infestation using digital imagery**

Stéphane Dubé
Shannon Berch

Monitoring soil disturbance on salvaged areas within the mountain pine beetle infestation using digital imagery

Stéphane Dubé^a and Shannon Berch^b

^aBC Ministry of Forests, Lands and Natural Resource Operations,
Regional Operations Division-Omineca Area, 1011 4th Avenue,
5th Floor, Prince George, British Columbia, V2L 3H9 Canada
stephane.dube@gov.bc.ca

^bBC Ministry of Environment, Ecosystems Protection and Sustainability Branch,
4300 North Road, Victoria, British Columbia, V8Z 5J3 Canada

Abstract. There is a concern that the accelerated timber harvest in the mountain pine beetle epidemic area of British Columbia (BC) could compromise long-term forest productivity if soils are unduly disturbed. Consequently, the Ministry of Forests, Lands and Natural Resources Operations (MFLNRO) developed a protocol using ground- and image-based methods to assess the status of the forest soil resource in part of the BC Forest and Range Evaluation Program (FREP). Although this protocol uses high-resolution aerial imagery, the MFLNRO is also collecting beetle imagery at a smaller scale for detecting and monitoring. For this evaluation, we use a combination of ground- and imagery-based assessments as developed for FREP within the BC Interior Plateau. We determined that low-resolution data are useful and are sufficient for detecting and measuring the extent of roads and landings. Areas occupied by landslides, erosion, drainage diversion, inordinate disturbance, or roadside work areas can be captured on remote-sensed images with spatial resolution greater than 2.5 m. However, based on this review and previous work, aerial photographs in 10-cm pixel size are best suited to reveal less evident harvesting-related soil disturbance. © The Authors. Published by SPIE under a Creative Commons Attribution 3.0 Unported License. Distribution or reproduction of this work in whole or in part requires full attribution of the original publication, including its DOI. [DOI: 10.1117/1.JRS.7.073541]

Keywords: aerial photography; monitoring; digital imagery; soil disturbance; mountain pine beetle.

Paper 13025 received Jan. 28, 2013; revised manuscript received May 24, 2013; accepted for publication May 29, 2013; published online Jun. 25, 2013.

1 Introduction

The cumulative area of British Columbia (BC) that was affected to some degree by the mountain pine beetle (MPB) is estimated at 18.1 millions ha, and the Ministry of Forests, Lands and Natural Resources Operations (MFLNRO) predicts that 57% of the provincial lodgepole pine (*Pinus contorta*) inventory could be killed by 2021—these trees make-up over half the BC Interior's annual harvest.¹ To lessen the impacts of the forest health crisis, the BC MPB Action Plan included a provision to recover the greatest value from dead timber before it burns or decays, while conserving the long-term forest values identified in land-use plans.²

The resulting accelerated timber harvest in the MPB epidemic area could compromise long-term forest productivity as wet soil conditions have expanded.³ With less interception and evapotranspiration, dead and dying lodgepole pine stands experience changes in water balance resulting in more soil moisture, a quicker hydrological response to precipitation events, and a greater frequency of increased water.⁴ Where soils “water up,” there is a higher risk of compaction and rutting during salvage operations.⁵

To evaluate if current forest practices conserve and protect soils in BC at the local scale, a monitoring process was put in place that measures soil-based indicators developed to assess the effectiveness of forest and range legislation in achieving stewardship objectives.^{6,7} Indicators provide a protocol to assess changes in soil conditions in line with international standards and criteria for sustainable forest management set out by the Montreal Process.^{8–11} Indicators

are assessed through soil disturbance observable on the ground as proxy for longer-term effects, and therefore, provide a qualitative assessment of soil productivity and hydrologic function within the last two years after harvesting at the cutblock level.⁶ Measuring indicators are done mostly using high-resolution air photography in 10-cm pixel size to provide a rapid evaluation of soil attributes. A ground-based survey can complement the air photo review when site conditions are not favorable, i.e., certain disturbances are not visible on brush-rich grounds from scarifying the mineral soil to remove surface organic materials.

High-resolution air photography provides crisp-quality image for the assessment of soil disturbance at the local scale, but must be acquired specifically for a project. Their utility has been shown for measuring small-scale disturbance in forestry.^{12,13} However, they are not readily available as satellite imagery. Additionally, high-resolution air photography is costly considering quality satellite imagery are becoming increasingly available (i.e., IKONOS), and some are being provided for free or at reasonable cost over the Internet.¹⁴⁻¹⁶ Within the context of the information needed, the immediate goal of the current project was to investigate whether there are sources of data other than highly pixelated aerial photography (e.g., <10 cm resolution) that can be used to identify and map soil disturbance indicators following salvage harvesting using the imagery analysis method developed for Forest and Range Evaluation Program (FREP).

In this research, we examined available remote-sensed images of different spatial resolution with respect to (1) level of recognition and (2) accuracy assessment of indicators of soil conservation in association with harvesting activities within MPB areas.

2 Methodology

2.1 Data

The FREP Soil Resource Stewardship Monitoring method is organized into five key indicators, which provide an objective and representative evaluation of productive and hydrologic function of soils at cutblock level under BC's *Forest and Range Practices Act*.⁷ This is primarily an image-based survey method that focuses on indicators that rely on features that can be easily distinguished in remote-sensed images, i.e., are visible from overhead. Table 1 highlights those indicators for describing the status of soils on recently logged cutblock.

Indicators were assessed across a range of digital image formats ranging from satellite imagery to low-altitude aerial photography with pixel size between 10 cm and 30 m (also referred to by spatial resolution of 30 × 30 m² frame, Table 2). The lower the spatial resolution frame (or the higher the resolution of the data), the smaller is the visible feature that can be captured. For example, coarse woody debris lying on the ground is visible in a 10-cm pixel size, whereas within a larger pixel of 30 × 30 m² a large feature can be detected. A total of 95 images were analyzed across 23 random cutblocks. Each cutblock came with at least two image data types to a maximum of five.

Images were in TIFF format, which is an uncompressed format commonly used for image-manipulation, and geo-referenced to allow for direct measurement of distances, areas, and

Table 1 Cutblock-level indicators of soil conservation included in the image-based method of Soil Resource Stewardship Monitoring.

Indicators of soil conservation
• Lost productivity due to access construction • In-block area affected or potentially affected by landslides, drainage diversion, or erosion • Soil disturbance hazards, dispersed disturbance, inordinate disturbance, and roadside work areas • Green tree retention • Dead wood

Table 2 Images accessed for monitoring indicators of soil conservation across selected forest districts.

Image format (pixel size)	Mackenzie	Prince George	Vanderhoof	Rocky Mountain
Landsat 5 TM (30 m) ^a	14	16	8	4
SPOT 5 (15 m) ^b	0	0	4	0
SPOT 5 (5 m)	0	8	4	0
SPOT 5 (2.5 m)	0	8	0	0
BC orthophoto (1 m) ^c	2	0	4	0
Aerial photo (0.5 m) ^d	0	0	4	0
Aerial photo (0.1 m) ^e	7	8	0	4
Total number of images	23	40	24	8
Total number of blocks	7	8	4	4

^aLandsat 5 Thematic Mapper (TM) satellite color image (2004 and 2005), National Oceanic and Atmospheric Administration, USA.

^bSPOT 5 (Satellite Pour l'Observation de la Terre) black and white image, spatial resolution of 15 × 15 m², 5 × 5 m², and 2.5 × 2.5 m², SPOT Image Corporation, USA.

^cBC orthophoto is a geometrically corrected aerial photograph provided by the BC government in color or black and white.

^dLow elevation true color aerial photography taken with vertical camera system provided by TDB, <http://www.tdb.bc.ca>.

^eLow elevation true color aerial photography taken with vertical camera system by J. Heath, Terrasaurus Aerial Photography, <http://www.terrasaurus.ca/>.



Fig. 1 Map of northern, central, and eastern British Columbia (BC), Canada. Locations of study sites are shown with a symbol "K."

position. Images are available to the general public, and can be ordered using the Base Map Online Store except for those of high resolution, i.e., less than 1-m pixel size.¹⁷ High-resolution aerial photographs acquired locally for this study used a fixed-wing aircraft, and will be accessible to the general public once the data is audited for quality assurance.

Image analysis aimed to identify and map indicators of soil disturbance was performed by an end-user with limited knowledge in soils, but was assisted by an experienced photo-interpreter. Some remote-sensed data were field verified for quality assurance. Accuracy of measurement was examined only for access structures (key indicator 1, Table 1) from various image formats based on comparisons with the highest-resolution image available for each block (equal or very close to the true value on the ground). Means and standard deviations of access structure estimates were computed in Microsoft Excel (2007) using the AVERAGE and the STDEV functions, respectively.

Images were loaded into *OziExplorer* GPS Mapping software, and processed to evaluate cutblock-level indicators (Table 1).¹⁸ The software was selected for its low cost and user friendliness for maps containing geo-referenced information and real-tracking ability with a GPS receiver for work in the field. Using *OziExplorer*, we can determine the size of features and areas, and prepare a map showing the location of soil disturbance types (e.g., landings).

2.2 Study Area

The study area is mostly located in the central part of the interior plateau, which lies in the rain shadow of the BC Coast Mountains. Between 800 and 1400 m above sea level, the landform is rolled with few high peaks, and parent materials are mostly consolidated and of glacial origin. Precipitation can be as little as 250 mm annually in the valleys, but can reach 750 mm or more on western slopes. Soils are frozen in the winter, but in the summer soils “water-up” due to increased delivery of precipitation to the ground as the MPB affected trees die.¹⁹ Additional salvaged areas were added to the sample population just to the east of the Interior Plateau in the southern Rocky Mountains, where digital imagery was also available and site disturbance field data existed to confirm the photo interpretation. During the summer months, in each cutblock, clearcut harvests were implemented, and trees were felled mechanically and yarded to the roadside areas for processing. Ground survey results presented in this study are based on the BC Soil Conservation Survey Guidebook.²⁰ The study focused in forest districts, where the MPB outbreak was important within the Vanderhoof, Mackenzie, Rocky Mountain, Prince George, 100 Mile House, Central Cariboo, and Chilcotin Forest Districts (Fig. 1).

Table 3 Identifiable features from different remote-sensed image format in relation to soil indicators.

Image format	Access structure	Areas of landslides, drainage diversion, or significant erosion	Inordinate disturbance and roadside work areas	Green tree retention	Dead wood
Landsat 5 TM (30 m)	Visible ^a	Not visible	Not visible	Visible ^a	Not visible
SPOT 5 (15 m)	Visible	Not visible	Not visible	Visible	Not visible
SPOT 5 (5 m)	Visible	Not visible	Not visible	Visible	Not visible
SPOT 5 (2.5 m)	Visible	Visible	Visible	Visible	Not visible
BC orthophoto (1 m)	Visible	Visible	Visible	Visible	Not visible
Aerial photo (0.5 m)	Visible	Visible	Visible	Visible	Not visible
Aerial photo (0.1 m)	Visible	Visible	Visible	Visible	Visible

^aApplies to roads only. Landings become clear at 5-m pixel size unless significantly greater than 0.2 ha in size.

^bApplies to green tree retention in patches. Single-tree retention is best observed at 50 cm and at a smaller pixel size.

3 Results

3.1 Identifiable Features

In central BC, we were able to find randomly 23 sites that had been salvage harvested and where digital imagery was acquired within 1 year of harvest. The amount of information available in each remote-sensed image is a function of its lowest object detail. The spatial resolution of some images limits the number of indicators that can be evaluated (Table 3). Access structures, particularly roads, and green tree retention in patches are evident on all remote-sensed images, but easier to discern on aerial photographs (Fig. 2). On Landsat 5 Thematic Mapper (TM) color images (30 m), roads are generally represented by dark pink pixels, whereas tree retention stands out in green. Exposed soils in landings and roads yield a brighter spot than the surrounding areas on black and white SPOT 5 (Satellite Pour l'Observation de la Terre) images. Surface wetness from drainage diversion displays as a darker color due to poor reflection response and, unfortunately, often blends in with natural ingress and brush making interpretation difficult.

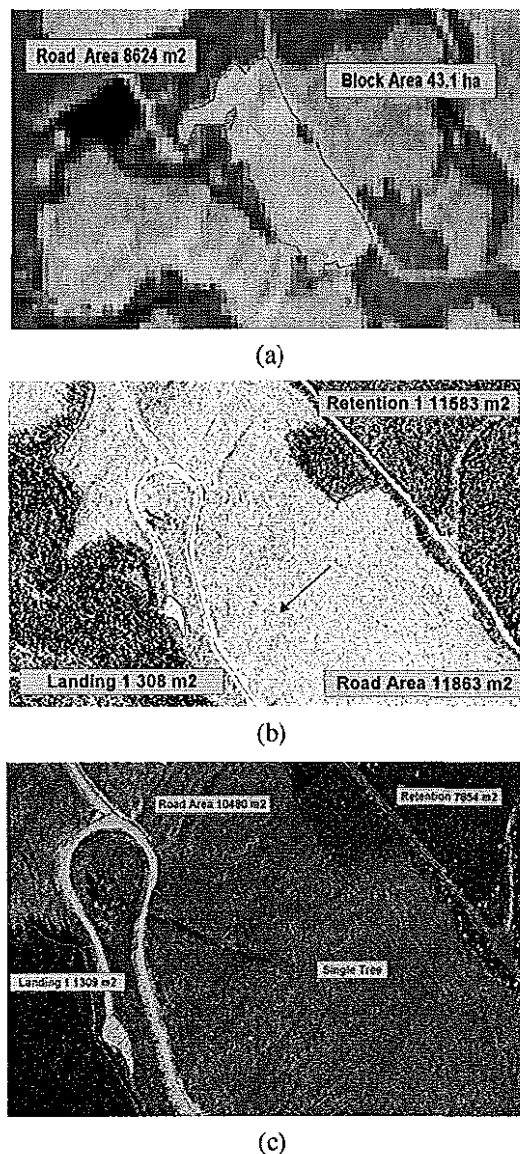


Fig. 2 Examples of access structure and green tree retention on Mackenzie cutblock #239: (a) Landsat 5 Thematic Mapper (TM) (30 m), (b) BC orthophoto (1 m), and (c) aerial photo (0.1 m).

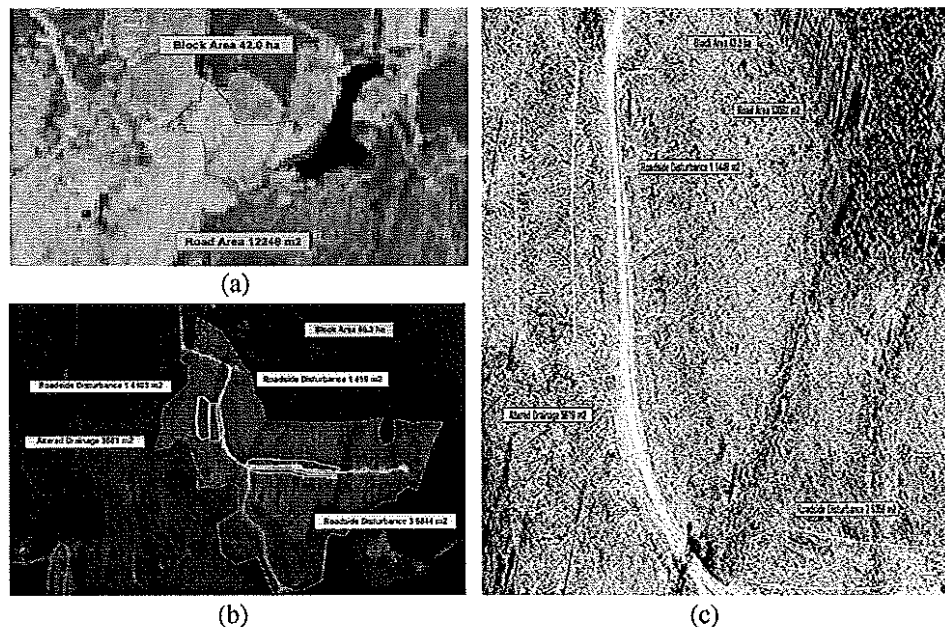


Fig. 3 Lynx Lake cutblock in Prince George Forest District showing smaller areas of soil disturbance such as altered drainage and roadside work areas: (a) Landsat 5 TM (30 m), (b) SPOT 5 (2.5 m), and (c) aerial photo (0.1 m).

Small areas (<0.2 ha) where soil has been disturbed, such as landings and inordinate disturbance areas, often appeared fuzzy and blended in with other ground features on low-resolution images with a pixel size greater than 2.5 m (Table 3). In comparison, wheel ruts and skid trails are clearly visible on higher-quality images less than 1-m pixel (Fig. 3). They were mostly found near or within roadside work areas and often contributed to impeded natural drainage patterns. High-resolution data greater than 1-m pixel size allow discernment of single-tree retention. All other indicators of soil conservation, except for dead wood, escape notice on satellite images until pixel size equaled 2.5 m. Higher quality images facilitate detection of other disturbances such as areas of altered drainage and roadside work areas (Fig. 3). A spatial resolution of $10 \times 10 \text{ cm}^2$ is best suited for assessing the amount of dead wood (Fig. 4).

3.2 Accuracy of Measurements

The accuracy of remote-sensed images for measuring roads and landings varies with the image format. Here, accuracy of measurements refer to how close the measured value is to the true or accepted value, not to be confused with positional accuracy which is an assessment of the closeness of the object's location in relation to its true position on the Earth's surface. Estimation of the amount of roads varied with standard deviation between 6% and 40% (Table 4). On a block-by-block basis, the largest variation was found in Landsat TM images as a result of the large field of view ($30 \times 30 \text{ m}^2$) and poor differentiation of color tones (e.g., logging road width is less than 30 m). It has the lowest data resolution of remote-sensed data used in our study. However, on an average, satellite images performed nearly as well as any other remote-sensed images for measuring roads (percent difference from actual values as low as 6%, Table 4), although their detection is not as easy as with high-resolution images (Fig. 2).

The area occupied by landings identified from the different image formats was between 3% and 26% lower than the area identified from the reference high-resolution photo (Table 4). However, there is a large source of variation (standard deviation up to 44%, Table 4) associated with the estimates for the same reasons as roads. Overall, moderate-resolution data between 1 and 5-m pixel size are sufficient for estimating areas occupied by landings (Table 4) when no higher-resolution images are available.

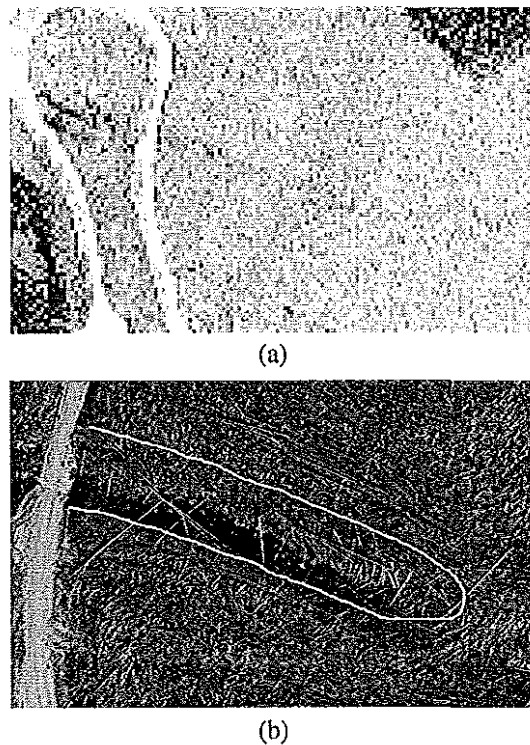


Fig. 4 Coarse woody debris across a gully on Mackenzie block #239: (a) BC orthophoto (1 m) and (b) aerial photo (0.1 m).

Table 4 Variability in estimating loss of productivity due to access structure using five remote-sensed image formats when compared with a reference photo (STD = standard deviation).

Image format	Roads		Landings	
	Average difference (%)	STD (%)	Average difference (%)	STD (%)
Landsat 5 TM (30m)	-3 ^a	40	-26	44
SPOT 5 (15 m)	-1	6	No landings	No landings
SPOT 5 (5 m)	6 ^a	25	-3	44
SPOT 5 (2.5 m)	2	26	-7	39
BC orthophoto (1 m)	-5	15	-10	28

^aA negative value means that estimates underestimate reference photo value.

^bA positive value means that estimates overestimate reference photo value.

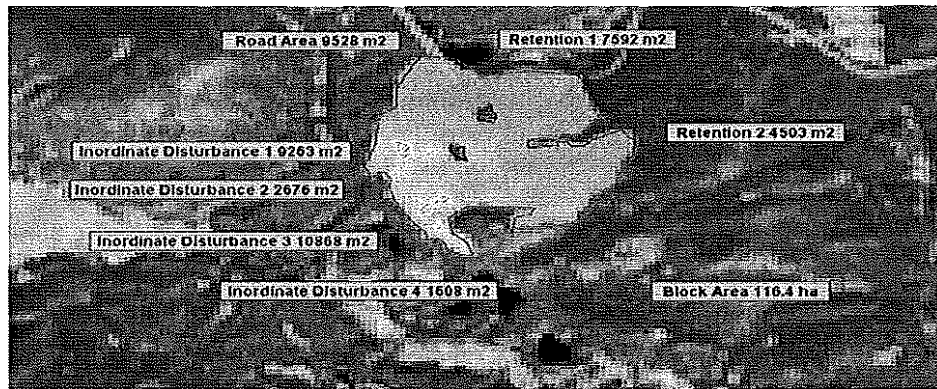
4 Discussion

Aerial photos (<50 cm pixel size or approximately 1:16,000) show the more obvious types of soil disturbance quite clearly, whereas the more subtle kinds of disturbances, i.e., when forest floor layers are still present, make it difficult to interpret compaction. Knowing the textural composition of the soil is important to assess compaction. However, soil texture cannot be extracted from an image (i.e., without a remote spectral signature). Rutting and other machine traffic were then used as proxy indicators of compaction.

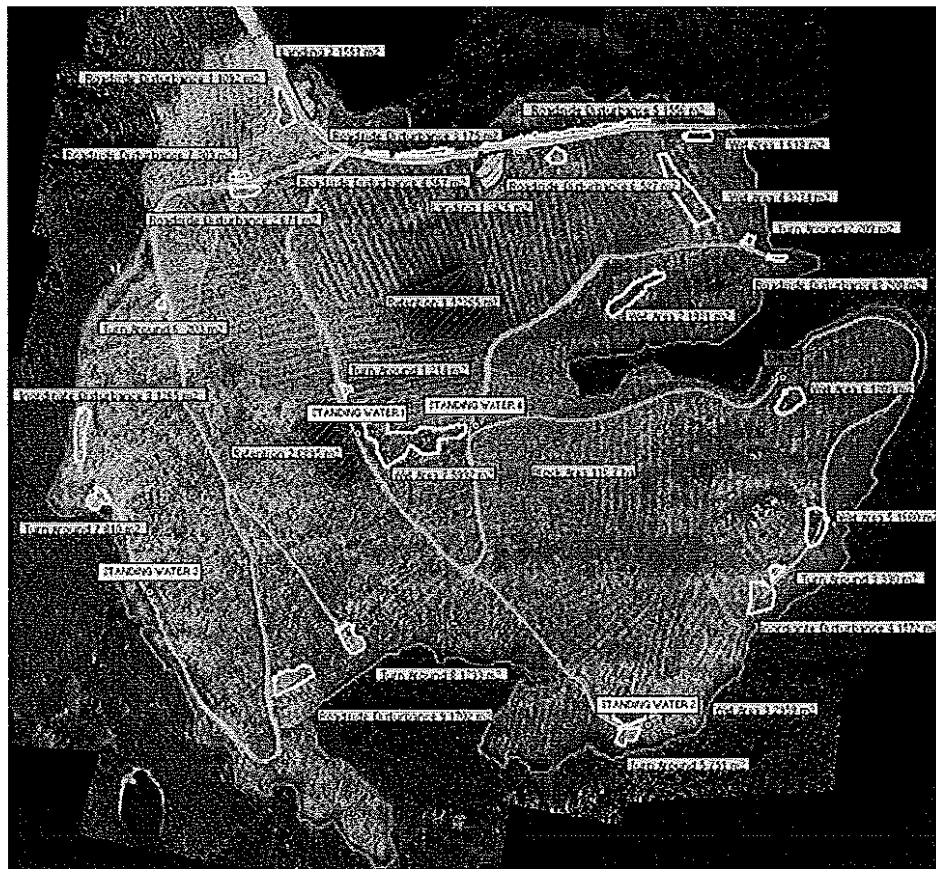
Ground surveys for soil disturbance were conducted on 5 of the 23 sampled cutblocks to validate our results. The method using aerial photos succeeded to identify blocks that had significant amounts of soil disturbance (e.g., ruts and gouges) ranging from 8.1% to 49.1% of the net area to be reforested. Except for Landsat TM, satellite imagery, although less pixelated, was adequate to pick up roads and patches of tree retention. We were confident that both satellite

imagery of 15 m resolution or less and high-resolution aerial photography were able to show actually what was there on the ground.

To get the most from remote-sensed images used for detecting soil disturbance, one needs to understand that spatial resolution limits the amount of information (i.e., the level of details that can be detected from a selected image format) (Fig. 5). Satellite imagery trades off quality against ground coverage in one swath (e.g., Landsat TM 185-km width versus small area coverage low elevation aerial photography), although pixel size as well as positional accuracy—not examined here—are rapidly increasing with advanced sensor technology. As a result, smaller size features, such as landings, were sometimes identified incorrectly as a result of fuzzy boundaries in the satellite image, something not observed on aerial photographs. These “hits and misses” can impact



(a)



(b)

Fig. 5 (a) Landsat 5 TM image (30 m) provides limited information. Even permanent access structures are very difficult to identify. (b) The same block mapped at 10-cm pixel resolution from an aerial photo.

the estimates, but not significantly in the case of access structure considering that landings receive a smaller weight compared with roads in the computation of access structure due to their small size.

Overall, satellite images provided acceptable results for tracking productivity losses on access structures (Fig. 3). Although the amount of green tree retention patches were not assessed between image formats, our work suggests its accuracy would be similar to that of access structures. This review indicates that aerial photographs are more suited to map indicators other than loss of productivity due to access structures (e.g., areas affected by landslides, drainage diversion, or erosion), because there is less difficulty in distinguishing soil features from slash, brush, and natural regeneration or microrelief.²¹ High-resolution satellite imagery like SPOT 5 with pixel size ranging from 2.5 to 5 m could be useful, with an understanding that some information can be missed. However, newer satellite sensors such as GeoEye-1 (0.41 m) and IKONOS (0.82 m) may detect finer detailed features, and therefore, potentially be useful for estimating indicators that require a higher level of discrimination.²²

Good visibility of soil features in satellite images also depends on other factors. Local variation in terrain slope will influence how objects are reflected and captured by the sensors. In smaller blocks, various elements such as tree edge, landings, roads, or topography are present in one pixel and as a result, influence signal return producing a complex response making interpretation difficult (Fig. 6). With spatial resolution data less than or equal to $5 \times 5 \text{ m}^2$, roads running along cutblock boundaries are sometime difficult to map because they are obscured by the tree crowns. The appearance of the ground on satellite images also depends on weather conditions as satellites

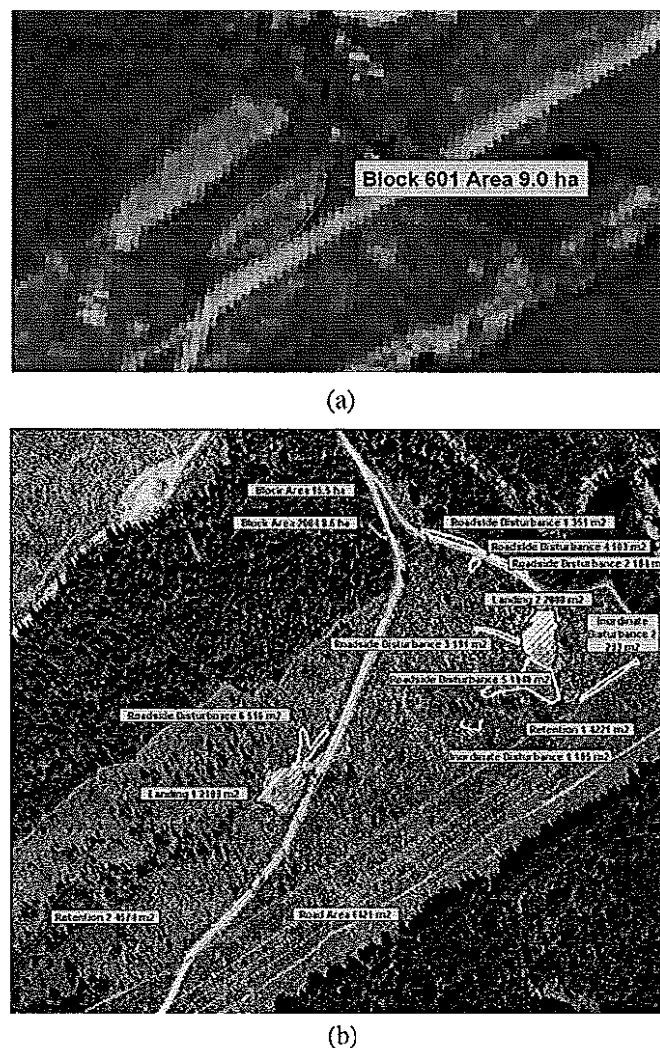


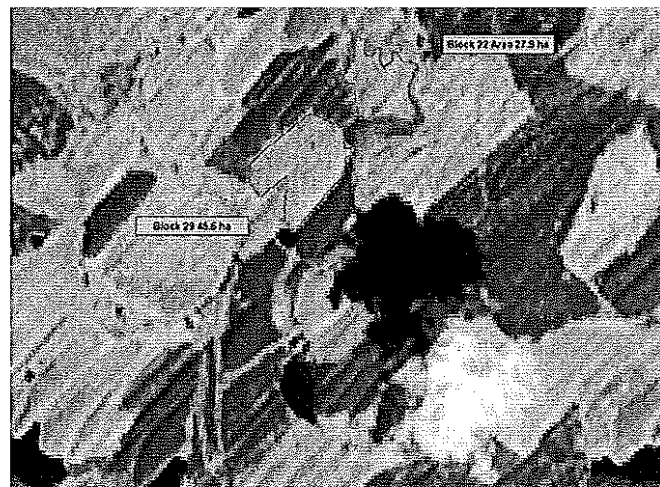
Fig. 6 (a) A Landsat 5 TM (30 m) image of Cranbrook block showing how block size affects the amount of identifiable features, in comparison with (b) high-resolution aerial photo (0.1 m).

follow predetermined orbital passes and work on a fixed schedule. Figure 7 illustrates that detection can be difficult on a cloudy or hazy day. In contrast, aerial photograph can be taken whenever the sky is clear but ground coverage is limited, and the cost of acquiring them is generally higher than that for satellite photos. Whether or not one image format is more appropriate than another one should be decided by the user's needs because information that can be derived from each image format is limited by its spatial resolution.

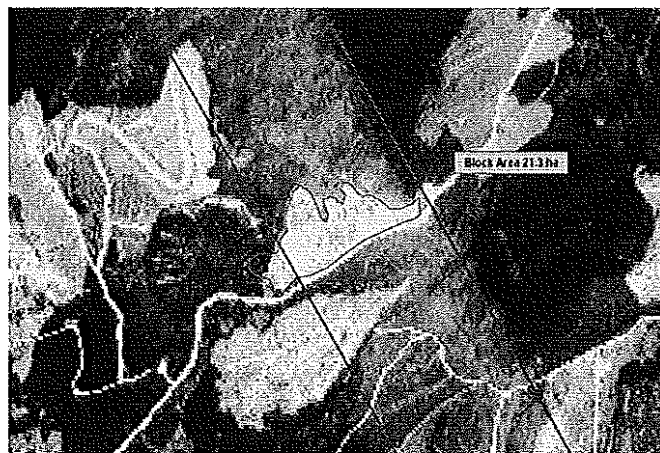
5 Management Implications

The extreme level of soil disturbance found in at least one block suggests that there may be a very good reason to be concerned about the level of soil disturbance associated with salvage harvest operations. This level of soil disturbance would never be considered acceptable for normal timber harvesting, and it is important to determine what harvest operations were used on this cut-block and if it is indicative of increased soil disturbance caused by the changes in hydrologic function of the site. We were able to identify and measure soil disturbance using both satellite imagery and low-level aerial photography. Therefore, digital imagery can be used to assess the overall state of soil management in relation to salvage harvesting.

Information needs should guide the choice of an appropriate data source for monitoring soil conservation following salvage operations within MPB-affected areas. Moderate resolution satellite imagery between 15 and 30 m (e.g., Landsat 5 TM) would be likely sufficient for detecting and



(a)



(b)

Fig. 7 Weather conditions affected feature identification: (a) A cloud on a Landsat 5 TM image and its associated shadow, and (b) a cloud patch (outlined in red) on a SPOT 5 (2.5 m).

measuring the extent of roads and landings. Finer images provide higher accuracy measurements if necessary. Areas occupied by landslides, erosion, drainage diversion, inordinate disturbance, or roadside work areas can be captured on remote-sensed images with spatial resolution greater than 2.5 m, such as SPOT 5, and 1-m pixel size image, such as BC government orthophotos.

Based on this research and previous work, aerial photographs are best suited to describe and accurately assess the less-evident harvesting-related soil disturbance. Higher-resolution data deliver the best information for end-users, but costs and availability will also need to be considered before making a final decision.

The information presented in this study was obtained from manual digital images interpretation, which is a process that has its limitations.²² As digital imagery evolves to provide finer details, techniques such as classification (either pixel- or object-based) or digital elevation model (e.g., ConMap) can complement manual interpretation to achieve accuracy gain in soil mapping.²³ Our method will contribute information to the Montreal Process-Member Countries in evaluating the protective and productive functions of forests in relation to soil and water resources (Criterion 2—maintenance of productive capacity of forest ecosystems and Criterion 4—conservation and maintenance of soil and water resources).¹¹

Acknowledgments

The BC Forest and Range Evaluation Program (FREP) supported this project. The authors wish to thank Peter Bradford and his staff for their ongoing support to the soil resource stewardship monitoring program, and Amy Barnes for assistance with mapping using OziExplorer software and in collecting data.

References

1. Ministry of Forests, Lands, and Natural Resource Operations, "Facts about BC's Mountain Pine Beetle," 2012, http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/Updated-Beetle-Facts_April2013.pdf (23 May 2013).
2. Ministry of Forests, Lands, and Natural Resource Operations, "Mountain Pine Beetle action plan," 2006, http://www.for.gov.bc.ca/hfp/mountain_pine_beetle/Recovering_Value_from_Dead_Timber.htm (23 May 2013).
3. J. Rex, S. Dubé, and V. Foord, "Mountain Pine Beetles, salvage logging, and hydrologic change: predicting wet ground areas," *Water* **5**(2), 443–461 (2013), <http://dx.doi.org/10.3390/w5020443>.
4. R. D. Winkler et al., "Mountain Pine Beetle, forest practices, and watershed management," BC Ministry of Forests, and Range, Research Branch, Victoria, B.C. Extension Note 88, 2008, <http://www.for.gov.bc.ca/hfd/pubs/Docs/En/En88.htm> (23 May 2013).
5. W. M. Aust et al., "Soil physical and hydrological changes associated with logging a wet pine flat with wide-tired skidders," *Southern J. Appl. Forestry* **17**(1), 22–25 (1993).
6. M. Curran et al., *Protocol for soil resource stewardship monitoring: cutblock level*, Forest and Range Evaluation Program, BC Ministry of Forests and Range and BC Ministry of Environment, Victoria, BC, <http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/indicators/Indicators-Soils-Protocol-2009-May26-2009.pdf> (2009).
7. C. Bulmer et al., "Monitoring the effects of forest practices on soil productivity and hydrologic function," *BC J. Ecosyst. Manag.* **9**(2), 48–59 (2008).
8. J. A. Burger and D. L. Kelting, "Using soil quality indicators to assess forest stand management," *Forest Ecol. Manag.* **122**(1–2), 155–166 (1999), [http://dx.doi.org/10.1016/S0378-1127\(99\)00039-0](http://dx.doi.org/10.1016/S0378-1127(99)00039-0).
9. D. Page-Dumroese et al., "Soil quality standards and guidelines for forest sustainability in northwestern North America," *Forest Ecol. Manag.* **138**(1–3), 445–462 (2000), [http://dx.doi.org/10.1016/S0378-1127\(00\)00430-8](http://dx.doi.org/10.1016/S0378-1127(00)00430-8).
10. S. H. Schoenholtz, H. Van Miegroet, and J. A. Burger, "A review of chemical and physical properties as indicators of forest soil quality: challenges and opportunities," *Forest Ecol. Manag.* **138**(1–3), 335–356 (2000), [http://dx.doi.org/10.1016/S0378-1127\(00\)00423-0](http://dx.doi.org/10.1016/S0378-1127(00)00423-0).

11. The Montreal Process, "Criteria, and indicators for the conservation, and sustainable management of temperate, and boreal forests," 2nd ed., December 1999, http://www.montrealprocess.org/documents/publications/general/1999/1999santiago_e.pdf (23 May 2013).
12. P. Teti, "Novel aerial photography as an aid to sampling secondary structure in pine stands," Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC, Mountain Pine Beetle Working Paper 2009-16, 2009, <http://cfs.nrcan.gc.ca/pubwarehouse/pdfs/30122.pdf> (23 May 2013).
13. M. A. Wulder, J. C. White, and N. C. Coops, "Information-need-driven applications of remotely sensed data for mapping mountain pine beetle infestation at landscape and tree levels," Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia, Information Report BC-X-410 (2007).
14. C. E. Woodcock et al., "Free access to Landsat imagery," *Science* **320**(5859), 1011 (2008), <http://dx.doi.org/10.1126/science.320.5879.1011a>.
15. GeoBC Gateway, <http://geobc.gov.bc.ca> (23 May 2013).
16. TerraServer®, <http://www.terra-server.com/home.asp> (23 May 2013).
17. British Columbia Base Map Online Store, <http://www.basemaps.gov.bc.ca> (23 May 2013).
18. OziExplorer software, D&L Software Pty Ltd., Australia, <http://www.oziexplorer.com> (23 May 2013).
19. S. Dubé, A. P. Plamondon, and R. L. Rothwell, "Watering up after clear-cutting on forested wetlands of the St. Lawrence lowland," *Water Resour. Res.* **31**(7), 1741–1750 (1995), <http://dx.doi.org/10.1029/95WR00427>.
20. BC Ministry of Forests, "Soil conservation surveys guidebook," 2nd ed., Forest Practices Branch, BC Ministry of Forests, Victoria, BC, 2001, <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/soilurv/soil-toc.htm> (23 May 2013).
21. J. L. Morgan, S. E. Gergel, and N. C. Coops, "Aerial photography: a rapidly evolving tool for ecological management," *BioScience* **60**(1), 47–59 (2010), <http://dx.doi.org/10.1525/bio.2010.60.1.9>.
22. N. C. Coops and C. W. Bater, "Remote sensing opportunities for estimating indicators of forest sustainability," FREP, BC Ministry of Forests, and Range, Victoria, BC, Report #21, 2009, http://www.for.gov.bc.ca/ftp/hfp/external/publish/frep/reports/FREP_Report_21.pdf (23 May 2013).
23. T. Behrens et al., "The ConMap approach for terrain-based soil mapping," *Eur. J. Soil Sci.* **61**(1), 133–143 (2010), <http://dx.doi.org/10.1111/ejs.2010.61.issue-1>.

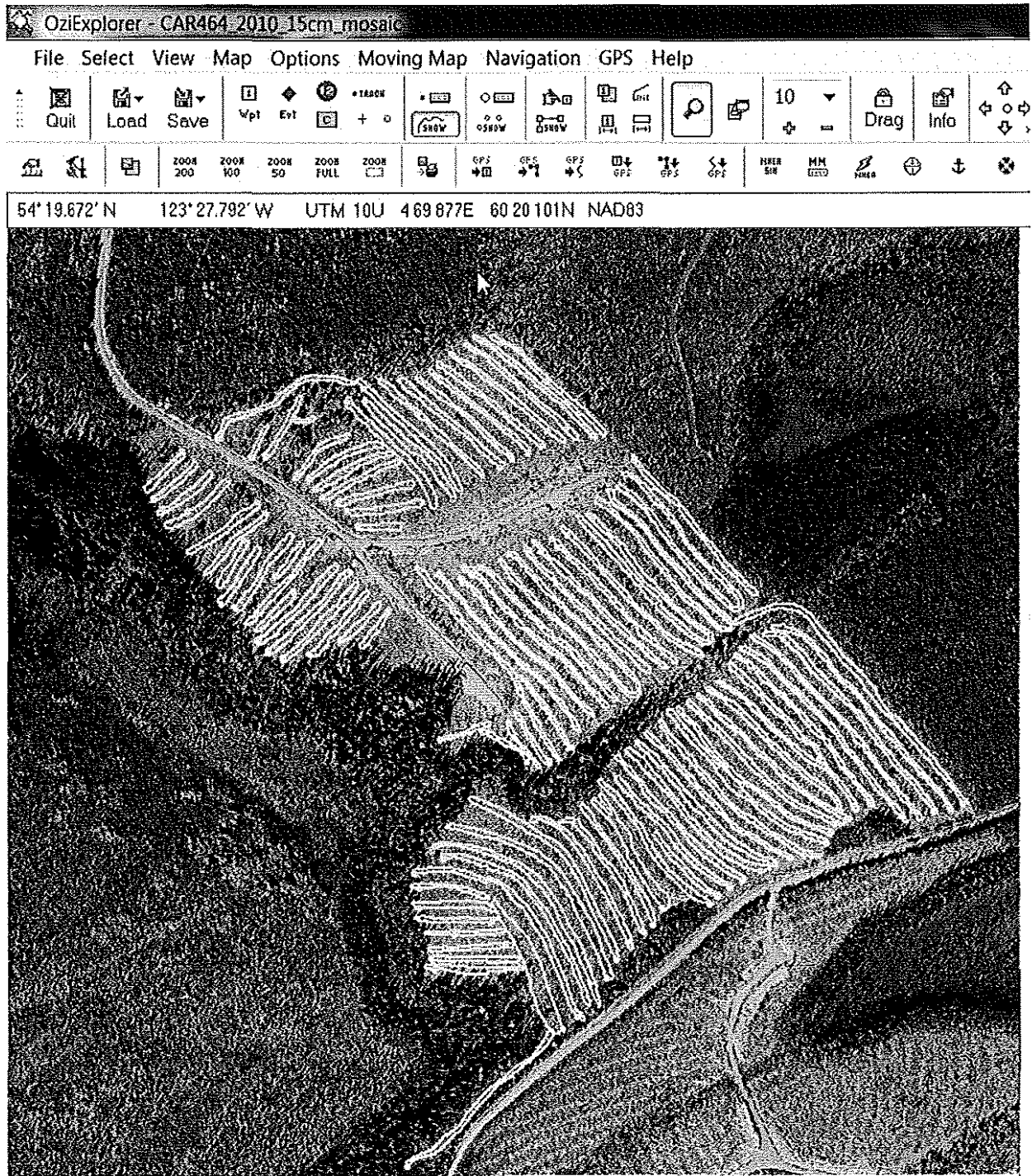


Stéphane Dubé BC Forest Service Soil Scientist, area of expertise is soil physics, wetland soils, soil conservation and rehabilitation. His research activities are designed to gain greater understanding about soil disturbance effects on forest productivity and provide products usable for forest practitioners facing operational issues. He is very cognizant of operational issues and how to connect with potential end-users based on 20 years of experience in applied research, extension activities and forest operations involving First Nations, licensees and other stakeholders. His recent work includes providing new innovative tools for monitoring soil practices, testing new soil rehabilitation techniques on waterlogged soils, and assessing hydrological risk within the mountain pine beetle infestation.



Shannon Berch is a research scientist and soil ecologist with the British Columbia Ministry of Environment and adjunct professor with the Faculty of Land and Food Systems at the University of British Columbia and with the Centre for Livelihoods and Ecology at Royal Roads University.

TRAILS + OTHER DISTURBANCES



Skidding trails



Other disturbances...

Recommendations

Hello Mike. An assessment and review of soil disturbance survey results submitted by CANFOR for CP B97 CB CAR468 & CP B66 CB CAR464 revealed that (1) my counted disturbance greatly exceeds that measured by S.M. Forrest (the surveyor), (2) our results point towards disturbance levels over maximum limits, and (3) the survey methodology used i.e. Big Block method with grid centres (for areas larger than 10 ha) was not appropriate because it assumes that soil disturbance is relatively evenly distributed throughout the block which was not the case here. In cut-to-length logging, soil disturbance is confined to skid trails and Roadside Work Area (RWA). With grid centres, transects by chance can either run parallel to a trail or right down a residual strip. This likely results into lower confidence limits and therefore, a false acceptance of in-compliance.

We checked those points surveyed by S.M. Forrest (approx. 360 points per block).

Soil disturbance limits RWA = 25% SU A = 10% SU B = 5%	CAR464		CAR468		
	RWA (154 pts)	SU A (240 pts)	RWA (52 pts)	SU A (240 pts)	SU B (60 pts)
CANFOR	11%	2.9%	31%	13%	0%
MOFR	42%	15%	21%	20%	30%

The predominant disturbance type that was often missed was repeated machine traffic. It is found on repeatedly used skid trails and in traffic areas usually associated with RWA's. Repeated machine traffic (code 0E0) is called when the survey point and sampling window (1m W x 2m L rectangle) show evidence of compaction indicated by increased soils density (coarse platy structure), puddling or compacted deposits of slash and organic debris. Compaction was best assessed when comparing soil structure at survey point to soil conditions of adjacent undisturbed areas. The natural soil condition was checked frequently by digging to ascertain compaction during our survey.

We could not guarantee the exact location of observation during our review was that of S.M. Forrest. However discrepancies between S.M. Forrest's results and the results from the review were significant enough that in our opinion, compaction condition of the soil was not properly identified on the 2 blocks. In one particular area, a transect crossed a 6 m wide compacted skid trail but no points assessed at 1 m interval were classified as 0E0's.

Grid centres were less than effective for surveying RWA's because it was not representative of RWA disturbance levels based on ocular assessment. Some transects ran parallel to main disturbance pattern almost avoiding it while others skipped the strata (e.g., survey points falling outside RWA or on roads) so not enough points were collected to get a precise estimate of the soil disturbance.

We also noted one large area affected by altered natural drainage patterns (roughly 1 ha in size) due to deep rutting in each block.

Based on our main findings, I recommend that I re-measure soil disturbance within the 2 blocks using the new random method. Like Bill Chapman, soil scientist said: "The method has been reviewed by a statistician, has been field tested by several experts and is being incorporated into the soil disturbance surveys guidance document which the MOFR research is currently preparing". The sampling method is truly random, use less number of survey points and most importantly, does provide a statically valid survey.

Please, let me know if you need to discuss. I plan to go out next week and start re-surveying.

Thanks.

Stephane

FREP

Technical Note

#5

July 2013

A Field Guide for Surveying Soil Disturbance Using Random Sampling

Prepared by Bill Chapman, PhD¹; Steve Thompson, BSc²; Peter Ott, MSc¹; Mike Curran, PhD¹; Shannon Berch, PhD³

Introduction

This field guide outlines a random sampling procedure for estimating levels of dispersed soil disturbance in Standards Units (SUs) of all sizes. This method can be used to assess the effectiveness of soil conservation practices under the Forest and Range Evaluation Program (FREP), or for Compliance and Enforcement Investigations and other circumstances where measures of soil disturbance are needed. This sampling procedure is intended for use with the following companion documents.

- FREP Soil Conservation Field Cards
- *OziExplorer Training and Help Manual*
- *Protocol for Soil Resource Stewardship Monitoring: Cutblock Level*

These documents are located under the "Soils" resource value at: <http://www.for.gov.bc.ca/hfp/frep/indicators/table.htm>

The sampling procedures described in this technical note are applicable to dispersed disturbance in the Net Area to be Reforested (NAR) and in Roadside Work Areas (RWA). The terms "SU," "NAR," and "RWA" all have legal definitions in British Columbia forestry. It is assumed the reader is familiar with current legislation and the description of counted soil disturbance (B.C. Ministry of Forests 2001). Soil disturbance that results from "Temporary Access Structures" may be counted as a category of disturbance within a random dispersed disturbance survey, or it may be surveyed separately using any of the standard methods for measuring road area, which are available from many other sources.

Although transect-based survey methods exist (e.g., B.C. Ministry of Forests 2001), a random sample gives the best estimate of disturbance for a given sample size and it is straightforward to calculate a statistical test to verify results. The random method also requires very little layout time and is easily scaled to different-sized areas and complex shapes. Some of the advantages of random sampling are discussed in Bergerud (2004).

Contents

Introduction.....	1
Survey Procedure ..	2
Field	5
Calculations for Multiple Strata (Stratified Random Sample)	6
Guidelines for Stratification	7
Calculating Stratum Sample Size.....	7
Literature Cited ...	8

¹ B.C. Ministry of Forests, Lands and Natural Resource Operations

² Frontline Forest Research, Nelson, B.C.

³ B.C. Ministry of Environment, Environmental Sustainability and Strategic Policy Division

Many different configurations of hardware and software can be used to locate points for a random survey. The survey procedure outlined here uses commonly available technology. Regardless of the equipment used, a random survey must meet the following criteria to be acceptable.

1. The observation points must be randomly generated with any point in the survey area having a chance of being sampled.
2. When the observation point is located in the field, the exact survey point must be selected by following a precise rule that eliminates the opportunity for surveyor bias to influence selection.
3. All points generated for a particular survey area must be evaluated. It is expected that random survey points and soil disturbance will be distributed unevenly throughout the survey area. Therefore, the entire set of points must be surveyed and evaluated before making judgements about the overall level of disturbance. Initially, a complete survey with a smaller number of points is possible. If this survey is subsequently found to have insufficient power to give a clear result, an additional set of random points can be generated for the same area and surveyed. These results can then be combined with the previous survey to generate a more precise estimate.

The goal of effectiveness evaluations is to determine whether practices are effective at achieving objectives, whereas a compliance-type survey assesses whether the level of prescribed disturbance has been exceeded.

The estimate of disturbance from a sample is subject to sampling error, and therefore a one-sided *t*-test is used to give a measure of the power of the sampling procedure. For investigations into excess soil disturbance resulting from forestry operations in British Columbia, a statistically significant, one-sided *t*-test at the 90% confidence level is typically considered as a sufficient indicator that the soil disturbance limit has been exceeded.

Survey Procedure

Office

1. **Preliminary Assessment and Mapping** – The recommended procedure is to **review** high-resolution digital imagery (i.e., 10 cm per pixel, or less) to **assess** the amount and distribution of disturbance, **delineate** the RWA and temporary access structures, and **identify** areas with potential environmental damage. For detailed instructions, see the *OziExplorer Training and Help Manual* (<http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/indicators/OziExplorer-Training-and-Help-Manual-May-2009.pdf>).

Delineate (stratify) areas with different concentrations of disturbance on the aerial photo. Stratification can improve the efficiency of a random survey and is recommended for large SUs with highly clustered disturbance (see "Guidelines for Stratification" below).

As an alternative to aerial photo assessment, conduct a field reconnaissance of the survey area to assess the distribution and severity of soil disturbance. The RWA can be defined from a ground survey, but this is very time consuming.

The survey area can include one or all SUs in a cutblock. The RWA is always treated as a separate SU and, depending on the level of disturbance, may or may not be surveyed. If a cutblock contains multiple SUs, it will not be necessary to survey all of them, as the unit of assessment (effectiveness or compliance) is the SU or the RWA.

If "Damage to the Environment" under the *Forest and Range Practices Act* is suspected, then a survey may also be undertaken on smaller areas within an SU. If a survey is



Figure 1: Example of stratification from a high-resolution aerial photo. In this case, the SU was divided into two strata (blue and yellow boundaries). The yellow stratum is not contiguous. The red lines show the location of RWAs mapped from the photo. In this example, the RWA has also been divided into two strata, corresponding to the different shades of red (which sometimes appears pinkish where it is adjacent to a blue line). The strata were selected because of visibly differing levels of soil disturbance, although the differences are not discernible at the scale shown. This image (~10 cm per pixel) can be greatly magnified without pixilation.

used to gather evidence for a “Damage to the Environment” action, then the area to be surveyed is defined by the expert giving evidence on the likelihood of environmental damage.

Map the survey area boundaries using the SU boundaries defined in the site plan, except for RWA boundaries, which are best determined from aerial photos.

- Exclude roads, landings, or other features that are not part of the NAR.
- Identify and map temporary access structures, such as roads and turnouts (if these are to be measured separately).

Figure 1 shows an example of boundaries mapped from a high-resolution aerial photo.

Create a digital map of the survey area using suitable GIS software (e.g., *OziExplorer*, *ArcMap™*, or *Global Mapper™*). Note the map datum so that a GPS can be set to match the map.

2. **Determine Sample Size – Review** survey objectives and **determine** sample size. The number of points to be sampled is determined by the expected level of disturbance and the desired confidence interval. With higher disturbance levels, fewer points are needed in the field survey to establish that the cutblock is over the prescribed disturbance limit.

For a typical compliance and enforcement survey of dispersed disturbance, 200 sample points are recommended in an SU with 5–15% disturbance. This gives a critical value that is approximately 3% less than the estimated mean using a one-sided t-test at the 90% Confidence Level (Table 1).

Typically, SUs will be considered in non-compliance if the measured disturbance exceeds 13% for a 10% disturbance limit block, or 8% for a 5% limit block.

For effectiveness evaluations, in which samples usually consist of many cutblocks, a 100-point survey is considered a good trade-off between sampling power and use of resources. For surveys

Table 1: Critical value for a one-sided t-test at the 90% confidence level

Percent Disturbance	Number of Survey Points											
	40	50	60	70	80	90	100	110	120	150	200	250
5							7.8	7.7	7.6	7.3	7.0	6.8
6						9.3	9.1	8.9	8.8	8.5	8.2	7.9
7					10.7	10.5	10.3	10.2	10.0	9.7	9.3	9.1
8				12.2	11.9	11.7	11.5	11.4	11.2	10.9	10.5	10.2
9			13.8	13.5	13.2	12.9	12.7	12.5	12.4	12.0	11.6	11.3
10		15.6	15.1	14.7	14.4	14.1	13.9	13.7	13.5	13.2	12.7	12.4
11		16.8	16.3	15.9	15.5	15.3	15.1	14.9	14.7	14.3	13.9	13.5
12		18.0	17.5	17.1	16.7	16.4	16.2	16.0	15.8	15.4	15.0	14.6
13	20.0	19.2	18.7	18.2	17.9	17.6	17.4	17.2	17.0	16.5	16.1	15.7
14	21.2	20.4	19.9	19.4	19.0	18.7	18.5	18.3	18.1	17.7	17.2	16.8
15	22.5	21.6	21.0	20.6	20.2	19.9	19.6	19.4	19.2	18.8	18.3	17.9
16	23.7	22.8	22.2	21.7	21.3	21.0	20.8	20.5	20.3	19.9	19.3	19.0
17	24.8	24.0	23.3	22.9	22.5	22.1	21.9	21.6	21.4	21.0	20.4	20.1
18	26.0	25.1	24.5	24.0	23.6	23.3	23.0	22.7	22.5	22.1	21.5	21.1
19	27.2	26.3	25.6	25.1	24.7	24.4	24.1	23.8	23.6	23.1	22.6	22.2
20	28.3	27.4	26.7	26.2	25.8	25.5	25.2	24.9	24.7	24.2	23.6	23.3
21	29.5	28.6	27.9	27.3	26.9	26.6	26.3	26.0	25.8	25.3	24.7	24.3
22	30.6	29.7	29.0	28.5	28.0	27.7	27.4	27.1	26.9	26.4	25.8	25.4
23	31.8	30.8	30.1	29.6	29.1	28.8	28.5	28.2	28.0	27.4	26.8	26.4
24	32.9	31.9	31.2	30.7	30.2	29.8	29.5	29.3	29.0	28.5	27.9	27.5
25	34.0	33.0	32.3	31.7	31.3	30.9	30.6	30.3	30.1	29.6	28.9	28.5
26	35.2	34.1	33.4	32.8	32.4	32.0	31.7	31.4	31.2	30.6	30.0	29.6
27	36.3	35.2	34.5	33.9	33.5	33.1	32.8	32.5	32.2	31.7	31.0	30.6
28	37.4	36.3	35.6	35.0	34.5	34.1	33.8	33.5	33.3	32.7	32.1	31.7
29	38.5	37.4	36.7	36.1	35.6	35.2	34.9	34.6	34.4	33.8	33.1	32.7
30	39.6	38.5	37.7	37.1	36.7	36.3	35.9	35.7	35.4	34.8	34.2	33.7
35	45.0	43.9	43.0	42.4	41.9	41.5	41.2	40.9	40.6	40.0	39.3	38.9
40	50.2	49.1	48.3	47.6	47.1	46.7	46.4	46.1	45.8	45.2	44.5	44.0
45	55.4	54.2	53.4	52.7	52.2	51.8	51.5	51.1	50.9	50.2	49.5	49.1
50	60.4	59.3	58.4	57.8	57.3	56.8	56.5	56.2	55.9	55.3	54.6	54.1
55	65.4	64.2	63.4	62.7	62.2	61.8	61.5	61.1	60.9	60.2	59.5	59.1
60	70.2	69.1	68.3	67.6	67.1	66.7	66.4	66.1	65.8	65.2	64.5	64.0
65	75.0	73.9	73.0	72.4	71.9	71.5	71.2	70.9	70.6	70.0	69.3	68.9
70	79.6	78.5	77.7	77.1	76.7	76.3	75.9	75.7	75.4	74.8	74.2	73.7
75	84.0	83.0	82.3	81.7	81.3	80.9	80.6	80.3	80.1	79.6	78.9	78.5
80	88.3	87.4	86.7	86.2	85.8	85.5	85.2	84.9	84.7	84.2	83.6	83.3

* Blank values are shown where use of this table is not recommended

associated with effectiveness evaluations, however, a cutblock is considered over the limit if the mean is over the limit, as the true disturbance in the block is likely closer to the mean than the confidence limit.

Because of mapping or GPS errors, some points will inevitably fall on permanent landings, roads, or other non-surveyed areas (e.g., a large pile of slash). Therefore, it is often more efficient to generate 10% more points (e.g., 110 points for a 100-point survey); then, if some points are dropped during the survey, an adequate sample can still be obtained without having to generate another set of survey points.

3. **Generate Random Waypoints and Download to GPS** – This step can be done with suitable GIS software and with the digital map generated during Step 1 (above).

For example, a point shapefile can be generated in ArcMap, using a Visual Basic for Applications macro developed by Sawada.⁴ The shapefile is then converted to waypoints in *OziExplorer* (or other mapping software that has this function). The waypoints are then downloaded to a suitable GPS unit. Production of a paper or digital map is recommended to assist in tracking field survey progress.

Field

4. **Determine the Hazard Rating for the SU** – Under the *Forest and Range Practices Act*, the Crown does not verify any soil hazard ratings⁵ that may be given in the site plan; therefore, soil hazard ratings must be independently determined by the surveyor. This hazard rating is then used to determine which soil disturbance categories count and the disturbance limits for the area to be surveyed. This may be done either before or after the survey is completed, as long as all disturbance types are described at each survey point.
5. **Verify that the GPS and Map Correspond** – If the GPS and map are in different map datums, or if the map has been georeferenced incorrectly, then a significant shift between the GPS readings and the map is possible, causing some survey points to be located outside of the sampled SU. Map correspondence can be checked by determining the GPS location of three or more points that are clearly and precisely located on the aerial photograph.
6. **Traverse Recording** – Before surveying, switch on the tracking function in the GPS so the traverse route will be recorded.
7. **Locate Survey Points in the Field** – For field location of survey points, the recommended procedure is to use built-in GPS features to navigate from waypoint to waypoint. Wherever feasible, approach the next waypoint from the general direction of the previous waypoint. In the final 10 m before a point, the surveyor should focus on the GPS unit and walk in a straight line at an even pace. If adjacent points are less than 10 m apart, ensure the approach to each point begins at least 10 m away. Do not use a haul road as the starting point when locating points in an RWA survey.
8. Navigation to a point is complete when the GPS indicates it is 1 m from the waypoint. This is determined by observing the changing distance to the waypoint on the GPS, or by programming the GPS to beep at a 1 m distance from the point. At precisely the moment when the 1 m distance is indicated, the exact survey point is identified by an arbitrary locator that is determined in advance and is consistently used throughout the survey.

⁴ Sawada, M. Random point generator, a VBA macro available from ESRI ArcScripts at: <http://arcscripits.esri.com/details.asp?dbid=12098> (Accessed March 2013).

⁵ Soil hazard ratings, which are a necessary prerequisite to conducting a soil disturbance survey, are described in the *Hazard Assessment Keys for Evaluating Site Sensitivity to Soil Degrading Processes Guidebook* (B.C. Ministry of Forests 1999).

Examples of locators are the point directly below one corner of the GPS unit, or the end of a heavy or weighted piece of flagging that hangs from the strap of the GPS. The surveyor marks the point immediately and must not adjust its location in any way. Because of the GPS's built-in variability, the reading may change while the surveyor is standing there; however, this will not matter as the surveyor uses the initial indication of the point.

The surveyor navigates to a location 1 m from the point because it is simply too time consuming to locate the point with any more precision (and most GPS units would not be able to do this anyway). If relocation of a point is attempted with the GPS, it is unlikely that the exact point would be found, but this is not important as the original point will have been located in an unbiased manner.

9. Field Marking and Data Recording –

For compliance surveys, the exact survey point should be semi-permanently marked. This is not necessary for effectiveness evaluation surveys unless they are subject to audit. Survey results can be entered directly into a GPS unit or an electronic data entry device, or recorded on notepaper.

10. Calculations –

When the survey is complete, compare the estimated mean to the prescribed soil disturbance limit using a one-sided t -test at the 90% confidence level. The formulae to calculate the critical value for this test are shown below.

If the critical value is greater than the prescribed soil disturbance limit, then the survey area is typically considered to be over the disturbance limit.

$$p = \frac{\text{counted disturbance points}}{n}$$

$$\text{Mean} = 100 \times p$$

$$\text{Variance} = \frac{p \times (1 - p)}{(n - 1)}$$

$$\text{Critical Test Value} = \text{Mean} - 100 \times t_{(0.1, n-1)} \times \sqrt{\text{Variance}}$$

Where: n = total number of survey points; and $t_{(0.1, n-1)}$ = Student's t statistic for a one-sided test at the 90% confidence level.

Note: If you are using Excel to calculate the t value, the function "TINV" assumes a two-tailed probability. To specify the correct value for TINV in a one-sided test, set $\alpha = 0.2$ (i.e., $\text{TINV}_{[0.2, n-1]}$).

Calculations for Multiple Strata (Stratified Random Sample)

If there is more than one stratum in the survey area, calculate the overall mean disturbance using a weighted mean and the lower confidence limit using a weighted standard error (SE). Weighted standard error is calculated stepwise by calculating the variance in each stratum, using the formula above and then combining the numbers on an area weighted basis:

$$\text{Weighted SE} = \sqrt{\sum_{i=1}^S \left(\frac{\text{Area}_i^2}{\text{Area}_{\text{Total}}^2} \times \text{Variance}_i \right)}$$

Where: Area_i = area of stratum "i"; $\text{Area}_{\text{total}}$ = total area of all strata; S = number of strata; and

Variance_i = variance of Stratum_i , calculated as above.

An example calculation of the weighted mean and SE in a 100-ha SU with two unequal-sized strata of 25 and 75 ha is shown below. A total of 114 points were surveyed in the smaller stratum, with 23 counted disturbance points (20.2%). Eighty-six points were surveyed in the larger stratum with 4 counted disturbance points (4.7%).

$$\begin{aligned} \text{Weighted Mean} &= \left(\frac{25 \text{ ha}}{100 \text{ ha}} \times 20.2\% \right) + \left(\frac{75 \text{ ha}}{100 \text{ ha}} \times 4.7\% \right) \\ &= 5.05\% + 3.53\% = 8.58\% \end{aligned}$$

$$\text{Variance1} = 100 \times \left[\frac{\frac{23}{114} \times \left(1 - \frac{23}{114} \right)}{(114 - 1)} \right] = 0.1425$$

$$\text{Variance2} = 100 \times \left[\frac{\frac{4}{86} \times \left(1 - \frac{4}{86} \right)}{(86 - 1)} \right] = 0.0522$$

$$\text{Weighted SE} = \sqrt{\left[\frac{25^2}{100^2} \times 0.1425 + \frac{75^2}{100^2} \times 0.0522 \right]} = 2.73\%$$

Guidelines for Stratification

Stratification may improve the efficiency of a survey, particularly if an aerial photo or other type of preliminary review shows large variability in the distribution of disturbance within an SU. In such cases, every portion of a surveyed area may not require sampling at the same intensity. The potential benefits of stratification are greatest with very large SUs.

Strata must be mutually exclusive, collectively account for the total area of the SU, and delineated before the field survey begins. This is most efficiently done using a high-resolution aerial photo (i.e., 10 cm per pixel or less). Figure 1 shows an example of stratification from an aerial photo review.

If more than one stratum is assessed in the survey area, final results are calculated with area-weighted means and variances. Using weighted means and variances compensates for the unequal allocation of survey points to strata so that a stratified random sample still gives a valid estimate of the overall disturbance level for the entire area surveyed.

Individual strata can consist of dispersed areas; for example, a number of mappable, non-contiguous, small-sized wetter areas within a larger survey area can be surveyed as one stratum.

For very large SUs, stratification may also be used to implement a multi-step effectiveness or compliance survey. This is done by identifying a stratum (via a preliminary assessment) within the SU that has above-average disturbance. Following the stratum sample size guidelines below, a survey is done on this smaller area. The results are then used to determine whether additional surveying is warranted in the other strata. For example, if the survey results clearly show the most disturbed stratum is low or in compliance, then it may not be worth surveying the remaining strata, which are presumed to have less disturbance. To improve interpretation, it may be desirable to include extra sample points in this first step.

This procedure can only be used if a surveyor can provide convincing evidence that a more disturbed area has been stratified out. High-resolution photography is useful to support such a position.

Calculating Stratum Sample Size

Sample size is a function of the number of points in the total survey area, the estimated disturbance, and the area of the stratum.

Estimate the amount of disturbance in each stratum (via preliminary assessment), and then calculate the sample size by weighting the number of points for each stratum using the formula below. In all cases, a minimum of 15% of the total sample should be used in each stratum (e.g., 30 points in a 200-point total sample). The surveyor can increase the number of points in a stratum of interest as this will not affect the final weighted average calculation of disturbance.

$$n_i = \frac{Area_i \times \sqrt{p_i(1-p_i)}}{\sum_{i=1}^S Area_i \times \sqrt{p_i(1-p_i)}} \times n_{Total}$$

Where: $Area_i$ = area of stratum "i"; S = number of strata; and p_i = estimated proportion of disturbed points.

Consider the example of a 100 ha survey area with two strata. One stratum is 25 ha with disturbance estimated at 20%. A second stratum is 75 ha with disturbance estimated at 5%. For a 200-point survey, sample sizes in each stratum would be estimated as:

$$n_{25} = \frac{25 \times \sqrt{0.20(1-0.20)}}{25 \times \sqrt{0.20 \times (1-0.20)} + 75 \times \sqrt{0.05(1-0.05)}} \times 200 = \frac{25 \times 0.4}{25 \times 0.4 + 75 \times 0.218} \times 200 = 76$$
$$n_{75} = \frac{75 \times \sqrt{0.05 \times (1-0.05)}}{25 \times \sqrt{0.20 \times (1-0.20)} + 75 \times \sqrt{0.05 \times (1-0.05)}} \times 200 = \frac{75 \times 0.218}{25 \times 0.4 + 75 \times 0.218} \times 200 = 124$$

Literature Cited

B.C. Ministry of Forests. 1999. Hazard assessment keys for evaluating site sensitivity to soil degrading processes guidebook. 2nd ed. Version 2.1. Forest Practices Branch, Victoria, B.C. Forest Practices Code of British Columbia Guidebook.

<https://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/HAZARD/HazardAssessKeys-web.pdf> (Accessed March 2013).

———. 2001. Soil conservation surveys guidebook. 2nd ed. Forest Practices Branch, Victoria, B.C. Forest Practices Code of British Columbia Guidebook.

<http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/SOILSURV/Soil-toc.htm> (Accessed March 2013).

Bergerud, W. 2004. Why the units we evaluate should be randomly selected. The FRPA Evaluator. Technical Note No. 3. http://www.for.gov.bc.ca/ftp/hfp/external/!publish/frep/technical/FRPA_Evaluator_Technical_Note_03.pdf (Accessed March 2013).

For further information contact:

Bill Chapman
B.C. Ministry of Forests, Lands and Natural Resource Operations
200-640 Borland Street
Williams Lake, BC, V2G 4T1
250-398-4718
Bill.Chapman@gov.bc.ca



BRITISH
COLUMBIA



Soil DISTURBANCE LIMITS

Soil disturbance limits RWA = 25% SU A = 10% SU B = 5%	CAR464		CAR468		
	<i>RWA</i> (154 pts)	<i>SU A</i> (240 pts)	<i>RWA</i> (52 pts)	<i>SU A</i> (240 pts)	<i>SU B</i> (60 pts)
CANFOR	11%	2.9%	31%	13%	0%
MOFR	42%	15%	21%	20%	30%

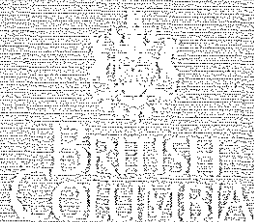


of
BRITISH COLUMBIA

Soil Conservation Surveys Guidebook

2nd Edition
May 2001

This Forest Practices Code Guidebook is presented for information only. It is not cited in regulation. The Forest and Range Practices Act and its regulations took effect on Jan. 31, 2004. This replaced the Forest Practices Code of British Columbia Act and regulations. For further information please see the Forest and Range Practices Act.





Soil Conservation Surveys Guidebook

2nd Edition
May 2001

Authority

Forest Practices Code of British Columbia Act
Silviculture Practices Regulation
Operational Planning Regulation
Timber Harvesting Practices Regulation
Woodlot Licence Forest Management Regulation

National Library of Canada Cataloguing in Publication Data

Main entry under title:

Soil conservation surveys guidebook. — 2nd ed.

(Forest practices code of British Columbia)

ISBN 0-7726-4492-6

1. Soil conservation - British Columbia. 2. Forest soils - British Columbia - Evaluation. 3. Forest roads - Environmental aspects - British Columbia. 4. Soil erosion - British Columbia. I. British Columbia. Ministry of Forests. II. Series.

SD390.43.C3S64 2001 631.4'5 C2001-960056-9

© 2001 Province of British Columbia

Citation

B.C. Ministry of Forests. 2001. Soil Conservation Surveys Guidebook. 2nd ed. For. Prac. Br., B.C. Min. For., Victoria, B.C. Forest Practices Code of British Columbia Guidebook.

URL: <http://www.for.gov.bc.ca/tasb/legsregs/fpc/fpcguide/SOILSURV/Soil-toc.htm>

For copies of this or any guidebook, contact:

Government Publications

PO Box 9452, Stn Prov Govt,

Victoria BC, V8W 9V7

Telephone: 1-800-663-6105 (outside Victoria)

(250) 387-6409 (within Victoria)

Fax: (250) 387-1120

Internet: <http://www.publications.gov.bc.ca>

Guidebooks are also available on the British Columbia

Ministry of Forests home page at:

<http://www.for.gov.bc.ca/tasb/legsregs/fpc/FPCGUIDE/Guidetoc.htm>

Preface

This guidebook has been prepared to help forest resource managers plan, prescribe, and implement sound forest practices that comply with the Forest Practices Code.

Guidebooks are one of the four components of the Forest Practices Code. The others are the *Forest Practices Code of British Columbia Act*, the **regulations**, and the **standards**. The *Forest Practices Code of British Columbia Act* is the legislative umbrella authorizing the Code's other components. It enables the Code, establishes mandatory requirements for planning and forest practices, sets enforcement and penalty provisions, and specifies administrative arrangements. The regulations lay out the forest practices that apply province-wide. Standards may be established by the chief forester, where required, to expand on a regulation. Both regulations and standards, where required and established under the Code, must be followed.

Forest Practices Code guidebooks have been developed to support the regulations, but are not part of the legislation. The recommendations in the guidebooks are not mandatory requirements, but once a recommended practice is included in a plan, prescription, or contract, it becomes legally enforceable. Guidebooks are not intended to provide a legal interpretation of the *Act* or regulations. In general, they describe procedures, practices, and results that are consistent with the legislated requirements of the Code.

The information provided in each guidebook is to help users exercise their professional judgement in developing site-specific management strategies and prescriptions to accommodate resource management objectives. Some guidebook recommendations provide a range of options or outcomes considered acceptable under varying circumstances.

Where ranges are not specified, flexibility in the application of guidebook recommendations may be required to adequately achieve land use and resource management objectives specified in higher-level plans. A recommended practice may also be modified when an alternative could provide better results for forest resource stewardship. The examples provided in many guidebooks are not intended to be definitive and should not be interpreted as the only acceptable options.

Contents

Preface	iii
1 Introduction	1
2 Overview of post-harvest and post-treatment soil inspection procedures ..	2
2.1 Different soil conservation requirements over time	2
2.2 Requirement for soil conservation surveys	3
2.3 Measuring the area occupied by permanent access structures	4
2.4 Measuring soil disturbance	4
3 Definitions and requirements	5
3.1 Access structures	5
3.2 Soil disturbance	5
3.3 Soil disturbance requiring rehabilitation	6
3.3.1 <i>Excavated or bladed trails</i>	6
3.3.2 <i>Corduroyed trails</i>	7
3.3.3 <i>Compacted areas</i>	8
3.4 Dispersed disturbance	9
3.4.1 <i>Dispersed trail: wheel or track ruts</i>	10
3.4.2 <i>Dispersed trail: repeated machine traffic</i>	13
3.4.3 <i>Deep gouges</i>	14
3.4.4 <i>Wide gouges</i>	14
3.4.5 <i>Long gouges</i>	15
3.4.6 <i>Very wide scalps</i>	15
3.4.7 <i>Wide scalps</i>	16
3.4.8 <i>Rehabilitation disturbance</i>	17
3.4.9 <i>Prescribed fire impacts</i>	17
3.4.10 <i>Woodlot licence area requirements</i>	17
4 Survey methods	19
4.1 Information needed from the approved plan	19

4.2	Visual inspection	20
5	Survey methods for access structures	22
5.1	Road traverse survey	22
5.1.1	Width measurement interval.....	23
5.1.2	Width measurement	24
5.2	Landing survey	26
5.2.1	Hip chain traverse.....	27
5.2.2	Representative length and width measurements.....	27
6	Survey methods for soil disturbance	29
6.1	Site stratification	29
6.1.1	Criteria for stratified areas	30
6.1.2	Surveying roadside work areas	30
6.2	Classifying soil disturbance	30
6.2.1	Assessing the survey point	31
6.2.2	Assessing the area around the survey point.....	31
7	Transect method for areas 10 hectares and smaller	34
7.1	Preparation	34
7.2	Field survey layout	35
7.3	Observations along the transect	36
7.4	Locating subsequent transects	37
7.5	Field calculation procedure.....	37
7.6	Finalizing the survey.....	38
8	Transect method for areas larger than 10 hectares	39
8.1	Grid centres and grid layout	40
8.2	Transects and points	40
8.3	Calculations	41
9	Site summary	43
9.1	Mapping	43

Appendices

1. Requirements and definitions for prescriptions approved under the Forest Practices Code 1995 Operational Planning Regulation	44
2. Flow chart for correct assessment of soil disturbance survey points under the Forest Practices Code	46
3. Table of random numbers	47
4. Grid spacing for large area method	48
5. Field marking conventions	49
6. Forms	51
7. Counted soil disturbance categories and recommended limits according to hazard ratings	63

Tables

1. Soil disturbance categories usually requiring rehabilitation	6
2. Dispersed disturbance categories	9
3. Transect and point spacings for small area surveys	35
4. Decision rules for comparing survey results to prescription limits	38

Figures

1. Depth assessment of wheel or track ruts	12
2. Layout for road traverse survey	23
3. Separate surveys for roads with different widths	23
4. Measuring road widths on sloping ground	24
5. Measuring road widths on level ground	25
6. Idealized layouts for landing surveys	28
7. Sampling window orientation	32
8. Sampling windows can overlap	32
9. Equivalent sampling window sizes	33
10. Typical transect survey layout for small areas	36
11. Transect survey layout for large areas	39
12. Omit points outside the net area to be reforested	41
13. Flow chart for forms recording large area transect surveys	42

1 Introduction

Soil conservation is a key component in the *Forest Practices Code of British Columbia Act*. This guidebook describes procedures for measuring disturbance to soil caused by forest practices.

The first part of this guidebook provides an overview of post-harvest and post-treatment inspection procedures. The section discusses how soil conservation requirements have changed, and describes generally how disturbance on access structures and in the net area to be reforested (NAR) should be measured.

The second part of the guidebook provides the current requirements and definitions that apply to soil conservation surveys.

The third part of the guidebook describes how soil conservation surveys should be carried out. It details the requirements for visual inspections, road traverse surveys, landing surveys, and transect surveys for small and large areas. Also described are how survey points established during transect surveys are classified.

Appendix 1 provides the requirements and definitions that apply to prescriptions that were approved under the Forest Practices Code (Code) before June 15, 1998. Appendix 2 outlines the sequence used for classifying survey points, Appendix 3 presents a random number table, Appendix 4 shows a table of grid spacings for the transect survey method for large areas, Appendix 5 describes field marking conventions, Appendix 6 contains the forms to be used in conducting soil conservation surveys, and Appendix 7 presents the recommended limits of soil disturbance for coastal and interior sites.

2 Overview of post-harvest and post-treatment soil inspection procedures

Important aspects of soil conservation are the inspections carried out to check that detrimental impacts to forest soils are being minimized. This section of the guidebook outlines survey procedures appropriate for given situations.

Soil conservation surveys examine:

- the proportion of the prescription area occupied by access structures,
- the amount of soil disturbance within the net area to be reforested (NAR), and
- the amount of forest floor displacement within the NAR.¹

Pre-harvest silviculture prescriptions, silviculture prescriptions and stand management prescriptions set maximum limits for some or all, three of these factors. The limits depend on the standards in effect when the particular prescription was approved. Compliance surveys can be conducted for each factor.

2.1 Different soil conservation requirements over time

A number of significant changes to soil conservation requirements have been introduced over the years. Before any soil conservation survey is undertaken, the first step is to determine what soil conservation requirements were specified and what definitions apply. **Each soil conservation survey must be based on the standards specified in the prescription and must use the definitions in place when the prescription was approved.**

In the time prior to full Forest Practices Code compliance, there are three periods during which different soil conservation requirements and different definitions applied to prescriptions. (Requirements and definitions for these periods can be found in the first edition of the *Soil Conservation Surveys Guidebook* [1997]).

Since the Code was introduced, there have continued to be some changes, including the elimination of requirements to specify limits for forest floor displacement and forest floor reduction, and modification of how limits for temporary access structures are specified. A further description of these changes is provided in Appendix 1.

¹ Although specifying limits for forest floor displacement is no longer required for silviculture prescriptions approved under current legislation. It is a requirement on Code prescriptions approved before June 15, 1998.

In addition, soil conservation requirements for areas under woodlot licences have also undergone some changes and can be different from those of other tenures. These are discussed in a later section in this guidebook entitled “Woodlot licence area requirements.”

Unless otherwise specified, the following sections of this guidebook provide the soil conservation requirements and definitions of the regulations and *Act* in effect at the time of this guidebook’s publication.

Under the current requirements, silviculture prescriptions must specify:

- the maximum percentage of the total area under the prescription that may be occupied by permanent access structures;
- the maximum percentage of the NAR that may be occupied by soil disturbance; and
- the extent to which the maximum percentage of soil disturbance in the NAR can be temporarily exceeded to construct temporary access structures.

2.2 Requirement for soil conservation surveys

Soil conservation compliance reports are required in all areas where the government must establish a free-growing stand (in keeping with the Silviculture Practices Regulation). The district manager must complete a report that states the extent to which an area under a silviculture prescription is in compliance with the allowable limits prescribed for the area that may be occupied by permanent access structures and the amount of soil disturbance.

An assessment should be in the form of a visual inspection to confirm that the maximum limits in the prescription have not been exceeded. **No formal survey measurements need to be done, unless it is apparent that the limits may have been exceeded.**

For major licensees, soil conservation surveys are not mandatory. However, if visual inspections indicate that their operations may be in non-compliance, the district manager, in accordance with the Silviculture Practices Regulation, can direct the licensees to conduct surveys. The purpose of these surveys is to inspect a) the nature and extent of the total area under the silviculture prescription occupied by permanent access structures, and b) soil disturbance in the NAR, including temporary access structures.

2.3 Measuring the area occupied by permanent access structures

Silviculture prescriptions must specify the maximum percentage of the total area under the plan that can be occupied by permanent access structures (e.g. permanent haul roads, landings, gravel pits, borrow pits, and permanent logging trails). The types and definitions of access structures that count towards the maximum percentage in the prescription have changed over time, but the field measurement procedures are very similar.

Assessment of access structures begins with visual inspection. Where problems appear, a more detailed road and landing survey procedure is used to determine the percentage of the area occupied by permanent access structures.

2.4 Measuring soil disturbance

Maximum soil disturbance limits are specified in a prescription by standards unit. For each standards unit, the prescription should state the assessed hazards for soil compaction, soil displacement, and soil erosion, and indicate the likelihood of landslides (if detailed terrain stability mapping has been done). The assessed hazards should be used to determine:

- the maximum amount of soil disturbance allowed within a standards unit; and
- which types of soil disturbance to count in each standards unit (see the summary table in Appendix 7).

When a person is checking for compliance, it is important to know both of these factors. Separate strata must be used when surveying standards units that have different maximum limits or different categories of soil disturbance that count.

Where the method of timber harvesting is cable or aerial, it is not necessary to specify the soil hazards, only the likelihood of landslides (if warranted). **Where soil hazards have not been assessed, compacted areas and all categories of dispersed disturbance must be counted as soil disturbance** (i.e., those categories normally counted only on more sensitive sites).

Measuring soil disturbance begins with a visual inspection. Where disturbance appears to exceed the limits set out in the silviculture prescription, a transect survey may be required to determine the percentage of the area occupied by soil disturbance.

Transect surveys classify survey points along transect lines. Survey points are classified based on the soil conditions observed at and around each point.

In some cases, surveys may be conducted on strata that are smaller than the standards unit. The procedures and criteria for site stratification are discussed in the section “Survey methods for soil disturbance – Site stratification.”

3 Definitions and requirements

3.1 Access structures

Access structures located within a cutblock are identified as either permanent or temporary in a silviculture prescription.

Permanent access structures include main haul roads, spur roads, landings, gravel pits, borrow pits, quarries, and permanent logging trails that are built within the total area under the prescription. To be classified as permanent in a prescription, they must satisfy one of the following conditions: a) they must be in use for a long enough period such that, even if they were to be rehabilitated, a commercial crop of trees could not be established on the area occupied by these structures by the time a commercial crop is established on an adjacent area of the cutblock; or b) they must be constructed through soil or rock or ballasted with material that would make them unsuitable for rehabilitation. Such structures are not part of the net area to be reforested (NAR) and do not count towards soil disturbance.

Temporary access structures include roads, landings, pits or quarries, excavated or bladed trails, main skid trails, backspur trails, corduroyed trails, and similar structures within the NAR that are identified as being temporary in a silviculture prescription. Such structures count towards soil disturbance unless they have been rehabilitated. (See "Soil disturbance requiring rehabilitation," below.)

3.2 Soil disturbance

Soil disturbance is a general term referring to the following types of disturbance that occur on the NAR:

- unrehabilitated temporary access structures, including excavated or bladed trails of a temporary nature,
- corduroyed trails,
- compacted areas, and
- dispersed disturbance.

Dispersed disturbance is itself a general term referring to dispersed trails, gouges, and scalps. *Dispersed trails* include wheel and track ruts (normally created during the operation of ground-based equipment on wet soils of limited load-bearing strength) and compaction from repeated machine traffic. *Gouges* are subdivided into deep gouges, wide gouges, and long gouges. *Scalps* are divided into wide scalps and very wide scalps.

Some types of disturbance, such as wide scalps and repeated machine traffic, count as soil disturbance only on more sensitive sites.

When soil disturbance is being assessed, it is necessary first to determine which types of soil disturbance will count on the standards unit and which measurement criteria will be appropriate for each disturbance type.

3.3 Soil disturbance requiring rehabilitation

Temporary access structures (including excavated or bladed trails of a temporary nature), compacted areas, and corduroyed trails require rehabilitation, unless exempted by the district manager. If they are not rehabilitated in accordance with the requirements of the regulations, they count as soil disturbance. (Once satisfactorily rehabilitated, they no longer count as soil disturbance.) Survey symbols for bladed trails and similar structures are shown in Table 1.

Soil conservation surveys can be done before these structures are rehabilitated, with the objective of determining the percentage of the NAR occupied by temporary access. Normally, however, soil conservation surveys are conducted after rehabilitation is complete.

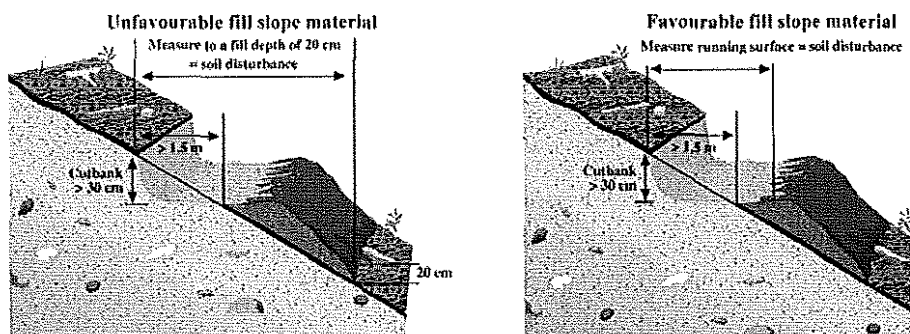
Table 1. Soil disturbance categories requiring rehabilitation^a

Symbol ^b	Category	Example
R	Excavated/bladed trails	Contour-built skid roads that have not been rehabilitated
Y	Corduoyed trails	Skid trails or backspare trails that have been ballasted with logs
A	Compacted areas	Junctions of skid trails and excessively compacted roadside work areas

^a These categories require rehabilitation unless exempted by the district manager.

^b These one-letter symbols are used to record a category of disturbance when conducting a survey.

3.3.1 Excavated or bladed trails (R)



Excavated or bladed trails are constructed trails that have:

- a mineral soil cutbank height greater than 30 cm, and
- an excavated width greater than 1.5 m.

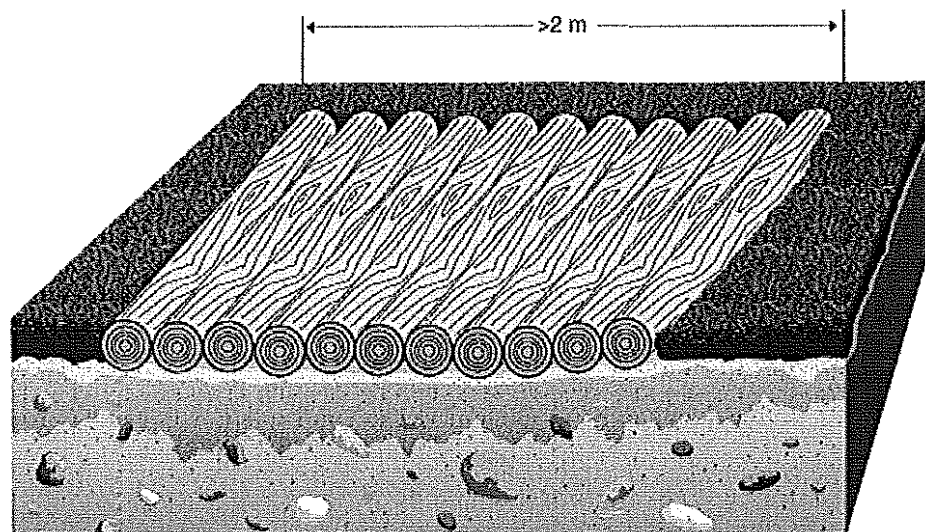
The classification of soil disturbance on excavated and bladed trails depends on whether fill slopes are considered a favourable or unfavourable medium for growing trees. (If this is not stated in the silviculture prescription, the section on fill slope soil material in the *Soil Conservation Guidebook* should be consulted.)

- If fill slopes are unfavourable: Classify survey points as soil disturbance (R) if they fall on the trail between the place where the sidecast is consistently greater than 20 cm deep and the top of the cut. Do not count as part of the sidecast any accumulations of slash that are clean woody debris (i.e., those that contain less than 30% mineral soil).
- If fill slopes are favourable: Classify survey points as soil disturbance (R) if they fall on the trail between the top of the cut to the outside edge of the compacted running surface. If the running surface is not compacted (e.g., on a winter trail), then include only survey points that fall within the excavated width.

If excavated or bladed trails have been satisfactorily rehabilitated, the exposed mineral soil surface associated with the trail does not count as soil disturbance. The exception is if the trail is under a woodlot site plan (as discussed in the section "Woodlot licence area requirements.")

Unrehabilitated excavated or bladed trails that are not identified as permanent logging trails in a silviculture prescription must be counted as soil disturbance on all sites.

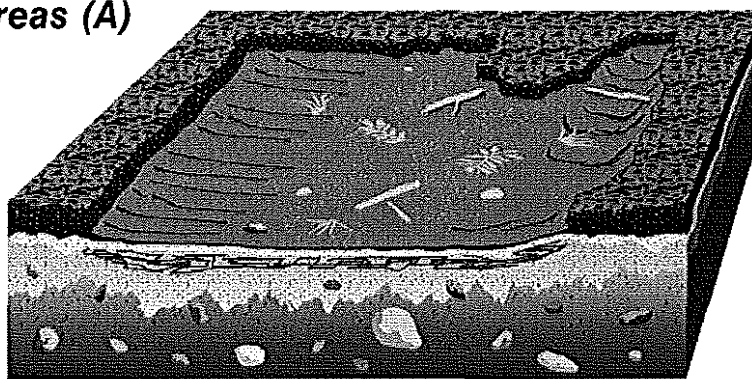
3.3.2 Corduroyed trails (Y)



Corduroyed trails are constructed using logs and woody debris placed side by side to form a surface greater than 2 m in length and capable of supporting equipment traffic. Tree tops and limbs placed in front of harvesting equipment to distribute machine load and reduce soil compaction should not be considered as corduroyed trails, unless the debris prevents the establishment of regeneration at close to the approved target stocking standards. If satisfactorily rehabilitated, a corduroyed trail does not count as soil disturbance.

Unrehabilitated corduroyed trails must be counted as soil disturbance on all sites.

3.3.3 Compacted areas (A)



Compacted areas are areas on which there is evidence of compaction at the survey point and on 100% of a portion that is both greater than 100 m² in area and greater than 5 m wide.

Assessing compaction

Any of these conditions is considered to be compacted soil: compacted mineral soil, puddled mineral soil, and compacted deposits of slash and organic debris.

Mineral soil compaction is assessed relative to the conditions of adjacent undisturbed soil. Any one of the following defines a compacted condition:

- Coarse platy structure.
The soil breaks apart in consolidated plates that are typically 1 cm or greater in thickness. This structure is not evident in the adjacent undisturbed soil.
- Loss of the normal structure evident in the undisturbed soil.
- A noticeable change in density. If the disturbed and undisturbed soils have the same moisture content, their difference in density may be recognized by:
 - a difference in resistance when a shovel is used to penetrate the soils, or
 - a difference in resistance when blocks of soil 2.5 cm thick are crushed between the thumb and index finger.

- Compacted deposits of forest floor, fine slash, and woody debris, overlaying and partially imbedded in, or crushed into, the mineral soil that cannot be readily excavated with a shovel (e.g., deposits of compacted and cribbed-in slash on winter skid trails that are deeper than 20 cm). Compaction of mineral soil occurs when accumulations of slash and woody debris are compacted and pressed into the mineral soil by repeated heavy machine traffic. Often the overlying accumulations are difficult to dig through or separate with a shovel; however, it may be necessary to sample the underlying mineral soil for evidence of compaction (in accordance with the three previous points), if there is any doubt about impacts to the soil.

Unrehabilitated compacted areas are counted as soil disturbance on all sites except those with low compaction hazard. Where the compaction hazard has not been assessed, compacted areas are always counted as soil disturbance.

3.4 Dispersed disturbance

The dispersed disturbance categories and symbols are shown in Table 2.

Note that while all the descriptions provided in this section are contained in the Operational Planning Regulation, the regulation does not identify the specific categories by the reference names used here (e.g., the term “repeated machine traffic” is not specified in the regulation, but the description of this category does fall under the definition of a dispersed trail).

Table 2. Dispersed disturbance categories

Symbol ^a	Category	Example
T	Wheel or track ruts	Machine traffic on wet soils
E	Repeated machine traffic	Skid trails
G	Deep gouges	Mound excavations
L	Long gouges	Excessive ripper-plow trenches, poor mounding
W	Wide gouges	Poor screefing, mounding, or stumping; intermittent trail blading
V	Very wide scalps	Scalping during piling, scalping on skid trails, areas where the forest floor has been completely burned off
S	Wide scalps	Aggressive patch scarification scalping during piling, or on skid trails
–	Not counted (undisturbed, etc.)	Survey points not meeting the criteria of categories above, or that fall on large logs, boulders, or slash piles where the ground surface cannot be seen and reliable assessment cannot be made
X	Not surveyed	Points that fall outside the NAR (e.g., on a permanent landing)

^a These one-letter symbols should be used in field surveys to record soil disturbance.

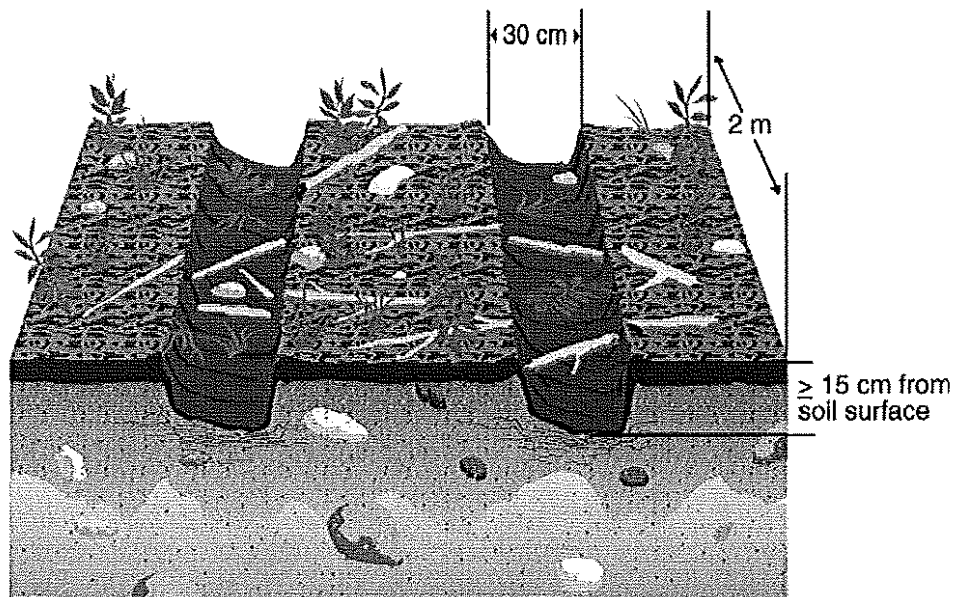
3.4.1 Dispersed trail: wheel or track ruts (T)

Wheel or track ruts are impressions or ruts in the soil caused by heavy equipment traffic. They are at least 30 cm wide and 2 m long. Two different depth criteria (5 cm and 15 cm) apply, depending on the compaction hazard of the standards unit being assessed. On sites with a high or very high compaction hazard, or where the compaction hazard has not been assessed, both depth criteria apply. On sites with a moderate or low compaction hazard, only the 15 cm depth criterion applies. This category does not require the survey point to be assessed for evidence of compaction.

Ruts 15 cm deep

Ruts must have a minimum depth of 15 cm at the deepest point in the perpendicular cross-section, over the entire length of 2 m. Depth is measured from the surface of the undisturbed forest floor to either the forest floor surface in the bottom of the rut or the mineral soil surface in the bottom of the rut if a forest floor is not present.

- For areas of organic soil within cutblocks, measure 15 cm from the undisturbed organic soil surface to the surface in the bottom of the rut (Figure 1).

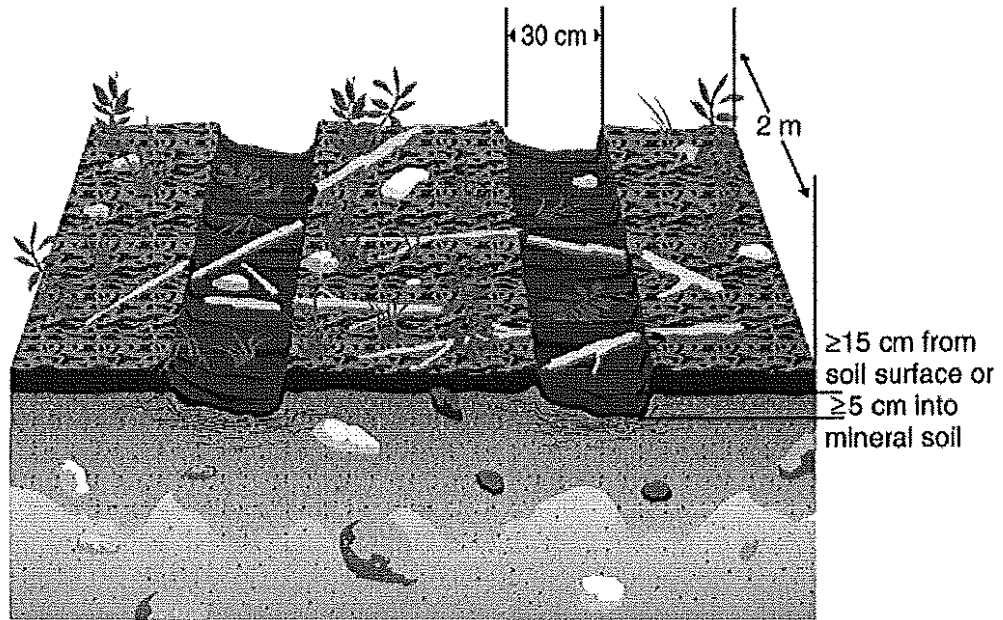


Wheel or track ruts 15 cm deep are counted as soil disturbance on all sites.

Ruts 5 cm deep

On sites with high or very high compaction hazard, both 15-cm-deep ruts and ruts at least 5 cm deep into mineral soil should be counted. Depth is measured from the surface of the undisturbed mineral soil to the mineral soil surface in the bottom of the rut, ignoring any forest floor that may be in the rut.

⇒ Measure at the deepest point in the perpendicular cross-section over the entire length of 2 m (Figure 1).



Wheel or track ruts 5 cm deep are counted as soil disturbance on sites with high or very high soil compaction hazard or where compaction hazard has not been assessed.

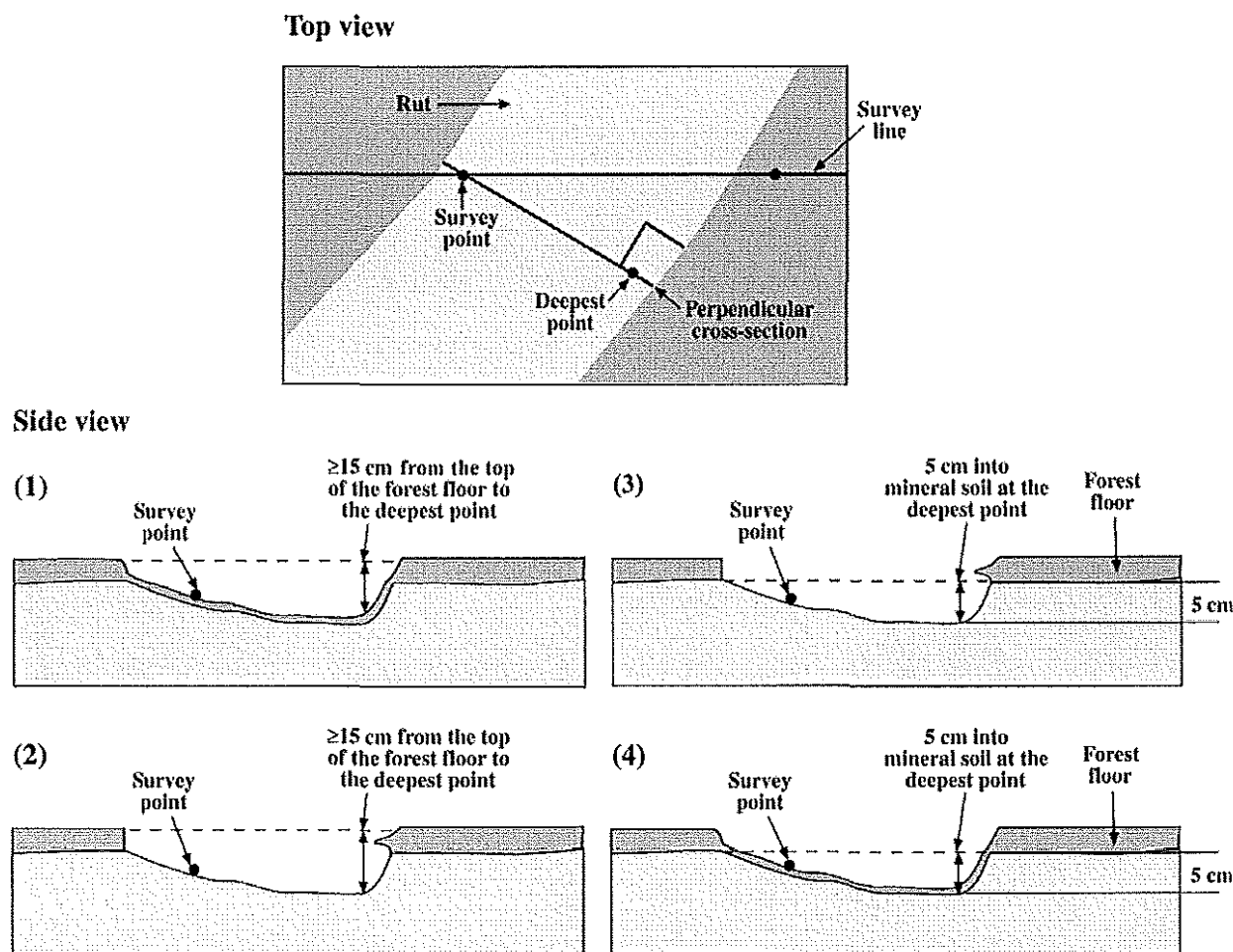
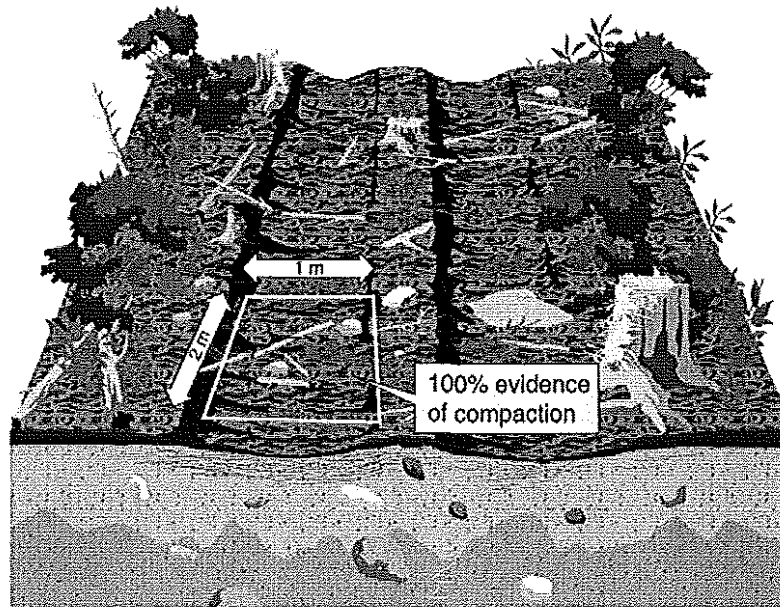


Figure 1. Depth assessment of wheel or track ruts.

- Top view:** The depth assessment for wheel or track ruts uses the deepest point in the perpendicular cross-section of the rut, not the depth exactly at the survey point, as is the case for most other disturbances.
- Side view:**
- (1) On all sites, ruts can be assessed using the depth of 15 cm from the surface of the undisturbed forest floor to the top of the forest floor in the rut.
 - (2) Where forest floor is not present in the rut, measure at least 15 cm from the top of the undisturbed forest floor to the mineral soil surface in the rut.
 - (3) For sites with very high or high soil compaction hazard or where the compaction hazard has not been assessed, measure at least 5 cm from the surface of the undisturbed mineral soil to the mineral soil surface in the bottom of the rut. The mineral soil itself must be depressed 5 cm.
 - (4) When assessing 5-cm-deep ruts into mineral soil, gently brush aside any forest floor if it is present in the bottom of the rut, and measure to the mineral soil surface in the bottom of the rut.

3.4.2 Dispersed trail: repeated machine traffic (E)

The category *repeated machine traffic* describes disturbance resulting from repeated heavy machine traffic. Such disturbance is typically found on repeatedly used skid trails, which are obvious linear features. It may also occur on heavy traffic areas associated with roadside work areas and around piles constructed by windrowing or piling slash. This disturbance rarely occurs on moderate compaction hazard soils logged under dry conditions, where random skidding operations have limited the use of trails to one or two passes.

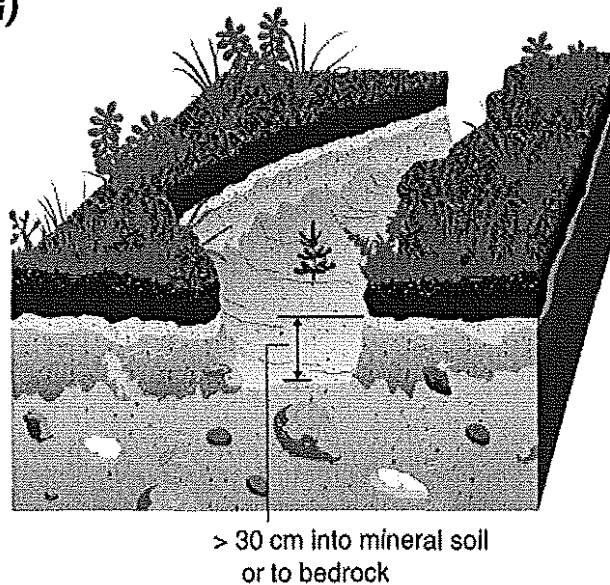


The following criteria define repeated machine traffic:

- The survey point shows evidence of compaction (see “Assessing compaction,” above), indicated by:
 - altered soil structure or increased density relative to the surrounding soil,
 - puddling, and
 - compacted deposits of forest floor, fine slash, and woody debris overlaying and partially imbedded in, or crushed into, the mineral soil (compacted such that they cannot be readily excavated with a shovel).
- There is evidence of compaction across 100% of a 1 x 2 m rectangle. (If digging in the 1 x 2 m rectangle shows less than 100% compaction, the disturbance should not be called repeated machine traffic.)

Repeated machine traffic must be counted as soil disturbance on all sites except those with low compaction hazard. Where the compaction hazard has not been assessed, repeated machine traffic must be counted as soil disturbance.

3.4.3 Deep gouges (G)

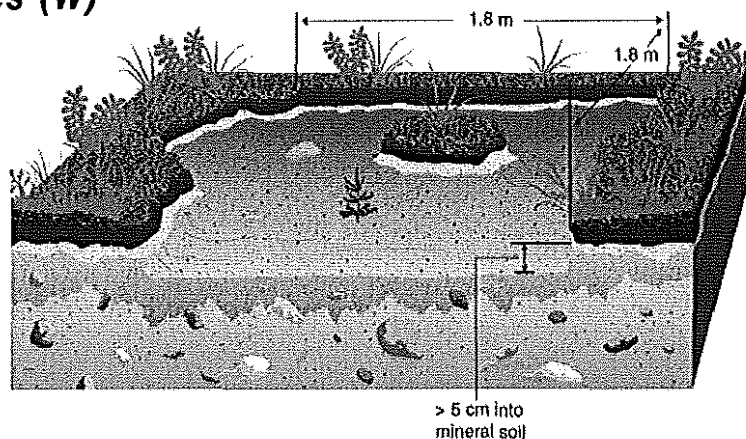


Deep gouges are excavations into mineral soil that are deeper than 30 cm or to bedrock at the survey point.

⇒ Measure from the undisturbed mineral soil surface to the mineral soil surface in the gouge.

Deep gouges must be counted as soil disturbance on all sites.

3.4.4 Wide gouges (W)

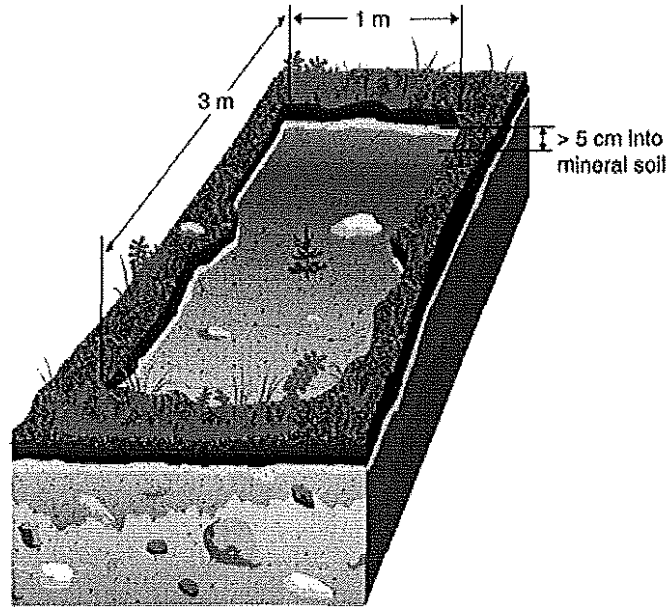


Wide gouges are excavations into mineral soil that are a) deeper than 5 cm at the survey point and b) deeper than 5 cm or to bedrock, on at least 80% of an area 1.8 x 1.8 m.

⇒ Measure the depth of the gouge from the undisturbed mineral soil surface to the mineral soil surface in the gouge.

Wide gouges must be counted as soil disturbance on all sites.

3.4.5 Long gouges (L)

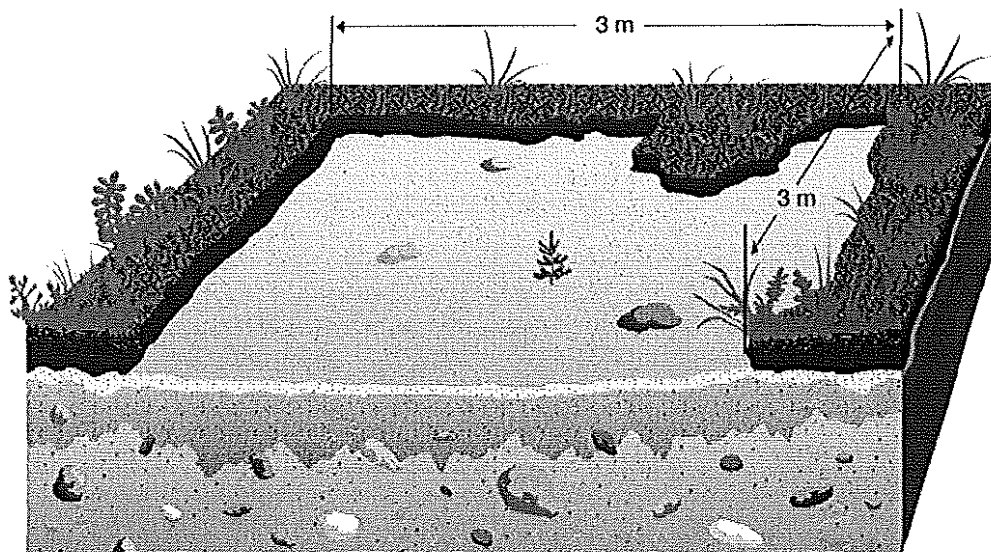


Long gouges are excavations into mineral soil that are a) deeper than 5 cm at the survey point and b) deeper than 5 cm or to bedrock on 100% of an area 1 x 3 m.

⇒ Measure the depth of the gouge from the undisturbed mineral soil surface to the mineral soil surface in the gouge.

Long gouges must be counted as soil disturbance on all sites.

3.4.6 Very wide scalps (V)



Very wide scalps are areas where the forest floor has been removed at the survey point and from over 80% of an area 3 x 3 m.

Forest floor is considered removed when the underlying mineral soil is exposed as a result of scalping, gouging, or burning, and the exposed mineral soil is covered by:

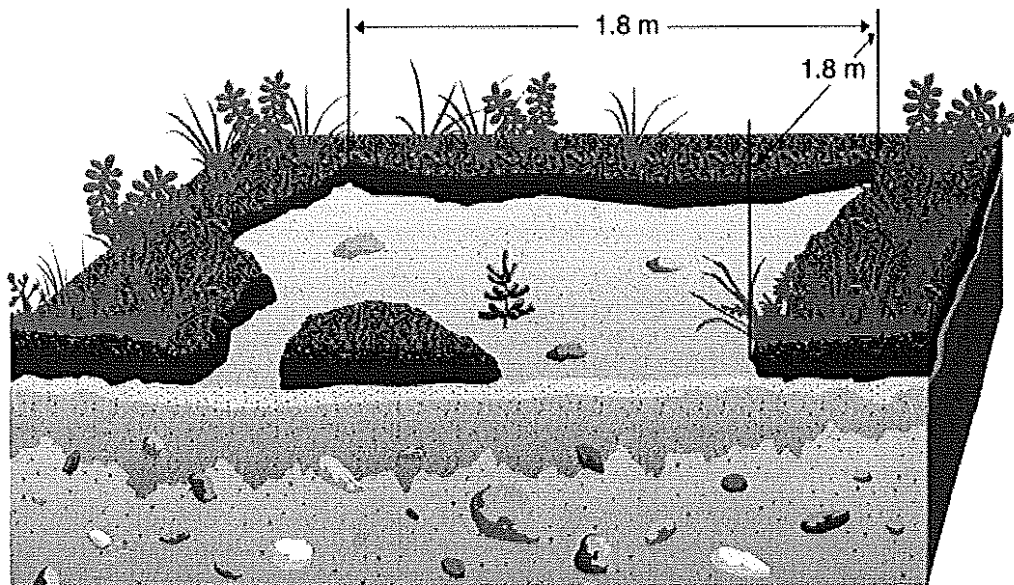
- fine woody slash, undecomposed needles, or dislodged rotten wood, or
- dislodged forest floor that is less than half the depth of the adjacent undisturbed forest floor.

Forest floor is not considered to be removed when it is:

- intact forest floor of any depth, typically showing roots growing into the mineral soil;
- mixed forest floor and mineral soil resulting from prescribed site preparation mixing treatments (mixed forest floor is a non-compact layer at least 5 cm thick at the surface, at least half composed of forest floor material); or
- exposed mineral soil covered by dislodged forest floor that is at least half the depth of the adjacent undisturbed forest floor (dislodged forest floor must be similar to the adjacent undisturbed forest floor to be acceptable).

Very wide scalps must be counted as soil disturbance on all sites.

3.4.7 Wide scalps (S)



Wide scalps are areas where the forest floor has been removed at the survey point and from over 80% of an area 1.8 x 1.8 m.

The same definition of forest floor removal applies here as is described above for very wide scalps.

Wide scalps must be counted as soil disturbance on sites with:

- very high soil displacement hazard,
- very high compaction hazard,
- very high soil erosion hazard,
- moderate or high likelihood of landslides, or
- where the hazards for soil compaction, soil displacement, or soil erosion have not been assessed.

3.4.8 Rehabilitation disturbance

Rehabilitation disturbance occurs when a temporary access structure or other type of soil disturbance is satisfactorily rehabilitated.

⇒ Record points that land on rehabilitation disturbance as not counted or undisturbed (“-”).

The acceptability of rehabilitation should not be assessed using the soil conservation surveys described in this manual, but should be evaluated based on completion of the treatments as required in the Timber Harvesting Practices Regulation or described in a soil rehabilitation plan. (Note that rehabilitation disturbance can be dealt with differently under woodlot licence areas, as described in the section on “Woodlot licence area requirements.”)

3.4.9 Prescribed fire impacts

Large areas where *prescribed fire* has completely consumed the forest floor should be treated like scalps. Prescribed fire impacts must be counted as soil disturbance if they meet the specifications described for very wide scalps or wide scalps.

3.4.10 Woodlot licence area requirements

Requirements and definitions related to soil conservation on areas under woodlot licences are provided in the Woodlot Licence Forest Management Regulation, which came into effect on November 30, 1998. Before this date, the requirements for woodlot licensees were the same as for major tenure holders. The following discusses some of the requirements of the new regulation.

The district manager can direct the woodlot licensee to conduct a survey to determine both the total area of the cutblock occupied by permanent access structures and the nature and extent of soil disturbance in the NAR.

For *woodlot licence areas*, a permanent access structure is any in-block road, landing, pit, or quarry not identified as requiring rehabilitation in an operational plan. Excavated or bladed trails, other logging trails, or similar structures may also be permanent access structures if identified as such in an operational plan. The maximum proportion of the total area within a cutblock that may be occupied by permanent access structures is the amount specified in an operational plan, or 7% if there is no amount specified.

Those structures not identified as permanent access structures and not rehabilitated contribute to the total area occupied by soil disturbance. The maximum proportion of any standards unit within the NAR that may be occupied by soil disturbance is the amount specified in the forest development plan or site plan, if an assessment of soil hazards has been carried out. If an operational plan for the area does not specify the maximum proportion of the NAR that may be occupied by soil disturbance, then the limit is 5%.

For areas covered by site plans, the maximum limit for soil disturbance must accommodate the area that will be occupied by all non-permanent access structures. (Note that the term “temporary access structure” is not used, nor defined in the Woodlot Licence Forest Management Regulation.) Even after these structures are rehabilitated, they may still be counted as soil disturbance if they meet any of the criteria for dispersed disturbance. For example, the surface of a rehabilitated temporary road that does not have any forest floor remaining could be categorized as a scalp and therefore count as soil disturbance. (This would not count on an area covered by a prescription held by a major licensee or a timber sale licensee.)

For areas covered by silviculture prescriptions approved before the Woodlot Licence Forest Management Regulation came into effect, access structures identified as requiring rehabilitation do not count as soil disturbance if they are satisfactorily rehabilitated.

For an area under a stand management prescription that calls for mechanized ground-based stand tending treatments using heavy machinery, the maximum proportion of the area to be treated that may be occupied by soil disturbance is the amount specified in the prescription—or 5% if no amount is specified.

4 Survey methods

4.1 Information needed from the approved plan

- ⇒ The purpose of a soil conservation survey is to determine whether the standards in the approved plan (silviculture prescription, stand management prescription, or site plan) have been adhered to. Check the approved plan to determine the following²:
- the date the plan was approved and, in some cases, when it was submitted for approval.
 - Note that if the prescription was submitted before June 15, 1998 but approved after this date, it must adhere to the rules in place prior to the June 15, 1998 legislation and regulation amendments;
 - which access structures are permanent, and the approved maximum allowable limits for these structures;
 - Although not a requirement, worksheets used for calculating road occupancy from road layout and design standards may sometimes accompany the prescription. These worksheets can be useful for comparing proposed and constructed dimensions;
 - which access structures are temporary, by how much maximum soil disturbance limits can be temporarily exceeded to construct temporary access structures, and, if required, *the maximum allowable limits for temporary access structures*;
 - which excavated or bladed trails and other temporary access structures have to be rehabilitated, the maximum time to complete rehabilitation following the completion of harvesting, and, if required, *the methods for rehabilitation*;
 - whether fill slopes are considered favourable or unfavourable growing media (this information is optional for prescriptions, but is useful to know when measuring haul roads and unrehabilitated excavated or bladed trails);
 - whether fill slopes adjacent to permanent roads will not be reforested to improve visibility or to facilitate snow removal;
 - what maximum allowable level of soil disturbance has been approved for each standards unit;
 - *what maximum allowable level of forest floor displacement has been approved for each standards unit (if required)*;

² Note that the information in italics is no longer a requirement for prescriptions submitted and approved on or after June 15, 1998.

- whether roadside work areas may be surveyed separately from adjacent portions of a cutblock;
- the minimum area to which maximum soil disturbance limits should be applied (see section on “Survey methods for soil disturbance—Site stratification”); and
- the hazards assessed for soil compaction, soil erosion, soil displacement, and, if required, *forest floor displacement and mass wasting (Interior sites)*, as well as the likelihood of landslides if a terrain assessment has been carried out (this information is used to determine which soil disturbance categories to count in each standards unit).

Information from the silviculture prescription, stand management prescription, or site plan can be recorded on a Soil Disturbance Summary form (FS 889 in Appendix 6) for reference when assessing soil impacts.

4.2 Visual inspection

A visual inspection is the first level of assessment and can be as simple as a walk-through of the area. It is recommended that the method of inspection and any findings are documented. The back of the Soil Disturbance Summary form (FS 889 in Appendix 6) can be used to make notes and map any areas requiring a further ground check (e.g., such areas as unauthorized temporary access structures or heavily disturbed roadside work areas).

During the visual inspection:

- Verify the location of permanent and temporary access structures, and check whether road widths and landing sizes appear to be excessive or not.
- Look at temporary access structures to determine whether the required rehabilitation has been completed.
- Classify several points within each of the disturbance types present in the NAR (this may involve digging with a shovel to assess compaction and measuring the dimensions of the disturbance).
- Compare the observed disturbance types with the soil disturbance categories that will count on that block.
- Determine whether the disturbance types (see Appendix 7) and levels observed are allowed under the approved plan.
- Identify areas that appear to have excessive disturbance.
- Decide whether a transect survey is warranted.
 - If after an initial visual assessment it appears that disturbance levels may be high, a quick informal survey using a “pacing” method can be useful in

getting a rough estimate of disturbance levels. This “ballpark” estimate may help when deciding whether or not a formal survey is warranted.

- Determine whether a survey should be done for an entire standards unit or a stratified portion of a standards unit (see section on “Survey methods for soil disturbance—Site stratification”).

5 Survey methods for access structures

A road traverse survey or landing survey should be conducted if road widths or landing sizes appear larger than normally required for similar operations and if they are not consistent with road layout and design standards. If structures not identified in an approved plan already exist, they should be treated as an operational plan violation.

5.1 Road traverse survey

Application

- ⇒ Use the following method for measuring the length and width of haul roads and permanent skid trails (i.e., excavated, bladed, or unbladed structures that will be kept free of trees to facilitate repeated stand entries).

Layout

Figure 2 shows layout details of the road traverse survey.

- ⇒ Hip-chain the length and measure the width at fixed intervals (see “Width measurement interval,” below).
- ⇒ Make the first width measurement at one half of the width measurement interval distance from the point of commencement (POC).
- ⇒ Measure the length and width in horizontal distance.
- ⇒ Do not measure the road width on landings.
- ⇒ At junctions or switchbacks, move the width measurement location in 5-m increments in the direction of travel, until you are back on the regular portion of the road. The distance to the next width measurement will be your normal width measurement interval, less the distance you offset.
- ⇒ Conduct a separate survey for each different type of structure (such as permanent skid trails or haul roads) that differ in width by more than 3 m (e.g., a narrow spur road and a wide haul road). See Figure 3.

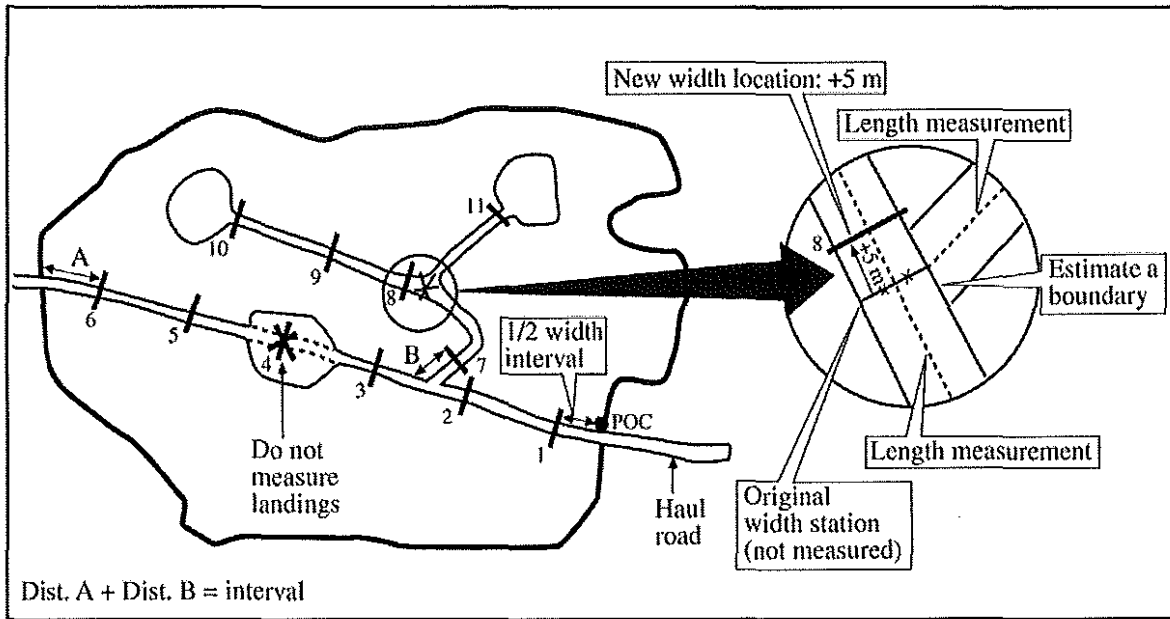


Figure 2. Layout for road traverse survey. Measure the width at approximately 10 locations.

5.1.1 Width measurement interval

The target number of width measurements is 10. Figure 3 shows a typical cutblock, with 10 width measurements for a main haul road and 10 for a spur road.

⇒ Determine the width measurement interval by estimating the total length of road, excluding landings, and dividing by 10.

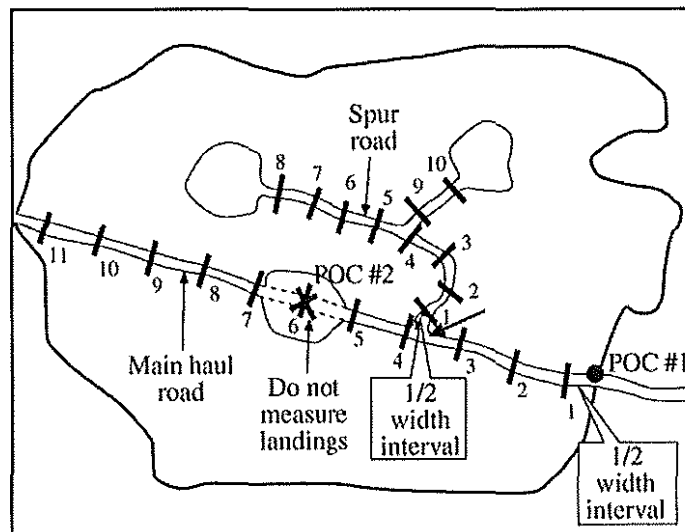


Figure 3. Separate surveys for roads with different widths. Do separate surveys, with approximately 10 width measurements, for roads that differ by more than 3 m in average width.

5.1.2 Width measurement

On sloping ground, the width measured depends on whether the fill slopes are considered favourable or unfavourable for growing trees (see Figure 4) and whether the fill slope will be kept free of trees. Surveyors should review the prescription to determine whether this information has been provided. In most cases information on fill slope material is not specified, and it will be up to surveyors to assess whether material is favourable or unfavourable, in the field. Surveyors should consult with silviculture staff before making this assessment, especially if they are not familiar with local conditions. Detailed descriptions of unfavourable growing media are provided in the *Soil Conservation Guidebook*, and further information may be contained in local or regional guidelines.

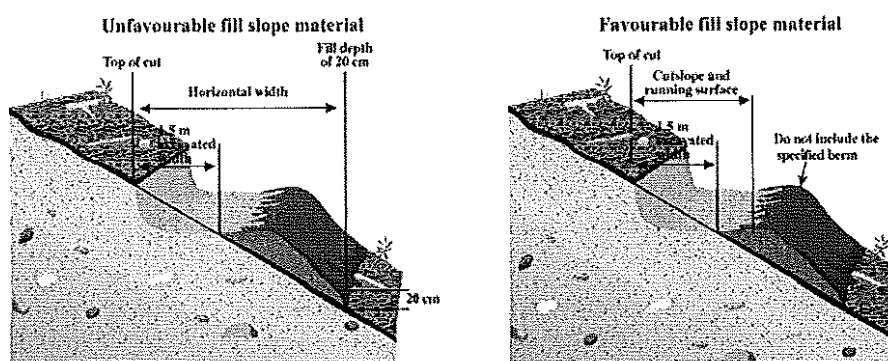


Figure 4. Measuring road widths on sloping ground. Include unfavourable fills greater than 20 cm deep as part of the access structure. For favourable fills, measure only the excavated portion and the compacted running surface.

- ⇒ If fill slopes are unfavourable for tree growth, measure the width to the top of the cut from a point where the sidecast is consistently greater than 20 cm deep. Do not count as sidecast any accumulations of slash that are clean woody debris (i.e., containing less than 30% mineral soil). Ignore isolated patches of sidecast deeper than 20 cm that are not a contiguous part of the road fill. Road fill with buried stumps or slash is always considered unfavourable.
- ⇒ If fill slopes are favourable for tree growth, measure the width of the road or trail from the top of the cut to the outside edge of the running surface. Do not include the uncompacted berm and fill slope.

Road edges that will be kept free of trees (to provide adequate visibility, ensure safety standards or facilitate snow removal) should be included as part of the road area.

- ⇒ On level ground, measure the width in horizontal distance (see Figure 5), including:

- the running surface plus any ditches to the outside edge of each ditch line;
- berms that are made of unfavourable soil material that are greater than 20 cm deep; and
- the area to be kept free of trees for visibility, snow removal, etc.

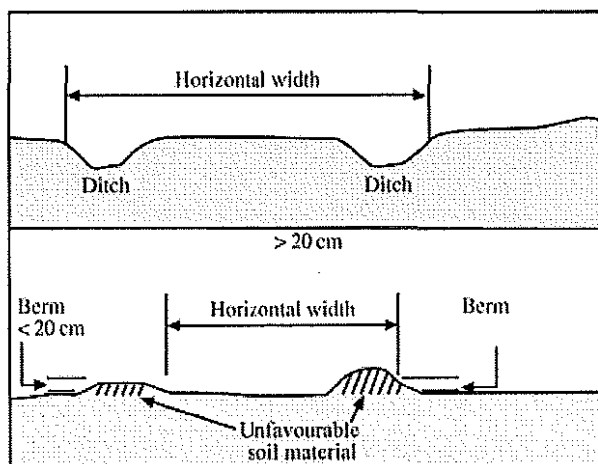


Figure 5. Measuring road widths on level ground. Measure to the outside of the ditches (if present). Otherwise, include berms of unfavourable fill if they are greater than 20 cm deep.

Calculations

- ⇒ Record the measurements on the Traverse Survey Field Card (FS 880; see Appendix 6), and then use the Traverse Survey Calculation Card (FS 881; see Appendix 6) to do the calculations:
1. Complete separate calculations for each type of structure, such as spur roads, main roads, and permanent skid trails. Record the measurements for each type of structure on the front or back of the FS 880 card.
 2. For each type of structure, calculate the total length in horizontal distance.
 3. For each type of haul road, measure the length of road that passes through landings and record this under comments on the FS 880 card.
 4. For each type of structure, calculate the mean and standard deviation for width from the data on the FS 880 card.
 5. For each type of structure, enter on the FS 881 card the number of width measurements, its length³ and mean width, and the standard

³ Use the total length if, when you are calculating the landing area, you exclude the area of the roads that cross through it. Otherwise, subtract the length of road on landings from the total length, but include the areas of road that pass through landings in the landing area measurement.

deviation of width. If you need an estimate of landing area minus its road area, enter the road length on landings in a separate column so that the area of roads on landings can be calculated.

6. Follow the calculation procedure on the bottom of the FS 881 card to determine the area disturbed and its lower confidence limit. When calculating the percentage of area occupied by roads and other permanent access structures, use the total (gross) cutblock area after harvesting has been completed, taking into account any deletions or additions.
7. Use the percentage area error calculated on the FS 881 card (and on the Landing Area Calculation Card FS 886, described below) to calculate the lower confidence limit for the proportion of the cutblock occupied by permanent access structures. Follow the calculation procedures on the bottom of the Soil Disturbance Summary Card (FS 889, see Appendix 6).

5.2 Landing survey

Application

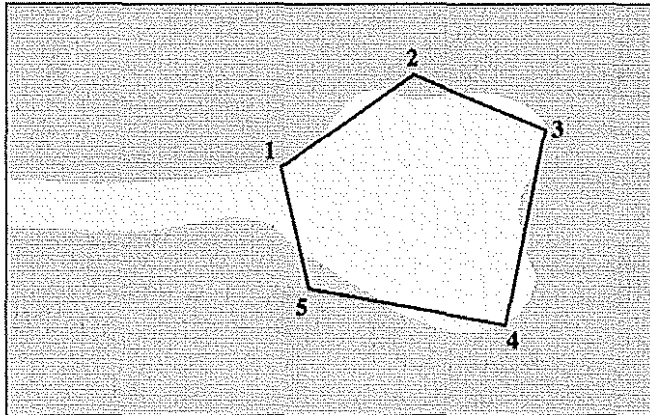
- ⇒ Use the following procedures and methods for determining the area of landings, pits, quarries, and turnouts.

Layout

- ⇒ Avoid surveying landings before disposal of the debris pile. If a survey must be conducted before routine debris disposal, and the edge of the constructed landing cannot be readily determined, measure to the outer edge of the debris pile.
- ⇒ Piles that have been burned, with ash remaining, must be assessed according to the soil conditions under the ash pile. If the pile was burned on the landing running surface or unfavourable sidecast, count it as part of the landing. Otherwise, count the burned portion as part of the NAR.
- ⇒ Measure landing areas depending on whether fill slopes are considered favourable or unfavourable for tree growth (the same as for haul roads):
 - If fill slopes are unfavourable, measure to the top of the cut from the point where the sidecast is consistently greater than 20 cm deep.
 - If fill slopes are favourable, measure from the top of the cut to the outside edge of the landing surface.

- ⇒ On level ground, include the compacted running surface, berms of unfavourable soil deeper than 20 cm, and associated ditches.
- ⇒ Measure landings using a hip chain traverse of the perimeter (the preferred method) or the representative length and width measurements, as described below.

5.2.1 Hip chain traverse



Complete a hip chain traverse to obtain a closure error of 10% or less. For most landings, four to eight stations will provide sufficient accuracy.

If landings are measured using a closed traverse, record the net landing areas directly on the FS 886 form.

5.2.2 Representative length and width measurements

- ⇒ Hip chain representative width and length measurements. Estimate one-quarter and three-quarters of the total distance on the centreline of each dimension (see Figure 6), and record the information on the Landing Area Calculation Card (FS 886; see Appendix 6).
- ⇒ Follow the calculation procedures on the Landing Area Calculation Card (FS 886). To calculate landing area without the area of roads that cross landings, follow these steps:
 1. Determine the length of roads on landings from the road traverse.
 2. Determine the area of roads on landings:

$$\text{area of roads on landings} = \text{length of roads on landings} \times \text{average road width from the FS 881 card}$$
 3. Subtract the area of roads on landings from the total landing area before calculating the lower confidence limit for landings.
 4. Use the percentage area errors from the FS 886 card for landings and the FS 881 card for roads to calculate the lower confidence limit for the proportion of the cutblock occupied by permanent access structures. Follow the calculation procedures on the bottom of the FS 889 summary card.

To be in compliance, the lower confidence limit for the proportion of the cutblock occupied by all permanent access structures must be less than the maximum allowable limit specified in the prescription.

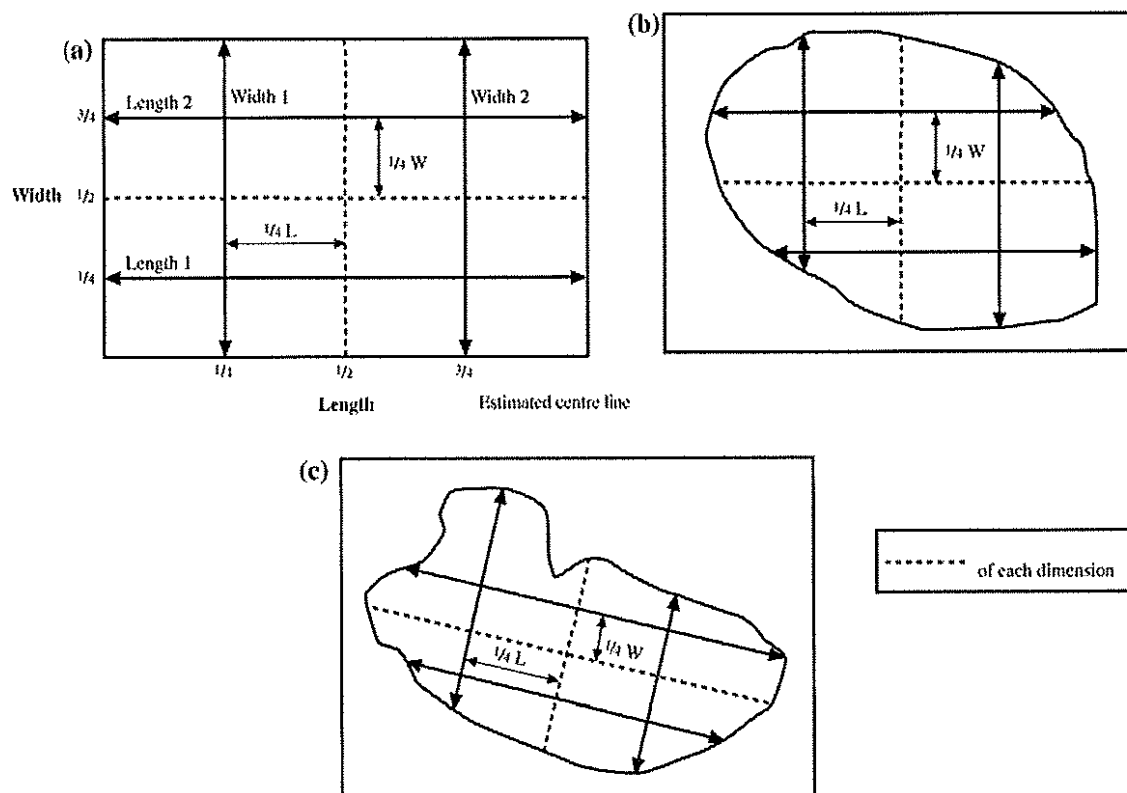


Figure 6. Idealized layouts for landing surveys. It can be (a) a rectangular landing, (b) an elliptical landing, or (c) a complex landing shape. Measurements are taken at points that approximate one-quarter and three-quarters of the length and width of each landing.

6 Survey methods for soil disturbance

Soil disturbance within the NAR includes such harvesting and site preparation disturbances as unrehabilitated excavated or bladed trails, compacted areas, corduroyed trails, dispersed trails (from repeated machine traffic and wheel or track ruts), and gouges and scalps as defined in the Operational Planning Regulation.

The average levels of soil disturbance in the survey area are determined by transect surveys. Transect surveys must be completed as soon as possible after the disturbance was created to avoid confusion caused by the re-establishment of minor vegetation.

Before doing a transect survey, the surveyor should walk the area to become familiar with the various soil disturbances, to confirm the planned orientation of the transects, and to compare disturbance assessments with co-workers.

Transect surveys are also used for assessing compliance with forest floor displacement limits, where such limits are required.

6.1 Site stratification

The objective of stratifying the NAR is to focus a survey on relatively homogeneous areas of soil disturbance that appear to exceed the limits in the prescription or site plan. The intent is not to focus a survey on areas where concentrated disturbance is anticipated (e.g., where trails converge at landings).

Stratification of a standards unit can only be done for either of the following two situations: a) the prescription clearly specifies that the soil disturbance limit applies to a certain size area within the standards unit (e.g., stratification down to one hectare would be appropriate if the prescription specified that the maximum soil disturbance limit of 10% applied to any given hectare of SU "B"),⁴ or b) a survey is required on a roadside work area (described below), in which case it is necessary to have a separate stratum from the adjacent NAR, to assess compliance with the maximum soil disturbance limit of 25% that is set in regulation.

Where stratification of a standards unit is not permitted, surveying should be carried out only on the whole standards unit if it appears that the average level of soil disturbance over the entire unit exceeds the limit.

⁴ The previous edition of the guidebook stated that any standards unit could be stratified down to a minimum of 1 ha and assessed for compliance with maximum soil disturbance limits.

6.1.1 *Criteria for stratified areas*

For areas where stratification is permitted the following criteria should be followed:

- ⇒ The minimum strata size cannot be less than the area to which the limit applies as specified in the prescription, and should not be less than 1 ha (the minimum recommended area for surveying).
- ⇒ Use the same disturbance categories as you would use in surveying the entire standards unit.
- ⇒ Ensure that soil disturbance within each stratum is relatively uniform.
- ⇒ Do not create strata only to encompass small areas where there is an unavoidable concentration of soil disturbance, such as areas immediately adjacent to landings where numerous trails may be converging, and areas surrounding major trail junctions, or surrounding individual skid trails. Note, however, that these areas can be included as part of a larger stratum.

6.1.2 *Surveying roadside work areas*

Roadside work areas are those sites located adjacent to haul roads and used during roadside harvesting operations for decking, loading, processing, and debris disposal. These areas can be subject to concentrated and high levels of soil disturbance. The maximum soil disturbance limit for roadside work areas is 25%, as required in the Timber Harvesting Practices Regulation.⁵ Prescriptions may identify these areas as separate standards units from adjacent portions of the NAR, which will normally have much lower maximum limits for soil disturbance. If these roadside work areas are not identified as separate standards units, they should be considered as a separate stratum for survey purposes.

6.2 *Classifying soil disturbance*

- ⇒ Measure soil disturbance in the NAR with transect surveys, classifying survey points at fixed distances along transect lines. Classify survey points according to the soil conditions observed at the point and in the area around the point.
- ⇒ Always use the flow chart in Appendix 2 to ensure that soil disturbance is counted appropriately.

⁵ Before June 15, 1998, roadside work areas had to be in compliance with maximum soil disturbance limits specified for the standards unit of which they were a part. As of June 15, 1998, roadside work area need only comply with the 25% limit established in the Timber Harvesting Practices Regulation, despite any limit that may be specified in a prescription.

6.2.1 *Assessing the survey point*

At each survey point along a transect line, determine whether soil disturbance exists in accordance with definitions that apply to the prescription for the area. The point observations in these surveys do not involve a fixed plot size.

To classify a survey point, first determine the type of disturbance directly below the point. For example, if the point falls on a small patch of undisturbed forest floor in the middle of a heavily disturbed area, classify the point as undisturbed (field symbol “–”).

6.2.2 *Assessing the area around the survey point*

Most types of disturbance involve size criteria, where the extent of disturbance around the point must also be assessed. For example, a wide gouge (field symbol “W”) must be gouged greater than 5 cm into mineral soil (or to bedrock) on at least 80% of a 1.8 x 1.8 m square.

The extent and type of disturbance in the area around the point is a secondary attribute that is also required to classify the point. For example, if the point is gouged deeper than 5 cm, but the area around the point is only scalped less than 5 cm deep, then the point could not be classified as a wide gouge (W). It may be classified as a wide scalp (field symbol “S”), which may or may not count depending on the assessed soil hazards.

⇒ Think of the area around the point as a sampling window. The sampling window:

- must include the survey point, but need not be centred around it (Figure 7);
- can be oriented in any direction;
- must be oriented to maximize the amount of disturbed area included within the window (Figure 7);
- must be of the size and shape of the disturbance being assessed; and
- can overlap with the sampling windows of adjacent points (Figure 8).

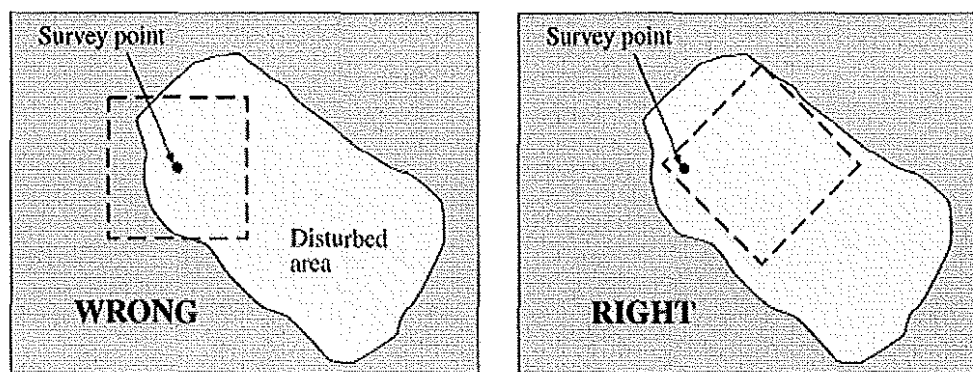


Figure 7. Sampling window orientation. Orient the sampling window to include the maximum amount of disturbed area. The survey window need not be centred around the survey point.

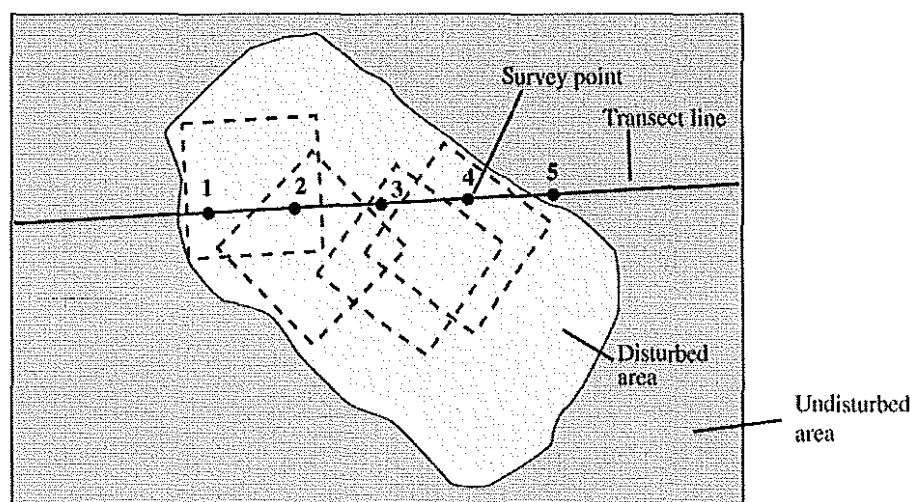


Figure 8. Sampling windows can overlap.

For soil disturbance to be classified within some gouging and scalping categories, a percentage (usually 80%) of an area must be disturbed to a certain level or depth. The percentage is set lower than 100% to account for the natural variation that occurs with some disturbances (e.g., small patches of forest floor that remain in a scalp).

Window dimensions are specified as a percentage of a square or rectangle. In practice, this means that the dimensions of the disturbance can be smaller if the area is 100% disturbed.

Figure 9 shows typical patterns of disturbance and the equivalent dimensions of smaller squares for two common window sizes (1.8 x 1.8 m for a wide scalp or wide gouge and 3.0 x 3.0 m for a very wide scalp).

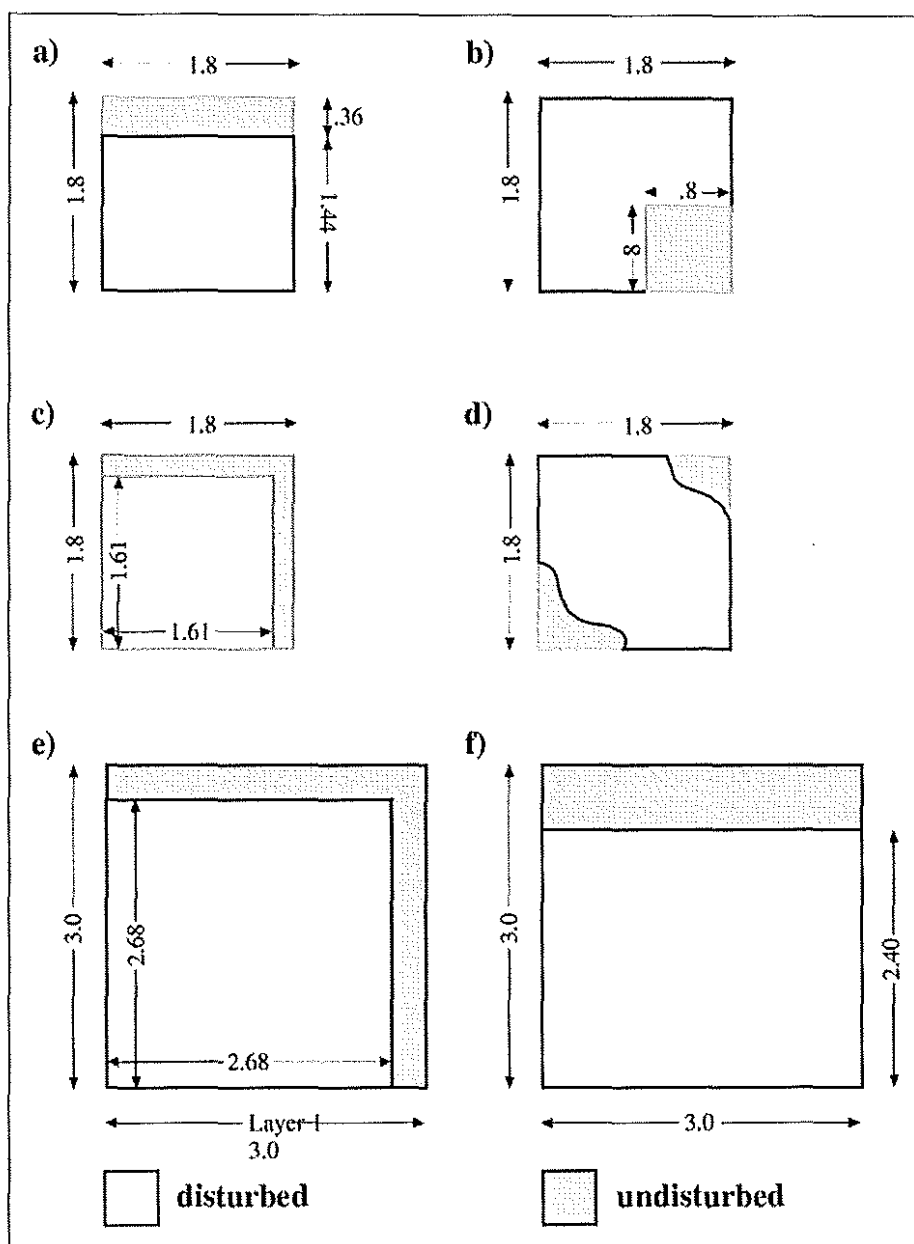


Figure 9. Equivalent sampling window sizes. Typical configurations for disturbance occupying 80% of a 1.8 x 1.8 m sampling window are shown in (a), (b), (c), and (d). Examples of disturbance occupying 80% of a 3.0 x 3.0 m sampling window are shown in (e) and (f).

7 Transect method for areas 10 hectares and smaller

For small areas typically 10 ha or less, the surveyor must establish a series of parallel transects within the survey area, with survey points assessed at defined intervals along each transect. Transects should be laid out to cover the area evenly with approximately 500 points. Two steps are then involved:

- A preliminary survey, using one-half the planned number of transects, must be completed and preliminary calculations made.
- If the preliminary survey results warrant it, the remaining transects must be sampled.

7.1 Preparation

⇒ Follow the steps below:

1. Walk through the survey area to determine the main orientation of soil disturbance, if any. See Figure 10.
2. Decide on a transect orientation that will cross the major disturbance at right angles. If the disturbance has no major orientation, locate transects in a convenient direction.
3. Record the transect bearing on the Transect Survey Field Card (FS 885; see example in Appendix 6).
4. Using Table 3, determine the transect and point spacing for the size of the survey area. Transect and point spacings are shown for areas up to 20 ha in size. It may be cost-effective to use this method for areas up to 20 ha if they have gentle terrain and a limited slash loading.
5. Determine the starting distance for the first transect from the point of commencement (POC) by picking a random number from Appendix 3.

To select a random number, first choose a row from 1 to 40 and a column from 1 to 12. The number in the table at the intersection of the chosen row and column is the one to use as a random percentage. (If a number larger than 100 is selected, use the last two digits.) Multiply the selected random percentage by the transect spacing from Table 3 to determine the distance from the POC to the first transect.

Table 3. Transect and point spacings for small area surveys. Survey points established at these spacings will achieve a sample size of 500.

Area (ha)	Transect spacing (m)	Point spacing within transects (m)
1.0	5	4
1.5	6	5
2.0	8	5
2.5	10	5
3.0	12	5
4.0	16	5
5.0	20	5
6.0	24	5
7.0	28	5
8.0	32	5
9.0	36	5
10.0	40	5
11.0	44	5
12.0	48	5
13.0	43	6
14.0	46	6
15.0	50	6
16.0	45	7
17.0	48	7
18.0	51	7
19.0	54	7
20.0	57	7

7.2 Field survey layout

⇒ Follow the steps below:

1. Establish and label the point of commencement (POC) (see Appendix 5 for marking conventions).
2. Lay out a baseline perpendicular to the transect orientation and flag the location of each transect. Try to locate the baseline in the middle of the area you are surveying so that you have a reference point to help you accurately locate transects.
3. For the first transect, proceed along the baseline using the distance calculated in step 5 of the "Preparation" section. Figure 10 shows a typical layout for this small area method.
4. Sketch a map of the survey strata on the back of the Soil Disturbance Summary Card (FS 889; see Appendix 6). This will help you keep track of your progress and record the survey coverage.

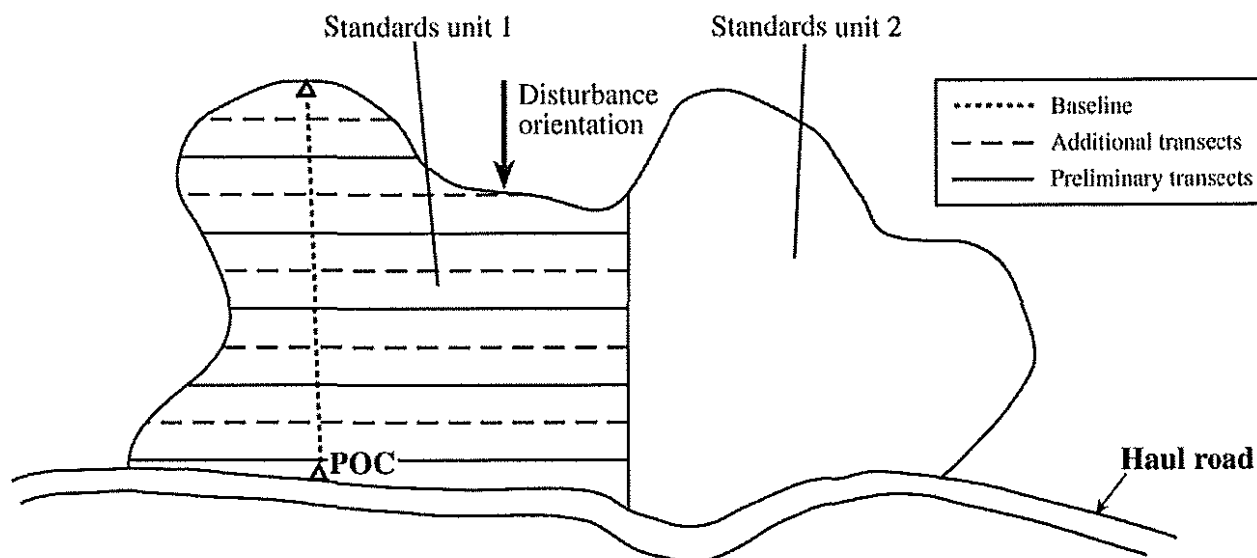


Figure 10. Typical transect survey layout for small areas (<10 ha). The layout shows the transect lines crossing the skidding disturbance. The solid transects are measured first; the dotted transects are added if necessary.

5. Chain along the transects in slope distance. Transects must be chained to ensure that sample points are located without bias. Various methods may be used as long as the points are determined objectively.

The recommended method is for two people to chain 100-m segments and then make point observations while walking towards each other. A hip chain is not acceptable here, as it is difficult to locate sample points objectively when walking over or around obstacles.

On uneven terrain, keep the chain near the ground (within 1 m) by hooking it under slash or running shorter distances. Leave flagging to mark the start and end of each transect segment (e.g., each 100-m section) you survey (see Appendix 5 for field marking conventions). Do not move the chain until those measurements are complete.

7.3 Observations along the transect

- ⇒ Tie or stake the chain taut and classify the soil disturbance directly below every survey point on the chain, using the spacing determined from Table 3. Record results on the Transect Survey Field Card (FS 885) using the symbols from Tables 1 and 2.
- ⇒ Measure to the edge of the survey area. Do not sample the zero point and do not count points that fall outside the survey area (e.g., permanent access structures, mapped non-productive areas).

7.4 Locating subsequent transects

- ⇒ At the end of a transect, move over the equivalent of two times the transect spacing. If you wish, mark the additional locations of the transect end points that could be completed in a full survey. Start the next transect.

7.5 Field calculation procedure

- ⇒ Use the Small Area Transect Survey Calculation Card (FS 897) to summarize the results from your preliminary survey. A completed example of this form is shown in Appendix 6.
1. Add up the number of points classified as counted soil disturbance and the total number of surveyed points. Enter these values in the "Preliminary Survey" column of form FS 897.
 2. Calculate the preliminary percentages for counted disturbance by dividing the total for each by the total number of surveyed points.
 3. For counted disturbance, obtain the confidence interval (CI) from the table on the back of the calculation card.
"Sample size" on the card means the total number of survey points. The column head "%" means the percentage counted disturbance from step 2.
 4. Calculate the upper and lower confidence limits for the preliminary counted disturbance. To do this, add and subtract the confidence interval to the percentage disturbed and to the percentage displaced.
 5. Using the upper and lower confidence limits as shown in Table 4, determine whether further surveying is necessary.

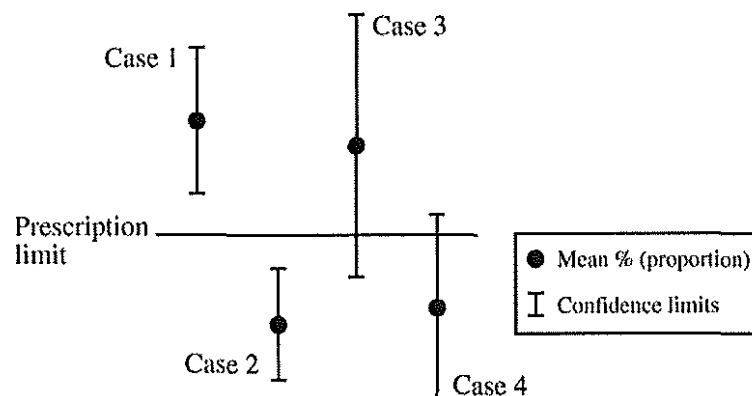


Table 4. Decision rules for comparing survey results to prescription limits

Case	Preliminary percentage	Confidence limit (CL)	Decision
1	Above	Lower CL is above the prescription maximum	Stop surveying
2	Below	Upper CL is below the prescription maximum	Stop surveying
3	Above	Lower CL is below the prescription maximum	Survey remaining transects
4	Below	Upper CL is above the prescription maximum	Survey remaining transects

7.6 Finalizing the survey

⇒ Follow the steps below:

1. If necessary, survey the remaining transects.
2. Subtotal the counted disturbance and then total number of points for the additional transects and record these numbers in the appropriate column.
3. Add these subtotals to the previous subtotals for the preliminary survey above to determine the final survey totals. Enter these survey totals on the FS 897 form in the top "Final Survey" box.
4. Calculate the final percentages for disturbance, as done in step 2 of the preliminary survey.
5. For counted disturbance, obtain the confidence interval (CI) from the table on the back of the calculation card.
6. Calculate the final upper and lower confidence limits for counted soil disturbance.
7. Calculate the non-compliance percentages for disturbance by subtracting lower confidence limits from the limits stated in the silviculture prescription.
8. If the final percentage disturbed and the lower confidence limit (cases 3 and 4) are still on opposite sides of the prescription limit, consider the area to be in compliance.

8 Transect method for areas larger than 10 hectares

For large areas, typically greater than 10 ha, the surveyor must systematically locate a number of grid centres within the area to be surveyed. To do this, points must be assessed at 1-m intervals along two 30-m transects radiating out from each grid centre. The number of grid centres depends on the size of the area to be surveyed. For areas up to 50 ha, a minimum of 30 grid centres is required. For areas larger than 50 ha, one grid centre for each additional 5 ha must be added. (These are recommended as the minimum number of grid centres.) Refer to Figure 11 for layout.

For a more precise estimate of the soil disturbance, it may be necessary to increase the number of grid centres. It is possible to calculate confidence limits for this survey, but they are wider than those obtained using the small area method. Whenever possible, the small area method should be used. In the case of large standards units, all parties (i.e., Forest Service district staff and license holders for the area in question) may wish to consider agreeing on a representative area that could then be surveyed more efficiently using the small area method.

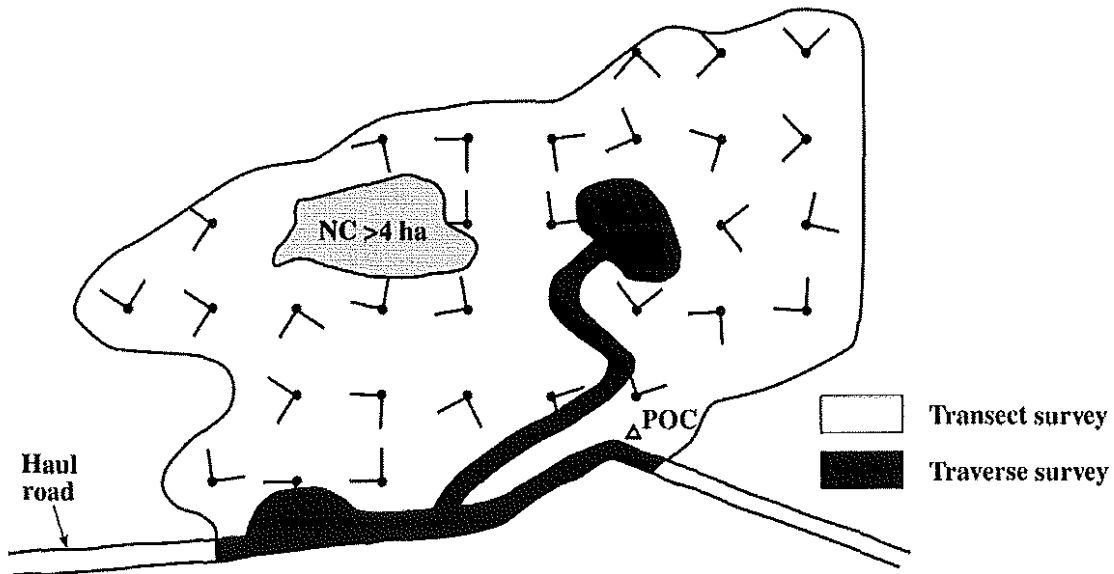


Figure 11. Transect survey layout for large areas (>10 ha). Establish regularly spaced grid centres on cardinal bearings from a random start. As also shown here, survey points are not established in areas of non-commercial cover greater than 4 ha or permanent access structures. Permanent access structures should be surveyed using the road traverse and landing survey methods.

8.1 Grid centres and grid layout

1. The first grid centre is located along a random bearing from the POC (selected from the table in Appendix 3). If the random bearing leads outside the survey area, add increments of 90° to the bearing until it leads into it. (See Appendix 4 for grid spacings to cover areas of various sizes.) Locate the first grid centre at one-half the grid spacing distance from the POC.
2. Flag each grid centre. Number the grid centres with unique numbers for each surveyor (e.g., 1, 2, 3... and 101, 102, 103...).
3. Use cardinal bearings (north, south, east, or west) to locate the remaining grid centres. Chain between grid centres in slope distance. Fill the entire survey area. This may require more or less than the target number of grid centres. The Transect Survey Field Card (FS 885) provides a space for recording the 45° offset spacing that allows diagonal shortcuts between grid centres on adjacent lines.

8.2 Transects and points

1. Fill in the random POC bearing on the Transect Survey Field Card (FS 885).
2. At each grid centre, choose a random bearing (from the table in Appendix 3) for the first transect, and add 90° for the second transect. If a grid centre falls outside the NAR, do not sample any transect points at that grid centre.
3. Mark the start and end of each transect exactly at the 0-m and 30-m marks with blue flags. If large changes in elevation occur, anchor the transect tape. Do not move the survey chain once it is set in place.
4. Record soil disturbance at the point directly below each metre mark. Fill in data on the Transect Survey Field Card, using the symbols from Tables 1 and 2.

As shown in Figure 12, do not sample portions of transects that are outside the NAR. Do not survey points on permanent access structures, outside the cutblock boundary or survey area, or within non-commercial cover greater than 4 ha. Do not sample points that land outside the NAR (e.g., if 12 m of a transect falls on a haul road, measure only the remaining 18 of the transect's 30 points; do not measure any of the points on the road). Mark each non-surveyed point with an X on the Transect Survey Field Card.

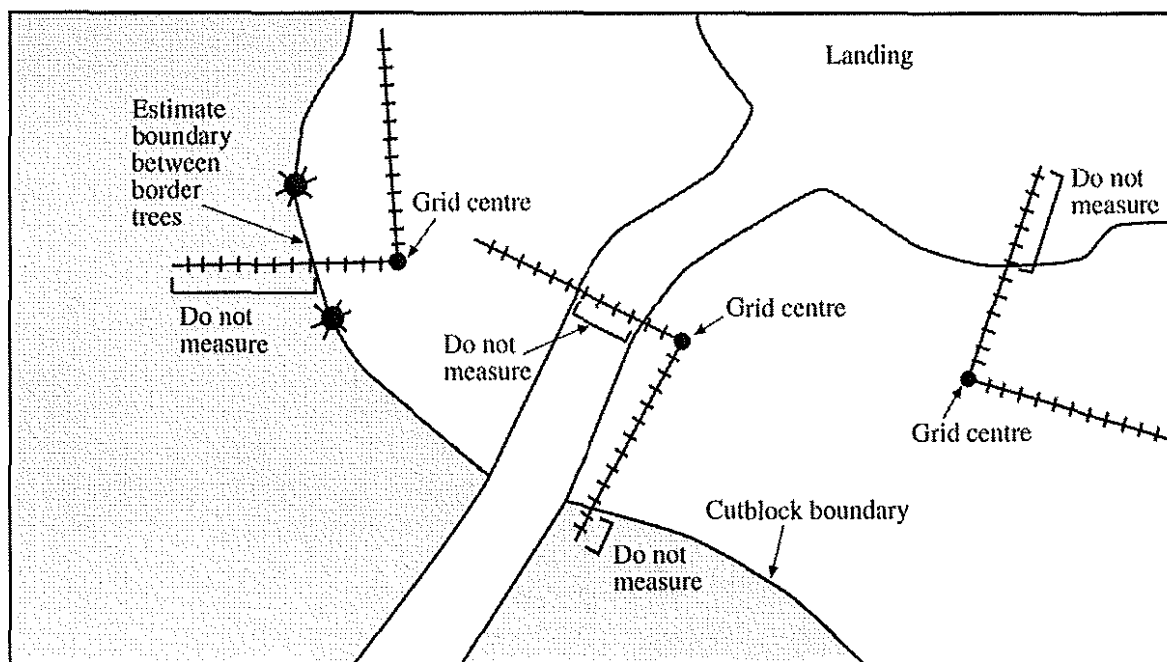


Figure 12. Omit points outside the net area to be reforested (NAR). Do not measure transect points outside the cutblock or on permanent access structures.

8.3 Calculations

1. Transfer the data for each grid centre from the FS 885 form to the Transect Survey Tally Card (FS 896). This optional form helps verify grid centre totals before the calculations are done.
2. Calculate statistics using either a spreadsheet or the Transect Survey Calculation Card (FS 895). The Ministry strongly recommends that a spreadsheet be used. (For more information on spreadsheet programs, contact the Forest Practices Branch in Victoria.)
3. Copy the lower confidence limit data from the bottom of form FS 895 to the Soil Disturbance Summary Card (FS 889) if the calculations were completed without the spreadsheet.
4. See Figure 13 for a flow chart of the tally and calculation procedure.

To be in compliance, the lower confidence limit for the proportion of counted disturbance must be less than the maximum allowable soil disturbance limit.

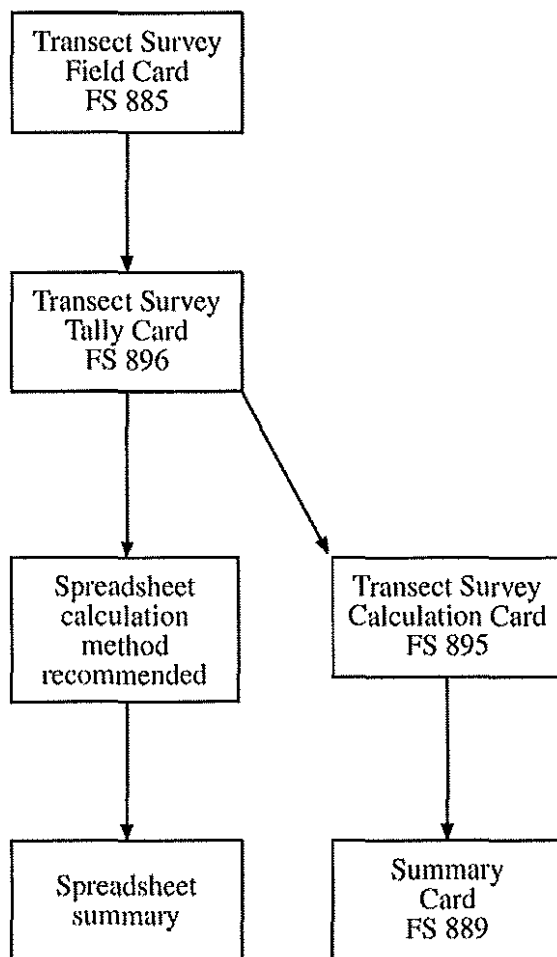


Figure 13. Flow chart for forms recording large area transect surveys.

9 Site summary

9.1 Mapping

The site and survey data on the front of the Soil Disturbance Summary Card (FS 889; see Appendix 6) should be filled out if calculations are performed manually; however, it is not necessary if the survey results are calculated using the spreadsheet method.

A site map should accompany any spreadsheet summary or card summary. The back of the FS 889 summary card can be used for mapping or else a separate map could be prepared.

The requirements for site mapping follow.

- ⇒ Use maps of a suitable scale (e.g., 1:5000 or 1:10 000).
- ⇒ Indicate the map scale and north arrow.
- ⇒ Mark the transects and point spacing or the grid bearing and grid spacing.
- ⇒ Number the transects or the grid centres, landings, and haul roads in the same way they were numbered on the field forms.
- ⇒ Clearly mark the boundaries of treatment units or standards units (if relevant).

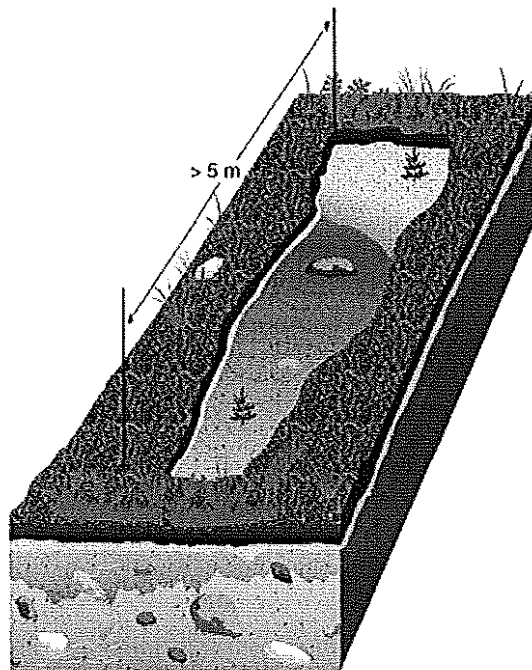
Appendix 1. Requirements and definitions for prescriptions approved under the Forest Practices Code 1995 Operational Planning Regulation (B.C. Reg. 174/95) (December 16, 1995–June 14, 1998)

The requirements and definitions of the 1995 regulation are the same as in the current 1998 Operational Planning Regulation, with the exceptions listed below.

1. Requirements for prescriptions approved under this regulation specified:
 - the maximum percentage of the NAR that could be occupied by temporary access structures and the action, if any, that would be taken to rehabilitate temporary access; and
 - the maximum percentage of the NAR that could be occupied by forest floor displacement.
2. Soil disturbance included continuous scalps as a category of counted soil disturbance.

The following provides a detailed description of continuous scalps and forest floor displacement.

Continuous scalp (C)



Continuous scalps were counted as a category of soil disturbance on areas under Forest Practices Code prescriptions approved or submitted for approval before June 15, 1998.

They are areas where the forest floor has been removed at the survey point and continuously for a length greater than 5 m. There is no width criterion for this category.

Continuous scalps are counted as soil disturbance on sites with:

- high or very high mass wasting hazard;
- high or very high surface erosion hazard;
- very high soil displacement hazard; and
- moderate or high likelihood of landslides, or where the hazards for soil displacement or surface soil erosion have not been assessed.

Forest floor displacement

Forest floor displacement, tallied by transect surveys (along with categories of soil disturbance), is symbolized on field survey forms with a circle drawn around the appropriate disturbance symbol.

Total forest floor displacement includes:

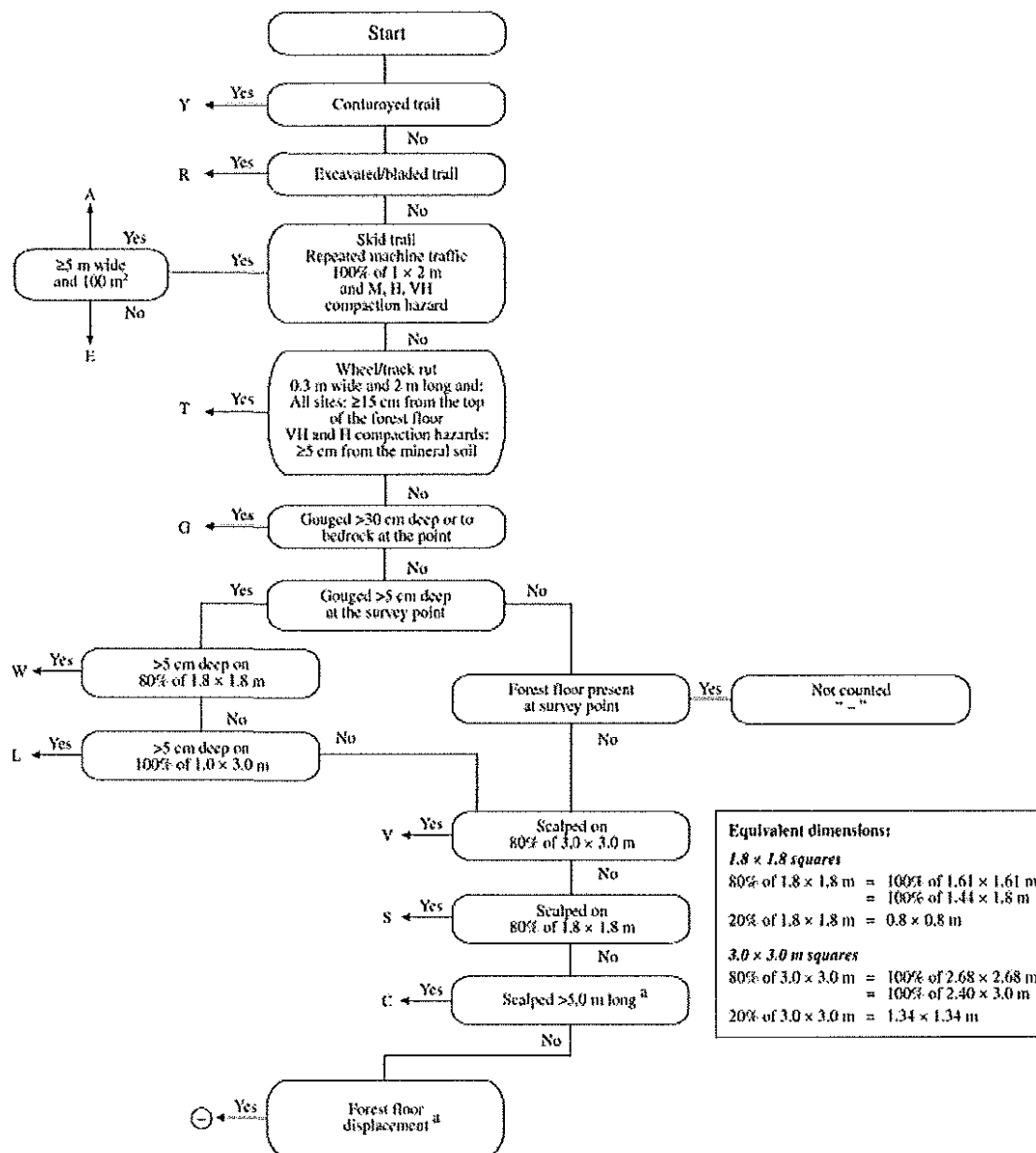
- any disturbance where forest floor has been removed;
- the exposed mineral soil surfaces of rehabilitated temporary access structures where forest floor is no longer present; and
- all areas where the forest floor has been completely consumed by prescribed burning.

Total forest floor displacement does **not** include:

- any disturbance where forest floor is not removed;
- intact or dislodged forest floor covered by deposits of mineral soil;
- any counted disturbance category covered with organic matter that does not qualify as forest floor removal (e.g., a rut where the forest floor is still intact);
- surfaces of rehabilitated temporary access structures where the forest floor has been restored in accordance with an approved rehabilitation plan (e.g., by application of a surface mulch);
- exposed mineral soil on mounds and berms created by mounding, disc-trenching, plowing, or other mechanical site preparation treatments, where the original forest floor is largely intact under the mound or berm; and
- exposed mineral soil resulting from mixing-type mechanical site preparation treatments, such as rototilling or bedding plow treatments.

Note: Do not count compacted areas, repeated machine traffic, or rut disturbance as forest floor displacement unless forest floor is removed at the survey point.

Appendix 2. Flow chart for correct assessment of soil disturbance survey points under the Forest Practices Code



^a These categories are not counted on areas covered under prescriptions approved in accordance with the 1998 Operational Planning Regulation.

Note: This flow chart does not address rehabilitated areas. Where planned rehabilitation has been successful, exposed mineral soil surfaces should be recorded as forest floor displacement, if required, and not as soil disturbance.

Appendix 3. Table of random numbers

Row number	Column number											
	1	2	3	4	5	6	7	8	9	10	11	12
1	20	288	215	98	44	202	323	226	162	262	248	276
2	331	171	204	131	185	39	183	338	209	352	285	333
3	250	142	85	145	348	55	327	137	289	135	146	282
4	259	226	225	215	219	306	267	181	29	328	247	280
5	143	103	64	332	199	215	159	145	84	87	135	250
6	234	261	211	152	181	198	59	179	99	29	106	342
7	360	61	177	310	265	150	23	8	83	122	303	112
8	86	103	313	117	254	284	17	347	296	196	153	251
9	120	191	52	93	297	209	290	251	155	210	47	357
10	6	105	155	77	191	147	356	245	262	36	268	32
11	37	2	259	115	3	24	105	115	130	246	256	61
12	357	180	52	190	311	20	48	348	12	322	223	355
13	326	227	40	93	217	100	336	262	272	83	179	48
14	336	322	174	335	94	358	303	337	253	253	42	163
15	240	213	217	8	184	72	219	136	211	64	154	217
16	289	327	291	216	112	106	147	181	33	311	7	111
17	140	32	297	319	342	15	30	53	54	55	10	139
18	125	81	128	59	121	236	307	264	328	120	247	127
19	351	21	132	172	148	91	93	334	74	126	223	62
20	80	91	98	280	41	146	219	271	248	246	185	179
21	198	255	26	201	330	134	100	19	41	50	192	349
22	80	225	321	260	161	330	260	333	195	145	42	169
23	66	54	140	179	179	46	311	87	340	341	287	98
24	19	185	137	346	163	224	13	72	208	48	124	288
25	281	321	20	16	5	48	70	91	122	305	240	75
26	126	61	317	336	188	184	23	31	174	280	115	88
27	355	267	117	253	186	72	1	221	345	86	89	355
28	321	327	358	78	320	261	187	325	100	91	179	184
29	201	341	29	14	341	63	253	249	226	170	311	127
30	308	233	229	344	215	341	318	334	144	326	70	148
31	195	42	88	337	122	97	84	215	298	168	300	312
32	22	115	136	100	110	73	219	290	133	70	23	55
33	48	190	121	352	200	249	135	55	336	17	263	269
34	175	225	341	307	283	280	359	348	143	230	102	283
35	133	17	293	356	45	151	49	69	334	340	151	251
36	188	43	324	343	104	302	168	92	97	43	321	268
37	133	103	334	241	207	12	208	168	16	153	121	268
38	351	360	102	5	85	226	246	16	155	323	113	260
39	80	354	191	267	197	169	172	348	271	231	40	164
40	299	311	165	41	211	64	281	91	95	186	283	299

Select a row from 1 to 40 and a column from 1 to 12. Use the number at the intersection of the selected row and column.

Appendix 4. Grid spacing for large area method

For survey areas greater than 10 ha this table indicates the required number of grid centres and the spacing between them. Two perpendicular 30-m transects are established per grid centre.

Area (ha)	No. of GCs ^a	Spacing (m)	Area (ha)	No. of GCs ^a	Spacing (m)	Area (ha)	No. of GCs ^a	Spacing (m)	Area (ha)	No. of GCs ^a	Spacing (m)	Area (ha)	No. of GCs ^a	Spacing (m)
11	30	61	33	30	105	55	31	133	76	36	145	97	40	156
12	30	63	34	30	106	56	32	132	77	36	146	98	40	157
13	30	66	35	30	108	57	32	133	78	36	147	99	40	157
14	30	68	36	30	110	58	32	135	79	36	148	100	40	158
15	30	71	37	30	111	59	32	136	80	36	149	101	41	157
16	30	73	38	30	113	60	32	137	81	37	148	102	41	158
17	30	75	39	30	114	61	33	136	82	37	149	103	41	158
18	30	77	40	30	115	62	33	137	83	37	150	104	41	159
19	30	80	41	30	117	63	33	138	84	37	151	105	41	160
20	30	82	42	30	118	64	33	139	85	37	152	106	42	159
21	30	84	43	30	120	65	33	140	86	38	150	107	42	160
22	30	86	44	30	121	66	34	139	87	38	151	108	42	160
23	30	88	45	30	122	67	34	140	88	38	152	109	42	161
24	30	89	46	30	124	68	34	141	89	38	153	110	42	162
25	30	91	47	30	125	69	34	142	90	38	154	111	43	161
26	30	93	48	30	126	70	34	143	91	39	153	112	43	161
27	30	95	49	30	128	71	35	142	92	39	154	113	43	162
28	30	97	50	30	129	72	35	143	93	39	154	114	43	163
29	30	98	51	31	128	73	35	144	94	39	155	115	43	164
30	30	100	52	31	130	74	35	145	95	39	156	116	44	162
31	30	102	53	31	131	75	35	146	96	40	155	117	44	163
32	30	103	54	31	132									

^a GCs = grid centres

Appendix 5. Field marking conventions

Transect surveys for areas 10 ha and smaller

Point of commencement (POC)

- Use two blue ribbons and two pink-striped ribbons.
- Label the first blue ribbon with “SDS” (for “soil disturbance survey”), the ID number on the survey form, the date, and the surveyor’s initials (e.g., SDS FFR-1 94/04/27 S.T.).
- Label the second blue ribbon with the distance and bearing to the baseline (or first transect, if not using a baseline) (e.g., 42 m @ 104° to B/L 0+000).

Baseline (optional)

Choose a convenient colour and mark the location of each transect.

Transects

- Mark the beginning and end of the transect with one pink-striped ribbon and one blue ribbon at each location.
- Label the ribbon with “SDS,” followed by start of transect (SOT) or end of transect (EOT), the transect number, and the bearing (e.g., SDS SOT T-3 @ 134°).
- Flag at 100-m intervals with pink-striped ribbon, labelling each ribbon with “SDS,” the transect number, the distance, and the bearing” (e.g., SDS T-3 0+100 m @ 134°).

Transect surveys for areas larger than 10 ha

POC

- Use two blue ribbons and two pink-striped ribbons.
- Label the first blue ribbon “SDS” (for “soil disturbance survey”), the ID number on survey form, the date, and the surveyor’s initials (e.g., SDS FFR-1 94/04/27 S.T.).
- Label the second blue ribbon with the distance and bearing to the first grid centre (e.g., 42 m @ 104° to GC-1).

Grid centres

- Use one blue ribbon and one pink-and-black-striped ribbon.
- Label the blue ribbon with “GC –,” followed by the grid centre number, and a random bearing (e.g., GC-101, 143°).

Transects

- Mark the ground with blue flagging at the start and end of each transect, exactly at the 0-m and 30-m marks (or the appropriate endpoint if the transect goes outside of the NAR).

Road traverses

POC

- Use a new POC for each type of road surveyed (e.g., a haul road, a spur road, and a permanent skid trail would require three separate POCs).
- Use two blue ribbons and two pink-striped ribbons.
- Label the first blue ribbon with the word “Road –,” followed by the road number, the ID number on survey form, the date, and the surveyor’s initials (e.g., Road-1, FFR-1, 94/04/27, S.T.).
- Label the second blue ribbon with the distance to the first width cross-section, followed by “to R –,” the road number, “x –,” and the cross-section number (e.g., 18 m to R-1, x-1).
- Leave a blue ribbon on the cutbank at each width-measuring station.

Landing surveys

- Mark the start and end of each landing length and width measurement with a blue ribbon and a pink-striped ribbon.
- Mark the location of each transect on a sketch map of the landing in the field notes.
- If traversing the landing:
 - mark the starting point of the traverse with a blue ribbon and a pink-striped ribbon;
 - label the blue ribbon with an “L –,” followed by the landing number and “POC Traverse” (e.g., “L-1 POC Traverse”); and
 - mark each station of the traverse by painting the ground with a blue cross or by leaving a blue ribbon.

Appendix 6. Soil conservation survey field, calculation, and summary forms

Number	Name	Purpose/Comments
FS 880 HSP 96/9	Traverse Survey Field Card (double-sided)	For collecting measurement data on roads, permanent logging trails, and pre-Code fireguards and backspur trails.
FS 885 HSP 96/8	Transect Survey Field Card (double-sided)	For collecting soil disturbance data in the NAR. Used for small <i>and</i> large area transect surveys.
FS 886 HSP 96/8	Landing Area Calculation Card (single-sided)	For collecting representative width and length measurements, and calculating areas, for landings.
FS 889 HSP 96/10	Soil Disturbance Summary / Field Map (double-sided)	Summary sheet for all soil disturbance survey calculations, including permanent roads and landings—for both small and large areas. Back side used for sketching map of survey strata.
FS 895 HSP 96/10	Transect Survey Calculation Card, including Calculation Procedure (double-sided)	For calculating statistical information from FS 896 tally card. Confidence limits entered into FS 889 form. <i>Note: there is also an MOF spreadsheet program to do calculations—available from the Forest Practices Branch.</i>
FS 896 HSP 96/10	Transect Survey Tally Card (single-sided)	For transferring data from FS 885 field cards. Used to tally large area transect survey totals.
FS 897 HSP 96/9	Small Area Survey Calculation Card / Table of 90% Confidence Interval Half-Widths (double-sided)	Summary card for small area survey of soil disturbance in the NAR (i.e., summary of FS 885 data).

Note: Forms can be downloaded or ordered through the forms index on Ministry of Forests website at: <http://www.for.gov.bc.ca/isb/forms>

52

FS 881 HSP 96/8 – Soil disturbance survey – Transverse survey calculation card



SOIL DISTURBANCE SURVEY

TRAVERSE SURVEY CALCULATION CARD

SURVEYOR A. Nybody	DATE Y M D 96 06 13	IDENTIFICATION NO. FFR-NE10

	MAIN AND SPUR ROADS			FIREGUARDS AND BACKSPAR TRAILS		
	MAIN		TOTAL			TOTAL
LENGTH (m)	291.0					
AVERAGE WIDTH (m)	20.11					
STD WIDTH (m)	1.856					
NUMBER OF WIDTHS MEASURED	10					
$\sqrt{\text{Number of Widths}}$	3.16					
CI WIDTH (m): CI_{width}	0.812					
Area (ha)	0.585		0.585			
AREA ERROR (ha): "AE"	0.0376					
AE ²	0.0014		0.0014			
GCA OR NAR (ha)		GCA (ha)	19.3		NAR (ha)	
AREA (%)			3.03			
AREA ERROR (%)			0.195			
AREA % LCL ₉₀			2.84			

CALCULATION PROCEDURE

- Complete separate summaries for: a) main and spur roads, and b) fireguards and backspare trails (for areas approved prior to full compliance with the Forest Practices Code).
- Calculate the average and standard deviation (STD) of the widths measured.
- Calculate the road width confidence interval (CI_{width}): $CI_{width} = \frac{1 \times STD_{width}}{\sqrt{\text{Number of Widths}}}$ where "t" is from the t Table
- Multiply length (in metres) by average width (in metres) and divide by 10,000 to calculate the road area in hectares. Enter the sum of the road areas in the column labelled "Total".
- Calculate Area Errors (AE) in hectares for each type of road: $AE = \text{Road Area} \times \sqrt{.0025 + \frac{(CI_{width})^2}{\text{Average Width}^2}}$
where Total Road Area = the total area disturbed by all haul roads, or all fireguards and backspare trails, as appropriate.
- Calculate the squares of the Area Errors (AE) and enter the sum of these squares in the column labelled "Total".
- Calculate the percentage area disturbed: $\text{Area \%} = \frac{\text{Area (ha)}}{\text{GCA or NAR (ha)}} \times 100$.
Use Gross Cutblock Area (GCA) for permanent roads, and Net Area to be Reforested (NAR) for fireguards and backspare trails.
- Calculate the Area Error in hectares: $\text{Area Error (ha)} = \sqrt{\text{sum of AE}^2}$
- Calculate the Area Error in percent: $\text{Area Error (\%)} = \frac{\text{Area Error (ha)}}{\text{GCA or NAR (ha)}} \times 100$.
- Calculate the lower 90% confidence limit for area % (LCL₉₀): $\text{Area \%} - \text{Area Error \%}$

t TABLE 90%, one-sided	
n - 1	t
5	1.476
6	1.440
7	1.415
8	1.397
9	1.383
10	1.372
11	1.363
12	1.356
13	1.350
14	1.345
15	1.341
16	1.337
17	1.333
18	1.330
19	1.328
20	1.325
21	1.323
22	1.321
23	1.319
24	1.318
25	1.316
26	1.315
27	1.314
28	1.313
29	1.311
30	1.310
>30	1.310

where "n" is the number of road widths or grid centres (not transects).

**FS 885 HSP 96/8 – Soil disturbance survey –
Transect survey field card – example for large block method**

BRITISH COLUMBIA		SOIL DISTURBANCE SURVEY		TRANSECT SURVEY FIELD CARD	
SURVEYOR A. Nybody			DATE Y M D 96 07 29		IDENTIFICATION NO. FFR-NE16
RANDOM NO. ROW 15 COLUMN 6		POC BEARING AND DISTANCE 72° 34 m	GRID / TRANSECT SPACING 68 m	45° OFFSET SPACING (spacing x 1.41) 95.9 m	POINT SPACING 1.0 m

GC/TRAN SECT NO.	101		102		103		104		105		106	
BEARING	56	146	100	190	186	276	92	182	286	16	86	176
1	X	⊖	—	—	⊖	—	—	—	—	—	—	⊕
2	⊖	⊖	—	—	—	—	⊖	⊖	—	—	—	—
3	—	—	—	—	—	E	—	—	—	—	—	S
4	—	—	—	—	⊖	E	—	—	—	—	⊖	S
5	—	E	—	—	G	E	—	⊖	W	—	S	X
6	S	E	⊖	S	—	—	S	—	W	—	—	—
7	S	E	⊖	S	—	—	S	—	—	—	—	—
8	—	E	—	—	—	—	—	—	—	—	⊖	⊖
9	—	—	—	—	—	⊖	—	⊖	—	⊖	—	⊖
10	—	—	—	⊖	—	—	—	—	—	⊖	—	—
11	—	⊖	—	⊖	X	—	⊖	—	—	T	—	—
12	—	—	—	—	⊖	X	—	—	—	T	—	—
13	—	—	—	⊖	⊖	—	—	X	⊖	—	E	—
14	⊖	—	—	⊖	—	⊖	—	—	⊖	—	E	—
15	⊖	—	—	—	—	—	C	—	—	—	E	—
16	—	—	X	—	—	—	C	—	—	—	E	—
17	W	—	X	—	—	⊖	C	—	—	⊖	—	⊖
18	W	—	—	⊖	—	—	—	⊖	—	—	—	—
19	—	⊖	—	⊖	—	—	—	⊖	—	—	—	—
20	—	—	⊖	⊖	⊖	—	—	—	—	—	—	—
21	⊖	—	—	—	—	—	—	⊖	⊖	⊖	⊖	E
22	X	S	—	—	—	⊖	—	—	—	—	⊖	E
23	—	S	—	—	T	⊖	—	—	—	—	—	E
24	—	—	—	⊖	⊖	⊖	—	⊖	X	—	X	E
25	—	—	⊖	⊖	⊖	S	E	—	—	—	—	—
26	⊖	—	—	⊖	⊖	S	E	⊖	—	—	—	—
27	⊖	—	—	—	—	—	—	—	X	—	—	—
28	—	—	—	—	—	—	—	—	—	⊖	—	—
29	—	—	—	—	—	—	—	—	—	—	—	—
30	—	G	—	—	—	⊖	—	—	—	—	—	⊖

FS 885 HSP 96/8

FS 886 HSP 96/8 – Soil disturbance survey – Landing area calculation card

	BRITISH COLUMBIA		SOIL DISTURBANCE SURVEY	LANDING AREA CALCULATION CARD*
SURVEYOR A. Nybody		DATE Y M D 96 06 21		IDENTIFICATION NO. FFR-NE12

LANDING SUMMARY TABLE*							
LANDING NUMBER	1	2	3				
LENGTH 1 (m)	55.5	33.2	69.1				
LENGTH 2 (m)	49.7	33.0	52.4				
AVG. LENGTH (m)	52.6	33.1	60.8				
WIDTH 1 (m)	33.1	5.9	43.4				
WIDTH 2 (m)	28.9	11.0	38.6				
AVG. WIDTH (m)	31.0	8.45	41.0				

							TOTAL
AREA (ha)	0.163	0.028	0.249				0.440

GCA (ha)	12.5
AREA (%)	3.52
AREA ERROR (%)	0.25
LOWER AREA LIMIT(%)	3.27

CALCULATION PROCEDURE:

1. Calculate the average of the two length measurements for each landing.
2. Calculate the average of the two width measurements for each landing.
3. Calculate the area of each landing in hectares by multiplying the average length by average width and dividing by 10,000.
4. Sum the area of all landings and enter this value in the column labelled "Total."
5. Divide the total landing area in hectares by the gross cutblock area (GCA) and multiply by 100 to calculate the percent area.
6. Calculate the area error by multiplying the area (%) by .0707
(e.g., 3.30% x .0707 = .23%).
7. Calculate the lower area limit by subtracting the area error % from the area %
(e.g., 3.3% - .23% = 3.07%).

*Use for landings, borrow pits, truck pull-outs, etc.

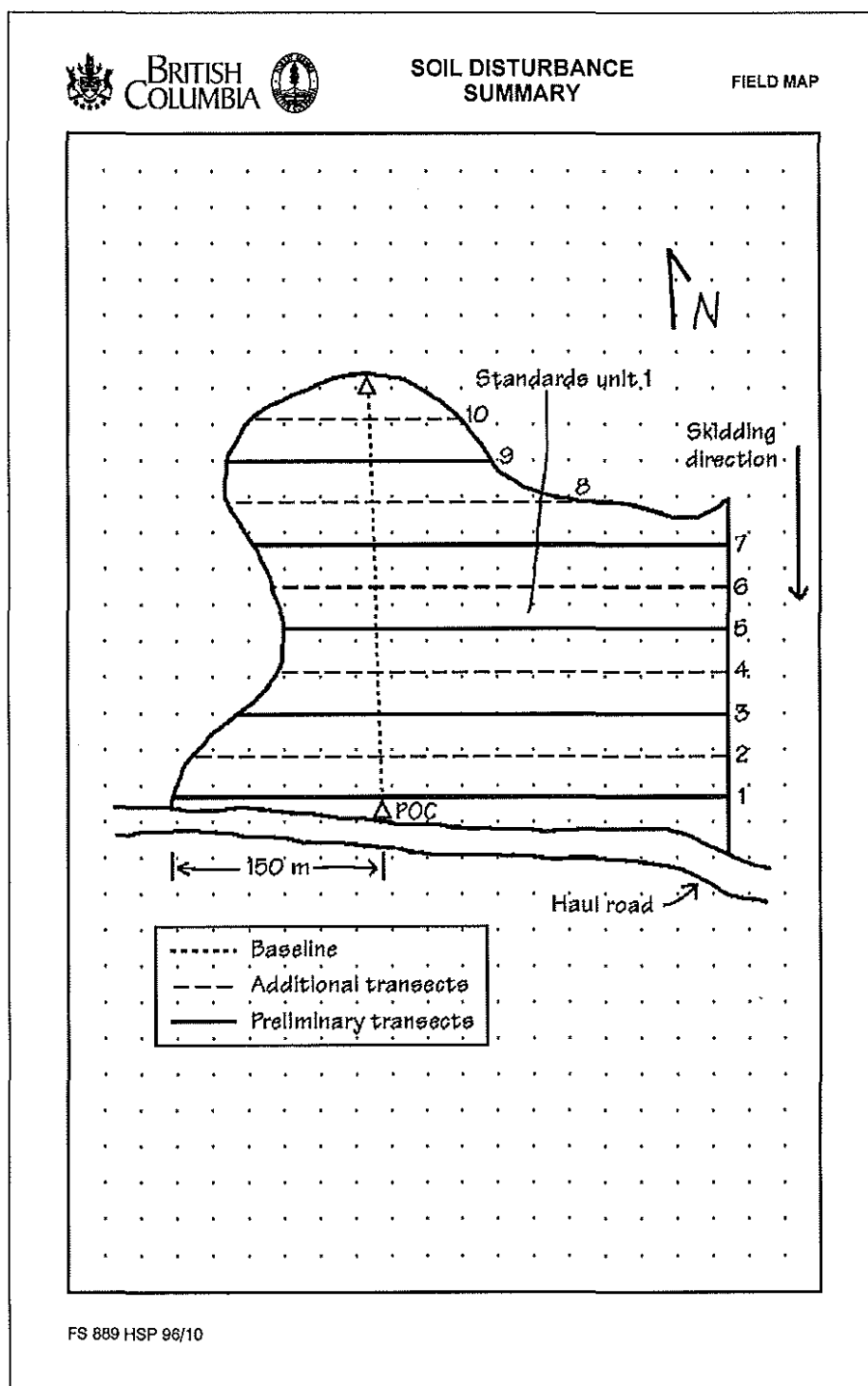
FS 886 HSP 96/8

**FS 889 HSP 96/10 (front) – Soil disturbance survey –
Soil disturbance summary
(example from large block data on the FS 885 form)**

BRITISH COLUMBIA		SOIL DISTURBANCE SUMMARY			
SURVEYOR A. Nybody			DATE Y M D 96 06 19		IDENTIFICATION NO. FFR-NE16
LICENSE NO. A99423		LICENSEE LOGWANA	CP 10	BLOCK 4	BCGS OPENING 82K 044-009
REGION		DISTRICT		TU OR SUSTRATUM Number 1 of 1	
GCA	NAR	SOIL HAZARD RATINGS	COMPAC- TION H	DISPLACE- MENT H	EROSION H
				MASS WASTING M	FOR FLOOR DISPLACE- MENT H
COUNTED SOIL DISTURBANCE CATEGORIES (please 3)		☐ COMPACTED AREAS ☐ WIDE SCALPS ☐ CONTINUOUS SCALPS ☐ REPEATED MACHINE TRAFFIC ☐ 5 cm DEEP WHEEL / TRACK RUTS			
SOIL DISTURBANCE SUMMARY					
PERMANENT ACCESS STRUCTURES				SUMMARY	
	LANDINGS	HAUL ROADS	PERMANENT TRAILS	SP ALLOWABLE	LOWER 90% CL
MEAN				COUNTED DISTURBANCE	10.0%
AE %				DISPLACE- MENT	25.0%
			LCL:	PERMANENT ACCESS	24.5%
					0.1%
					0.0%
FOREST FLOOR REDUCTION:				SP LIMIT	UPPER 90% CL
AVERAGE DEPTH OF FOREST FLOOR REMAINING AFTER BURNING:				cm	NON-COMPLI- ANCE AMOUNT
CALCULATION PROCEDURE FOR LOWER CONFIDENCE LIMIT (LCL) FOR LANDINGS AND PERMANENT ACCESS STRUCTURES: 1. Enter the Percentage Area Errors (AE) from the calculation cards corresponding to each disturbance type. 2. Calculate the pooled Confidence Interval: $CI_{\text{Permanent Access}} = \sqrt{AE \%^2_{\text{Landings}} + AE \%^2_{\text{Roads}} + AE \%^2_{\text{Permanent Trails}}}$ 3. Calculate the Lower Confidence Limit as: $LCL_{\text{Permanent Access}} = \text{Total Permanent Access} - CI_{\text{Permanent Access}}$ similarly for Counted Disturbance and Forest Floor Displacement.					
COMMENTS					

FS 889 HSP 96/10

FS 889 HSP 96/10 (back) – Soil disturbance summary – Field map



58

FS 895 HSP 96/10 (back) – Soil disturbance survey – Calculation procedure for large area method

CALCULATION PROCEDURE (retain four decimals in intermediate calculations):

1. Total each column in Row 1.
2. Calculate the mean number of surveyed points per grid centre in Cell H2.
3. Use the cell references in brackets to calculate the proportion of the total points surveyed with Counted Disturbance, Total Displacement and Skidroads.*

$$\begin{array}{lcl} \text{Proportion Counted} & = & \frac{[I1]}{[H1]} \\ \text{Disturbance} & & \end{array} \quad \begin{array}{lcl} \text{Proportion Total} & = & \frac{[J1]}{[H1]} \\ \text{Displacement} & & \end{array} \quad \begin{array}{lcl} \text{Proportion} & = & \frac{[K1]}{[H1]} \\ \text{Skidroads} & & \end{array}$$

where the text in square brackets specifies the cell references on the form (e.g., [H1] = Total of Points Surveyed).

* For Forest Practices Code surveys, calculate Counted Disturbance and Total Displacement.

For areas with prescriptions approved under the 1994 Silviculture Practices Regulations, if you are on a site with a High Soil Displacement or High Surface Erosion Hazard, also calculate Skidroads.

4. Calculate the square of the proportions (Proportion²).
5. For Counted Disturbance, Total Displacement and Skidroads, calculate: Mean % = 100% x Proportion (from Step 3).
6. Calculate the Standard Error (SE %) for Counted Disturbance, Total Displacement and Skidroads, using the cell references shown in the formulas below (the text in square brackets indicates the cell references on the form (e.g., [H2] = Mean of Points):

$$SE_{\text{Counted \%}} = 100\% \times \sqrt{\frac{[E1] - (2 \times [I3] \times [A1]) + ([I4] \times [D1])}{n \times (n - 1) \times [H2]^2}}$$

$$SE_{\text{Displacement \%}} = 100\% \times \sqrt{\frac{[F1] - (2 \times [J3] \times [B1]) + ([J4] \times [D1])}{n \times (n - 1) \times [H2]^2}}$$

$$SE_{\text{Skidroads \%}} = 100\% \times \sqrt{\frac{[G1] - (2 \times [K3] \times [C1]) + ([K4] \times [D1])}{n \times (n - 1) \times [H2]^2}}$$

where n = number of grid centres.

7. Calculate the Lower Confidence Limit (LCL %): LCL% = Mean % - t x SE

where 't' is the value from the t-Table shown on the Traverse Survey Calculation Card (FS 881).

**FS 897 HSP 96/9 (front) –
Small area survey calculation card
(data have not been provided for these calculations)**

 BRITISH COLUMBIA 		SOIL DISTURBANCE SURVEY SMALL AREA SURVEY CALCULATION CARD				
SURVEYOR A. Nybody		DATE	Y	M	D	IDENTIFICATION NO. FFR-NE15
			96	07	29	

TOTAL POINTS	PRELIMINARY SURVEY	+	ADDITIONAL TRANSECTS	=	FINAL SURVEY
Counted (C)	28		33		61
Displaced (D)	51		56		107
Total (T)	255		255		510

COUNTED DISTURBANCE	PRELIMINARY SURVEY	FINAL SURVEY
Proportion (%) (C/T) x 100%	11.0%	12.0%
CI	2.7%	2.0%
Proportion (%) - CI	8.3%	10.0%
Proportion (%) + CI	13.7%	9.0%
		1.0%

FOREST FLOOR DISPLACEMENT	PRELIMINARY SURVEY	FINAL SURVEY
Proportion (%) (D/T) x 100%	20.0%	21.0%
CI	3.4%	2.4%
Proportion (%) - CI	16.6%	18.6%
Proportion (%) + CI	23.4%	30.0%
		—

COMMENTS	Soil disturbance would have been higher if rehabilitation of excavated trails had not been completed.

FS 897 HSP 96/9

FS 897 HSP 96/9 (back) –
Small area transect survey calculation card

ONE-SIDED 90% CONFIDENCE INTERVAL HALF-WIDTHS (%)
FOR THE BINOMIAL DISTRIBUTION

SAMPLE SIZE														
%	100	150	200	250	300	350	400	450	500	550	600	650	700	
1	1.8	1.4	1.2	1.0	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	
2	2.3	1.8	1.5	1.3	1.2	1.1	1.0	1.0	0.9	0.9	0.8	0.8	0.8	
3	2.7	2.1	1.8	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	0.9	0.9	
4	3.0	2.4	2.0	1.8	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.1	1.0	
5	3.3	2.6	2.2	2.0	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.2	1.1	
6	3.6	2.8	2.4	2.1	1.9	1.8	1.6	1.5	1.5	1.4	1.3	1.3	1.2	
7	3.8	3.0	2.6	2.3	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.4	1.3	
8	4.0	3.2	2.7	2.4	2.2	2.0	1.9	1.8	1.7	1.6	1.5	1.4	1.4	
9	4.2	3.3	2.8	2.5	2.3	2.1	2.0	1.8	1.7	1.7	1.6	1.5	1.5	
10	4.4	3.5	3.0	2.6	2.4	2.2	2.0	1.9	1.8	1.7	1.7	1.6	1.5	
11	4.5	3.6	3.1	2.7	2.5	2.3	2.1	2.0	1.9	1.8	1.7	1.7	1.6	
12	4.7	3.7	3.2	2.8	2.6	2.4	2.2	2.1	2.0	1.9	1.8	1.7	1.6	
13	4.8	3.9	3.3	2.9	2.7	2.4	2.3	2.1	2.0	1.9	1.8	1.8	1.7	
14	5.0	4.0	3.4	3.0	2.7	2.5	2.4	2.2	2.1	2.0	1.9	1.8	1.8	
15	5.1	4.1	3.5	3.1	2.8	2.6	2.4	2.3	2.1	2.0	2.0	1.9	1.8	
16	5.2	4.2	3.6	3.2	2.9	2.7	2.5	2.3	2.2	2.1	2.0	1.9	1.8	
17	5.3	4.3	3.7	3.3	3.0	2.7	2.5	2.4	2.3	2.1	2.1	2.0	1.9	
18	5.4	4.4	3.7	3.3	3.0	2.8	2.6	2.4	2.3	2.2	2.1	2.0	1.9	
19	5.6	4.5	3.8	3.4	3.1	2.8	2.6	2.5	2.4	2.2	2.1	2.1	2.0	
20	5.7	4.5	3.9	3.4	3.1	2.9	2.7	2.5	2.4	2.3	2.2	2.1	2.0	
21	5.7	4.6	4.0	3.5	3.2	2.9	2.7	2.6	2.4	2.3	2.2	2.1	2.0	
22	5.8	4.7	4.0	3.6	3.2	3.0	2.8	2.6	2.5	2.4	2.3	2.2	2.1	
23	5.9	4.8	4.1	3.6	3.3	3.0	2.8	2.7	2.5	2.4	2.3	2.2	2.1	
24	6.0	4.8	4.1	3.7	3.3	3.1	2.9	2.7	2.6	2.4	2.3	2.2	2.1	
25	6.1	4.9	4.2	3.7	3.4	3.1	2.9	2.7	2.6	2.5	2.4	2.3	2.2	
26	6.1	4.9	4.2	3.8	3.4	3.2	2.9	2.8	2.6	2.5	2.4	2.3	2.2	
27	6.2	5.0	4.3	3.8	3.5	3.2	3.0	2.8	2.6	2.5	2.4	2.3	2.2	
28	6.3	5.0	4.3	3.8	3.5	3.2	3.0	2.8	2.7	2.5	2.4	2.3	2.2	
29	6.3	5.1	4.4	3.9	3.5	3.3	3.0	2.9	2.7	2.6	2.5	2.4	2.3	
30	6.4	5.1	4.4	3.9	3.6	3.3	3.1	2.9	2.7	2.6	2.5	2.4	2.3	
31	6.5	5.2	4.5	4.0	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3	
32	6.5	5.2	4.5	4.0	3.6	3.3	3.1	2.9	2.8	2.6	2.5	2.4	2.3	
33	6.6	5.3	4.5	4.0	3.7	3.4	3.1	3.0	2.8	2.7	2.5	2.4	2.4	
34	6.6	5.3	4.6	4.0	3.7	3.4	3.2	3.0	2.8	2.7	2.6	2.5	2.4	
35	6.6	5.3	4.6	4.1	3.7	3.4	3.2	3.0	2.9	2.7	2.6	2.5	2.4	
36	6.7	5.4	4.6	4.1	3.7	3.4	3.2	3.0	2.8	2.7	2.6	2.5	2.4	
37	6.7	5.4	4.6	4.1	3.7	3.5	3.2	3.0	2.9	2.7	2.6	2.5	2.4	
38	6.8	5.4	4.7	4.1	3.8	3.5	3.2	3.0	2.9	2.7	2.6	2.5	2.4	
39	6.8	5.5	4.7	4.2	3.8	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4	
40	6.8	5.5	4.7	4.2	3.8	3.5	3.3	3.1	2.9	2.8	2.6	2.5	2.4	
45	6.9	5.6	4.8	4.2	3.9	3.6	3.3	3.1	3.0	2.8	2.7	2.6	2.5	
50	6.9	5.6	4.8	4.3	3.9	3.6	3.3	3.1	3.0	2.8	2.7	2.6	2.5	

Appendix 7. Counted soil disturbance categories and recommended limits according to hazard ratings

Soil disturbance hazard ^a	Soil sensitivity rating	Categories counted in allowable soil disturbance ^b	Allowable soil disturbance (% NAR)	
			Coast and Interior	
Assessment of soil hazards not required		Always + S + E + T5 + A	5	
Likelihood of landslides	M, H	Always + S	5	
Soil erosion	VH	Always + S	5	
Soil displacement	VH	Always + S	5	
Soil compaction	VH	Always + S + E + T5 + A	5	
			Coast	Interior
Soil erosion	H	Always	5	10
Soil erosion	M, L	Always	5	10
Soil displacement	H, M, L	Always	5	10
Soil compaction	H	Always + E + T5 + A	5	10
Soil compaction	M	Always + E + A	5	10
Soil compaction	L	Always	5	10
Likelihood of landslides	L	Always	5	10

^a Assessing the hazards for soil compaction, soil displacement, and soil erosion need not be done if the harvesting method is cable or aerial.

^b Under the "Categories counted" column, the term "Always" includes soil disturbance that is always counted, namely excavated or bladed trails, corduroyed trails, 15-cm-deep ruts, deep gouges, long gouges, wide gouges, very wide scalps. The meaning of the other symbols are: "S": wide scalps; "T5": 5-cm-deep ruts; "E": repeated machine traffic; and "A": compacted areas.

Combine the categories measured for different hazard ratings if that will result in more categories being counted or a lower allowable disturbance limit. For example, on a site with a Very High compaction hazard and a High surface erosion hazard, the categories counted are "Always + S + E + A + T5," the soil disturbance limit would be 5%.

Calculation Sheet - CAR 464 ONLY

Calculator for a One Sided 90% Confidence Interval

SUA

Cutblock ID: CAR459

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR464

Enter the number of survey points and the number of counted points below

Number of Survey Points: 106

Counted Points: 26

Mean Counted: 24.5%

LCL Counted: 19.1%

CI Width: 5.4%

Cutblock ID: CAR466

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR468

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR491

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!
Counted Points: #REF!
#REF!

Mean Counted: #REF!
LCL Counted: #REF!
CI Width: #REF!

Cutblock ID: CAR517

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!
Counted Points: #REF!
#REF!

Mean Counted: #REF!
LCL Counted: #REF!
CI Width: #REF!

Cutblock ID: CAR526

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!
Counted Points: #REF!
#REF!

Mean Counted: #REF!
LCL Counted: #REF!
CI Width: #REF!

Cutblock ID: CAR527

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!
Counted Points: #REF!
#REF!

Mean Counted: #REF!
LCL Counted: #REF!
CI Width: #REF!

Cutblock ID: CAR528

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!
Counted Points: #REF!
#REF!

Mean Counted: #REF!
LCL Counted: #REF!
CI Width: #REF!

SUB

Cutblock ID: CAR459

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR468

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

RWA

Cutblock ID: CAR459

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR464

Enter the number of survey points and the number of counted points below

Number of Survey Points: 109

Counted Points: 60

Mean Counted: 55.0%

LCL Counted: 48.9%

CI Width: 6.2%

Cutblock ID: CAR466

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR468

Enter the number of survey points and the number of counted points below

Number of Survey Points: #REF!

Counted Points: #REF!

#REF!

Mean Counted: #REF!

LCL Counted: #REF!

CI Width: #REF!

Cutblock ID: CAR527

Enter the number of survey points and the number of counted points below

Number of Survey Points:	#REF!
Counted Points:	#REF!
	#REF!
Mean Counted:	#REF!
LCL Counted:	#REF!
CI Width:	#REF!

Table 2a. Mean percentange of counted disturbance and 90% lower confidence limit for SUA based on field survey.

SUA

Cut block ID	Total %	Mean counted Distbd. %	Not disturbed %	90% CI width (%)	LCL Counted Dist. %
CAR464	#REF!	#REF!	#REF!	#REF!	#REF!
Grand Total	100.0% (106)	24.5% (26)	75.5% (80)	5.4%	19.1%
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!

Note: the number of surveyed points are included in the parentheses.

Table 2b. Mean percentange of counted disturbance and 90% lower confidence limit for RWA based on field survey.

RWA

Cut block ID	Total %	Mean counted Distbd. %	Not disturbed %	90% CI width (%)	LCL Counted Dist. %
CAR464	#REF!	#REF!	#REF!	#REF!	#REF!
Grand Total	100.0% (109)	55.0% (60)	45.0% (49)	6.2%	48.9%
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!

Note: the number of surveyed points are included in the parentheses.

Table 2c. Mean percentange of counted disturbance and 90% lower confidence limit for SUB based on field survey.

SUB

Cut block ID	Total %	Mean counted Distbd. %	Not disturbed %	90% CI width (%)	LCL Counted Dist. %
Grand Total	#REF!	#REF!	#REF!	#REF!	#REF!
0	#REF!	#REF!	#REF!	#REF!	#REF!

Note: the number of surveyed points are included in the parentheses.

Block	Name	CountDis C&E	CountDis FREP	Description	Stratum	Summary_C&E
CAR464	1 U	U	RWA1	RWA	Not counted	
CAR464	2 E	E	RWA1	RWA	Counted Disturbance	
CAR464	3 L	L	RWA1	RWA	Counted Disturbance	
CAR464	4 E	E	RWA1	RWA	Counted Disturbance	
CAR464	5 U	U	RWA1	RWA	Not counted	
CAR464	6 U	U	RWA1	RWA	Not counted	
CAR464	7 G	G	RWA1	RWA	Counted Disturbance	
CAR464	8 E	E	RWA1	RWA	Counted Disturbance	
CAR464	9 U	TS	RWA1	RWA	Not counted	
CAR464	10 G	G	RWA1	RWA	Counted Disturbance	
CAR464	11 U	U	RWA1	RWA	Not counted	
CAR464	12 TD	TD	RWA1	RWA	Counted Disturbance	
CAR464	13 E	E	RWA1	RWA	Counted Disturbance	
CAR464	14 W	W	RWA1	RWA	Counted Disturbance	
CAR464	15 E	E	RWA1	RWA	Counted Disturbance	
CAR464	16 U	U	RWA1	RWA	Not counted	
CAR464	17 U	TS	RWA1	RWA	Not counted	
CAR464	18 OUT	OUT	RWA1	RWA	Not counted	
CAR464	19 TD	TD	RWA1	RWA	Counted Disturbance	
CAR464	20 E	E	RWA1	RWA	Counted Disturbance	
CAR464	21 E	E	RWA1	RWA	Counted Disturbance	
CAR464	22 E	E	RWA1	RWA	Counted Disturbance	
CAR464	23 G	G	RWA1	RWA	Counted Disturbance	
CAR464	24 U	U	RWA1	RWA	Not counted	
CAR464	25 E	E	RWA1	RWA	Counted Disturbance	
CAR464	26 E	E	RWA1	RWA	Counted Disturbance	
CAR464	27 U	TS	RWA1	RWA	Not counted	
CAR464	28 E	E	RWA1	RWA	Counted Disturbance	
CAR464	29 U	U	RWA1	RWA	Not counted	
CAR464	30 E	E	RWA1	RWA	Counted Disturbance	
CAR464	31 U	U	RWA1	RWA	Not counted	
CAR464	32 E	E	RWA1	RWA	Counted Disturbance	
CAR464	33 E	E	RWA1	RWA	Counted Disturbance	
CAR464	34 E	E	RWA1	RWA	Counted Disturbance	
CAR464	35 E	E	RWA1	RWA	Counted Disturbance	
CAR464	36 U	TS	RWA1	RWA	Not counted	
CAR464	37 E	E	RWA1	RWA	Counted Disturbance	
CAR464	1 OUT	OUT	RWA2	RWA	Not counted	
CAR464	2 E	E	RWA2	RWA	Counted Disturbance	
CAR464	3 U	U	RWA2	RWA	Not counted	
CAR464	4 OUT	OUT	RWA2	RWA	Not counted	
CAR464	5 U	TS	RWA2	RWA	Not counted	
CAR464	6 E	E	RWA2	RWA	Counted Disturbance	
CAR464	7 U	U	RWA2	RWA	Not counted	
CAR464	8 U	U	RWA2	RWA	Not counted	
CAR464	9 U	U	RWA2	RWA	Not counted	
CAR464	10 OUT	OUT	RWA2	RWA	Not counted	
CAR464	11 E	E	RWA2	RWA	Counted Disturbance	
CAR464	12 E	E	RWA2	RWA	Counted Disturbance	
CAR464	13 E	E	RWA2	RWA	Counted Disturbance	

Block	Name	CountDis C&E	CountDis FREP	Description	Stratum	Summary_C&E
CAR464	16 U	U	U	RWA2	RWA	Not counted
CAR464	17 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	18 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	19 U	U	U	RWA2	RWA	Not counted
CAR464	20 U	U	U	RWA2	RWA	Not counted
CAR464	21 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	22 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	23 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	24 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	25 U	U	U	RWA2	RWA	Not counted
CAR464	26 U	U	U	RWA2	RWA	Not counted
CAR464	27 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	28 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	29 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	30 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	31 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	32 U	U	U	RWA2	RWA	Not counted
CAR464	33 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	34 U	U	U	RWA2	RWA	Not counted
CAR464	35 E	E	E	RWA2	RWA	Counted Disturbance
CAR464	36 U	U	U	RWA2	RWA	Not counted
CAR464	37 U	U	U	RWA2	RWA	Not counted
CAR464	38 U	U	U	RWA2	RWA	Not counted
CAR464	39 U	U	U	RWA2	RWA	Not counted
CAR464	1 OUT	NR	NR	RWA3	RWA	Not counted
CAR464	2 V	V	V	RWA3	RWA	Counted Disturbance
CAR464	3 U	U	U	RWA3	RWA	Not counted
CAR464	4 V	V	V	RWA3	RWA	Counted Disturbance
CAR464	5 U	U	U	RWA3	RWA	Not counted
CAR464	6 U	U	U	RWA3	RWA	Not counted
CAR464	7 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	8 U	U	U	RWA3	RWA	Not counted
CAR464	9 U	U	U	RWA3	RWA	Not counted
CAR464	10 U	U	U	RWA3	RWA	Not counted
CAR464	11 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	12 U	U	U	RWA3	RWA	Not counted
CAR464	13 U	U	U	RWA3	RWA	Not counted
CAR464	14 U	U	U	RWA3	RWA	Not counted
CAR464	15 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	16 U	U	U	RWA3	RWA	Not counted
CAR464	17 TD	TD	TD	RWA3	RWA	Counted Disturbance
CAR464	18 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	19 V	V	V	RWA3	RWA	Counted Disturbance
CAR464	20 U	TS	TS	RWA3	RWA	Not counted
CAR464	21 OUT	NR	NR	RWA3	RWA	Not counted
CAR464	22 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	23 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	24 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	25 OUT	OUT	OUT	RWA3	RWA	Not counted
CAR464	26 U	U	U	RWA3	RWA	Not counted

Block	Name	CountDis C&E	CountDis FREP	Description	Stratum	Summary_C&E
CAR464	29 E	E	E	RWA3	RWA	Counted Disturbance
CAR464	30 U	U	U	RWA3	RWA	Not counted
CAR464	31 OUT	NR	NR	RWA3	RWA	Not counted
CAR464	32 U	U	U	RWA3	RWA	Not counted
CAR464	1 E	E	E	RWA4	RWA	Counted Disturbance
CAR464	2 U	U	U	RWA4	RWA	Not counted
CAR464	3 OUT	NR	NR	RWA4	RWA	Not counted
CAR464	4 U	U	U	RWA4	RWA	Not counted
CAR464	5 OUT	NR	NR	RWA4	RWA	Not counted
CAR464	6 E	E	E	RWA4	RWA	Counted Disturbance
CAR464	7 U	U	U	RWA4	RWA	Not counted
CAR464	8 OUT	NR	NR	RWA4	RWA	Not counted
CAR464	9 U	U	U	RWA4	RWA	Not counted
CAR464	10 U	U	U	RWA4	RWA	Not counted
CAR464	11 U	U	U	RWA4	RWA	Not counted
CAR464	12 E	E	E	RWA4	RWA	Counted Disturbance
CAR464	1 U	U	U	SUA	SUA	Not counted
CAR464	2 E	E	E	SUA	SUA	Counted Disturbance
CAR464	3 U	U	U	SUA	SUA	Not counted
CAR464	4 U	U	U	SUA	SUA	Not counted
CAR464	5 U	U	U	SUA	SUA	Not counted
CAR464	6 U	U	U	SUA	SUA	Not counted
CAR464	7 U	TS	TS	SUA	SUA	Not counted
CAR464	8 U	U	U	SUA	SUA	Not counted
CAR464	9 U	U	U	SUA	SUA	Not counted
CAR464	10 TD	TD	TD	SUA	SUA	Counted Disturbance
CAR464	11 U	U	U	SUA	SUA	Not counted
CAR464	12 U	U	U	SUA	SUA	Not counted
CAR464	13 E	E	E	SUA	SUA	Counted Disturbance
CAR464	14 E	E	E	SUA	SUA	Counted Disturbance
CAR464	15 OUT	OUT	OUT	SUA	SUA	Not counted
CAR464	16 E	E	E	SUA	SUA	Counted Disturbance
CAR464	17 U	U	U	SUA	SUA	Not counted
CAR464	18 U	U	U	SUA	SUA	Not counted
CAR464	19 U	U	U	SUA	SUA	Not counted
CAR464	20 U	TS	TS	SUA	SUA	Not counted
CAR464	21 U	U	U	SUA	SUA	Not counted
CAR464	22 U	U	U	SUA	SUA	Not counted
CAR464	23 E	E	E	SUA	SUA	Counted Disturbance
CAR464	24 U	U	U	SUA	SUA	Not counted
CAR464	25 U	U	U	SUA	SUA	Not counted
CAR464	26 U	U	U	SUA	SUA	Not counted
CAR464	27 U	U	U	SUA	SUA	Not counted
CAR464	28 OUT	OUT	OUT	SUA	SUA	Not counted
CAR464	29 U	TS	TS	SUA	SUA	Not counted
CAR464	30 U	U	U	SUA	SUA	Not counted
CAR464	31 U	U	U	SUA	SUA	Not counted
CAR464	32 U	U	U	SUA	SUA	Not counted
CAR464	33 OUT	OUT	OUT	SUA	SUA	Not counted
CAR464	34 U	TS	TS	SUA	SUA	Not counted

Block	Name	CountDis C&E	CountDis FREP	Description	Stratum	Summary_C&E
CAR464	37 U	U	U	SUA	SUA	Not counted
CAR464	38 U	U	U	SUA	SUA	Not counted
CAR464	39 E	E	E	SUA	SUA	Counted Disturbance
CAR464	40 U	U	U	SUA	SUA	Not counted
CAR464	41 U	U	U	SUA	SUA	Not counted
CAR464	42 E	E	E	SUA	SUA	Counted Disturbance
CAR464	43 N/A	N/A	N/A	SUA	SUA	Not counted
CAR464	44 U	U	U	SUA	SUA	Not counted
CAR464	45 U	U	U	SUA	SUA	Not counted
CAR464	46 U	U	U	SUA	SUA	Not counted
CAR464	47 E	E	E	SUA	SUA	Counted Disturbance
CAR464	48 U	U	U	SUA	SUA	Not counted
CAR464	49 E	E	E	SUA	SUA	Counted Disturbance
CAR464	50 U	U	U	SUA	SUA	Not counted
CAR464	51 U	U	U	SUA	SUA	Not counted
CAR464	52 U	U	U	SUA	SUA	Not counted
CAR464	53 U	U	U	SUA	SUA	Not counted
CAR464	54 OUT	U	U	SUA	SUA	Not counted
CAR464	55 E	E	E	SUA	SUA	Counted Disturbance
CAR464	56 E	E	E	SUA	SUA	Counted Disturbance
CAR464	57 U	U	U	SUA	SUA	Not counted
CAR464	58 OUT	E	E	SUA	SUA	Not counted
CAR464	59 U	U	U	SUA	SUA	Not counted
CAR464	60 U	U	U	SUA	SUA	Not counted
CAR464	61 U	U	U	SUA	SUA	Not counted
CAR464	62 E	E	E	SUA	SUA	Counted Disturbance
CAR464	63 E	E	E	SUA	SUA	Counted Disturbance
CAR464	64 U	U	U	SUA	SUA	Not counted
CAR464	65 E	E	E	SUA	SUA	Counted Disturbance
CAR464	66 U	U	U	SUA	SUA	Not counted
CAR464	67 U	U	U	SUA	SUA	Not counted
CAR464	68 U	U	U	SUA	SUA	Not counted
CAR464	69 U	U	U	SUA	SUA	Not counted
CAR464	70 N/A	N/A	N/A	SUA	SUA	Not counted
CAR464	71 U	U	U	SUA	SUA	Not counted
CAR464	72 U	U	U	SUA	SUA	Not counted
CAR464	73 U	U	U	SUA	SUA	Not counted
CAR464	74 U	U	U	SUA	SUA	Not counted
CAR464	75 U	U	U	SUA	SUA	Not counted
CAR464	76 U	U	U	SUA	SUA	Not counted
CAR464	77 TD	TD	TD	SUA	SUA	Counted Disturbance
CAR464	78 U	U	U	SUA	SUA	Not counted
CAR464	79 U	U	U	SUA	SUA	Not counted
CAR464	80 U	U	U	SUA	SUA	Not counted
CAR464	81 U	U	U	SUA	SUA	Not counted
CAR464	82 TD	TD	TD	SUA	SUA	Counted Disturbance
CAR464	83 U	U	U	SUA	SUA	Not counted
CAR464	84 U	U	U	SUA	SUA	Not counted
CAR464	85 U	U	U	SUA	SUA	Not counted
CAR464	86 U	U	U	SUA	SUA	Not counted

Block	Name	CountDis C&E	CountDis FREP	Description	Stratum	Summary_C&E
CAR464	89 U	U	U	SUA	SUA	Not counted
CAR464	90 U	U	U	SUA	SUA	Not counted
CAR464	91 U	U	U	SUA	SUA	Not counted
CAR464	92 TD	TD	TD	SUA	SUA	Counted Disturbance
CAR464	93 U	U	U	SUA	SUA	Not counted
CAR464	94 E	E	E	SUA	SUA	Counted Disturbance
CAR464	95 E	E	E	SUA	SUA	Counted Disturbance
CAR464	96 U	U	U	SUA	SUA	Not counted
CAR464	97 U	U	U	SUA	SUA	Not counted
CAR464	98 U	U	U	SUA	SUA	Not counted
CAR464	99 U	U	U	SUA	SUA	Not counted
CAR464	100 U	U	U	SUA	SUA	Not counted
CAR464	101 E	E	E	SUA	SUA	Counted Disturbance
CAR464	102 E	E	E	SUA	SUA	Counted Disturbance
CAR464	103 U	U	U	SUA	SUA	Not counted
CAR464	104 U	U	U	SUA	SUA	Not counted
CAR464	105 U	U	U	SUA	SUA	Not counted
CAR464	106 E	E	E	SUA	SUA	Counted Disturbance
CAR464	107 U	U	U	SUA	SUA	Not counted
CAR464	108 U	U	U	SUA	SUA	Not counted
CAR464	109 E	E	E	SUA	SUA	Counted Disturbance
CAR464	110 U	U	U	SUA	SUA	Not counted
CAR464	111 U	U	U	SUA	SUA	Not counted
CAR464	112 E	E	E	SUA	SUA	Counted Disturbance
CAR464	113 U	U	U	SUA	SUA	Not counted
CAR464	114 U	U	U	SUA	SUA	Not counted

NOTE

	Surveyor	Position
	Stephane	10U 469904 6019859
	Stephane	10U 469939 6019869
	Stephane	10U 469937 6019863
	Stephane	10U 469895 6019826
	Stephane	10U 469804 6019820
	Stephane	10U 469993 6019867
	Stephane	10U 469997 6019901
	Stephane	10U 470006 6019901
	Stephane	10U 469983 6019905
	Stephane	10U 469897 6019839
	Stephane	10U 470040 6019888
	Stephane	10U 469983 6019905
	Stephane	10U 470001 6019907
	Stephane	10U 470012 6019887
	Stephane	10U 469970 6019867
	Stephane	10U 469923 6019887
	Stephane	10U 470022 6019896
Road	Stephane	
	Stephane	10U 469966 6019873
	Stephane	10U 469789 6019802
	Stephane	10U 469857 6019841
	Stephane	10U 470008 6019884
	Stephane	10U 469942 6019860
	Stephane	10U 469876 6019847
	Stephane	10U 469882 6019829
	Stephane	10U 469916 6019846
	Stephane	10U 470029 6019889
	Stephane	10U 469876 6019819
	Stephane	10U 469936 6019850
	Stephane	10U 469884 6019820
	Stephane	10U 469799 6019803
	Stephane	10U 469848 6019813
	Stephane	10U 469983 6019876
	Stephane	10U 470005 6019885
	Stephane	10U 469838 6019828
	Stephane	10U 470051 6019890
	Stephane	10U 470013 6019900
	Stephane	
	Stephane	10U 469948 6019817
	Stephane	10U 469940 6019804
	Stephane	
	Stephane	10U 469955 6019818
	Stephane	10U 469976 6019807
	Stephane	10U 469876 6019778
	Stephane	10U 469807 6019762
	Stephane	10U 469846 6019779
	Stephane	
	Stephane	10U 469949 6019821
	Stephane	10U 470052 6019885
	Stephane	10U 469922 6019817

NOTE

Surveyor	Position
Stephane	10U 469942 6019789
Stephane	10U 469806 6019767
Stephane	10U 469903 6019811
Stephane	10U 469830 6019769
Stephane	10U 469881 6019782
Stephane	10U 469992 6019855
Stephane	10U 469943 6019827
Stephane	10U 469791 6019772
Stephane	10U 469892 6019786
Stephane	10U 469940 6019788
Stephane	10U 469927 6019780
Stephane	10U 469841 6019777
Stephane	10U 469794 6019775
Stephane	10U 469905 6019789
Stephane	10U 470001 6019857
Stephane	10U 469967 6019811
Stephane	10U 469912 6019800
Stephane	10U 469855 6019776
Stephane	10U 469879 6019787
Stephane	10U 469875 6019795
Stephane	10U 469876 6019794
Stephane	10U 469817 6019778
Stephane	10U 470047 6019876
Stephane	10U 470033 6019860
Stephane	
Stephane	10U 469704 6019802
Stephane	10U 469569 6019890
Stephane	10U 469670 6019832
Stephane	10U 469756 6019738
Stephane	10U 469722 6019785
Stephane	10U 469682 6019802
Stephane	10U 469573 6019897
Stephane	10U 469724 6019763
Stephane	10U 469583 6019886
Stephane	10U 469709 6019797
Stephane	10U 469709 6019781
Stephane	10U 469790 6019710
Stephane	10U 469637 6019839
Stephane	10U 469810 6019679
Stephane	10U 469543 6019911
Stephane	10U 469651 6019824
Stephane	10U 469773 6019712
Stephane	10U 469691 6019813
Stephane	10U 469792 6019678
Stephane	
Stephane	10U 469697 6019793
Stephane	10U 469654 6019843
Stephane	10U 469718 6019785
Stephane	
Stephane	10U 469822 6019864

Not in roadside

Gully

NOTE

Not in roadside

Surveyor	Position
Stephane	10U 469723 6019755
Stephane	10U 469533 6019915
Stephane	
Stephane	10U 469802 6019692
Stephane	10U 470234 6019431
Stephane	10U 470163 6019392
Stephane	
Stephane	10U 470445 6019488
Stephane	
Stephane	10U 470229 6019429
Stephane	10U 470415 6019486
Stephane	
Stephane	10U 470380 6019472
Stephane	10U 470400 6019484
Stephane	10U 470244 6019428
Stephane	10U 470158 6019388
Stephane	10U 469819 6019317
Stephane	10U 470064 6019633
Stephane	10U 469822 6019335
Stephane	10U 469633 6019672
Stephane	10U 470046 6019750
Stephane	10U 470439 6019493
Stephane	10U 470003 6019329
Stephane	10U 470193 6019558
Stephane	10U 470201 6019587
Stephane	10U 470123 6019765
Stephane	10U 470094 6019786
Stephane	10U 470014 6019633
Stephane	10U 470128 6019671
Stephane	10U 469923 6019887
Stephane	10U 470103 6019375
Stephane	10U 470016 6019327
Stephane	10U 470286 6019677
Stephane	10U 470127 6019779
Stephane	10U 469811 6019753
Stephane	10U 469985 6019671
Stephane	10U 469981 6019578
Stephane	10U 469581 6019752
Stephane	10U 470049 6019654
Stephane	10U 470218 6019630
Stephane	10U 469732 6019898
Stephane	10U 469990 6019956
Stephane	10U 470029 6019768
Stephane	10U 470096 6019852
Stephane	10U 470353 6019567
Stephane	10U 469984 6019465
Stephane	10U 469986 6019934
Stephane	10U 469822 6019769
Stephane	10U 469867 6020047
Stephane	10U 470053 6019888

NOTE

Surveyor

Position

Stephane 10U 469720 6019961
Stephane 10U 470105 6019594
Stephane 10U 469938 6019316
Stephane 10U 469780 6019978
Stephane 10U 469878 6019494
Stephane 10U 469769 6019909

not detected in the original survey field card

Stephane
Stephane 10U 470378 6019522
Stephane 10U 469878 6019404
Stephane 10U 469616 6019895
Stephane 10U 470219 6019482
Stephane 10U 469914 6019987
Stephane 10U 470089 6019767
Stephane 10U 469521 6019842
Stephane 10U 469836 6019120
Stephane 10U 470045 6019440
Stephane 10U 469958 6019783

Roadside

Stephane 10U 469806 6019815
Stephane 10U 469913 6019689
Stephane 10U 469917 6019875
Stephane 10U 469667 6019656

Roadside

Stephane 10U 469955 6019808
Stephane 10U 470060 6019810
Stephane 10U 469831 6019580
Stephane 10U 469636 6019928
Stephane 10U 469996 6019260
Stephane 10U 469746 6019713
Stephane 10U 470402 6019541
Stephane 10U 470181 6019451
Stephane 10U 469751 6019861
Stephane 10U 470094 6019483
Stephane 10U 470283 6019540
Stephane 10U 470082 6019751

not detected in the original survey field card

Stephane
Stephane 10U 470079 6019741
Stephane 10U 469958 6019951
Stephane 10U 470009 6019371
Stephane 10U 469855 6019968
Stephane 10U 470294 6019675
Stephane 10U 470107 6019814
Stephane 10U 469944 6019322
Stephane 10U 469884 6019736
Stephane 10U 470159 6019611
Stephane 10U 470283 6019690
Stephane 10U 469883 6019396
Stephane 10U 469878 6019706
Stephane 10U 469816 6019648
Stephane 10U 469523 6019900

Stephane 10U 470357 6019523
Stephane 10U 469938 6019316

NOTE

Surveyor	Position
Stephane	10U 469797 6020009
Stephane	10U 469864 6020003
Stephane	10U 469668 6019849
Stephane	10U 469565 6019759
Stephane	10U 470026 6019343
Stephane	10U 469883 6019934
Stephane	10U 469979 6019955
Stephane	10U 470141 6019600
Stephane	10U 469983 6019549
Stephane	10U 469925 6019715
Stephane	10U 470116 6019447
Stephane	10U 470175 6019555
Stephane	10U 470054 6019377
Stephane	10U 469508 6019896
Stephane	10U 469798 6019374
Stephane	10U 469640 6019885
Stephane	10U 469848 6019893
Stephane	10U 470017 6019841
Stephane	10U 469967 6019801
Stephane	10U 469932 6020012
Stephane	10U 469871 6019503
Stephane	10U 469950 6019797
Stephane	10U 469906 6019712
Stephane	10U 469849 6019982
Stephane	10U 469986 6019725
Stephane	10U 469824 6019361

* This table combined all the availab

information from Stephane and Steve as of March 29th, 2012. * I separated surveyed soil disturbance for compliance ("Count

C&E") and FREP ("CountDis FREP").



File Number
265-20/ FRPA - DTA

I also acknowledge and recognize that my authorities as an Official are automatically extinguished if and when I am no longer employed by the Ministry of Forests and Range and/or when I transfer to another program area within the Ministry of Forests and Range.

[illegible]Page 242
FNR-2013-00368, Part 1



BRITISH
COLUMBIA



OFFICIAL DESIGNATION
UNDER THE *WILDFIRE ACT*

FILE NO.

265-20/FRPA-DJA

Pursuant to section 1 of the *Wildfire Act*, I hereby designate the following persons as officials for the purpose of administering sections 2, 6(3), 7(3), 9(1), 10(1)(b), 11(2)(a), 13(1), 19(1), 20(1), 21, 22(1), (2) and (3), 24, 34(1), 35(1)(b) and 73 of the *Wildfire Act*.

In addition, these persons are designated to administer sections 20(4), 21(4), 22(5), 23(5) and 24(3) of the Wildfire Regulation.

Finally, these persons are designated officials for the purpose of issuing Violation Tickets for offences against the *Wildfire Act* and Wildfire Regulations.

[illegible]



BRITISH
COLUMBIA



FOREST OFFICIAL
DESIGNATION UNDER FRPA

File Number
265-20/FRPA - DJA

By way of my signature, I acknowledge the duties and responsibilities that arise from my designation as a Forest Official pursuant to Section 1 of the *Forest and Range Practices Act*.

I also acknowledge and recognize that my authorities as a Forest Official are automatically extinguished if and when I am no longer employed by the Ministry of Forests and Range and/or when I transfer to another program area within the Ministry of Forests and Range.

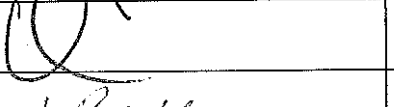
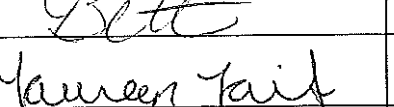
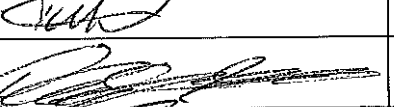
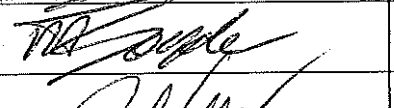
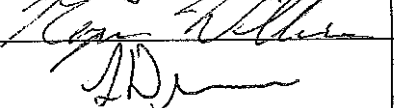
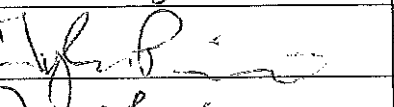
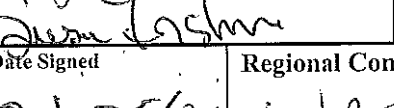
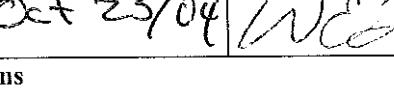
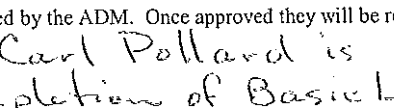
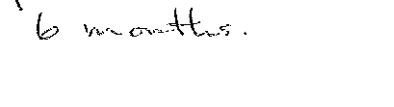
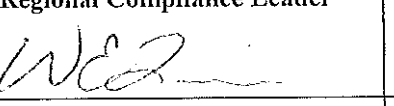
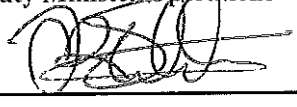
Name and Initials	Signature	Office Location	Badge #
ANDREW L. WHEATLEY		FORT ST. JAMES	0703
JEFF JONES		FORT ST. JAMES	1148
TYSON LUEDTKE		FORT ST. JAMES	
District Compliance Leader	Date Signed	Regional Compliance Leader	Date Signed
	August 29/05		06/01/14
		Assistant Deputy Minister Operations	Date Signed
			06/02/15

All designations will be approved by the ADM. Once approved they will be returned to the C&E Branch Director for distribution.

AUG 31 2005

By way of my signature, I acknowledge the duties and responsibilities that arise from my designation as a Forest Official pursuant to Section 1 of the *Forest and Range Practices Act*.

I also acknowledge and recognize that my authorities as a Forest Official are automatically extinguished if and when I am no longer employed by the Ministry of Forests and/or when I transfer to another program area within the Ministry of Forests.

Name and Initials	Signature	Office Location	Badge #
Jeff Holland		Fort St James	1152
Darrin Halloran		Fort St James	0664
Louise Bett		Fort St James	1583
Maureen Tait		Fort St James	N/A
Kevin Gustafson		Fort St James	0226
Todd Deveau		Fort St James	1590
Clayton Gross		Fort St James	1154
Mike Boyde		Fort St James	1985
Jim Norlock		Fort St James	0773
Byron Goerz		Fort St James	1586
* Carl Pollard		Fort St James	N/A
Megan Williams		Fort St James	1598
Lauri Deveau		Fort St James	1159
Tyler Pierre		Fort St James	N/A
Sue Forshner		Fort St James	1149
District Compliance Leader	Date Signed  Oct 25/04	Regional Compliance Leader 	Date Signed 04/10/28
Assistant Deputy Minister Operations			Date Signed 04-11-24

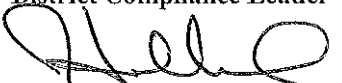
All designations will be approved by the ADM. Once approved they will be returned to the C&E Branch Director for distribution.

* Designation for Carl Pollard is conditional to successful completion of Basic Law training within 6 months.



File No. 265-20/FRPA
Page 2 of 2 - DJA

I also acknowledge and recognize that my authorities as a Forest Official are automatically extinguished if and when I am no longer employed by the Ministry of Forests and/or when I transfer to another program area within the Ministry of Forests.

Name and Initials	Signature	Office Location	Badge #
Kelly Glenn		Fort St James	1597
District Compliance Leader	Date Signed	Regional Compliance Leader	Date Signed
	Oct 25/04		04-10-28
Assistant Deputy Minister Operations			Date Signed
			04-11-24

Page 246
FNR-2013-00368, Part 1

AUGUST 28/08

1430	1600 AM.	
1435	A33501 B66 CARLIS9. SEE A, B, AND	
AG	C - BUILT TO END AND UNWELLED.	
08/09/02	ROAD RIGHT OF WAY PARCESSED AND	
AR	HAILED. CHECK APPRAISAL FOR	
08/09/03	ECG COSTS INTO OTHER PORTION	
	OF BULL. ROAD DRIVEN - GOOD	
	SUNDE. - BEST DUMP WORKING	
	IN PMP.	
1455	1600 AM.	
1615	OFFICE - UNLOAD GEAR.	
1630	OFF DUTY. 8.0 HOURS.	
		21
AUGUST 29/08 - FRIDAY - P. CLOUDY		

OCTOBER 29/08

1320	R15373 Blk. Blk-4, Blk-5,
AR	B-46-16 AND Blk-3 ALL
08/11/05	ROADS BUILT. DRAINAGE STREET-
AG	WAYS FUNCTIONING. ROAD STATUS
08/11/05	BEEN CHANGED
AH	A-33807 Blk COTE 464. BLOCK
08/11/05	LOCATED. BOUNDARY APPEARS CONSISTE
	NT WITH MAPS. BLOCK WAS
	ADJACENT TO THE STREET, AND
	PILES. SMALL COTTAGES LEFT
	THROUGHOUT BLOCK.
1340	MENT OUT.



ROAD INSPECTION REPORT

ID: 170513

X-Ref: IDIR\MIBOYDE 2008/10/28 00:00:00

A	Licensee: CANADIAN FOREST PRODUCTS LTD. PO BOX 9000 PRINCE GEORGE BC V2L4W2 Operator/Contractor: In Attendance: Mike Boyde		Tenure (type/no): B01/R15373 Section: B66_3 Road Name: SEC B66-3 895001.100 Road Status: Construction Other Section(s): B66_3, B66_4, B66_5, B66_6 Inspection Date (yyyy/mm/dd hh:mm): 2008/10/28 0:00 Regional Inspection: ☐		Amend #:
	Inspection Method		Area Inspected		
B	Ocular: ☒ Recce: ☐ Detailed Survey: ☐ Admin/Office: ☐	Roads/Trails: Complete Location Inspected:			
Activity Status					
C	Road/Trail Construction		Complete	Semi-permanent Deactivation	N/A
	Re-vegetation		N/A	Road Maintenance	Active
	Permanent Deactivation		N/A	Other	N/A
	Temporary Deactivation		N/A	if "Other", please specify	
Comments about status (length constructed):					
Comments about weather conditions, snow depth:					
Compliance Summary					
D	General Requirement			Compliance Status	
	1	Road/trail/landing construction (% quality, location)		Yes	
	2	Riparian management (debris mgmt., crossings etc.)		Yes	
	3	Forest health/protection (piling/FFPSR/etc.)		Yes	
	4	Road/Trail maintenance (water mgmt., integrity)		Yes	
	5	Road/trail use (gates, etc.)		N/A	
	6	Revenue Management (utilization, marking etc.)		Yes	
	7	Public safety/safe practices (signage, danger trees, etc.)		Yes	
	8	Site deactivation		N/A	
	9	Site rehabilitation		N/A	
	10	Other Plan/Prescription requirements		N/A	
Compliance Summary Comments:					
E	Inspector: Mike Boyde Signature: X (I certify that this inspection conforms to Ministry of Forests' compliance procedures)		Received by: Signature: X (Signing does not imply agreement with findings)		
	Attachment Description: Checklist: ☐ Digital Image: ☐ Other: ☐ Checklist: Other:		Delivery Method: Email: ☐ Fax: ☐ Mail: ☒ Hand Delivered: ☐		
	File # 11400-20/R15373 File #				

ROAD INSPECTION REPORT

ID: 170513

X-Ref: IDIRIMIBOYDE 2008/10/28 00:00:00

A	Licensee: CANADIAN FOREST PRODUCTS LTD. PO BOX 9000 PRINCE GEORGE BC V2L4W2 Operator/Contractor: In Attendance: Mike Boyde	Tenure (type/no): B01/R15373 Amend #: Section: B66_3 Road Name: SEC B66-3 895001.100 Road Status: Construction Other Section(s): B66_3, B66_4, B66_5, B66_6 Inspection Date (yyyy/mm/dd hh:mm): 2008/10/28 0:00 Regional Inspection: ☐
(1) Road B66-3 was built to end. (2) Road B66-4 was built to end. (3) Road B66-5 was built to end. (4) Road B66-6 was built to end. (5) Road right of way wood has been removed. (6) Drainage structures appeared functional. This inspection has revealed that operations are being conducted in accordance with FRPA.		
E	Inspector: Mike Boyde Signature: X (I certify that this inspection conforms to Ministry of Forests' compliance procedures)	Received by: Signature: X (Signing does not imply agreement with findings)



Fire Weather System

Bounded Days for MCLEOD LAKE

From 1998/08/10 to 1998/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
1998/08/10	act	18.2	39	240	14	3.8	*	74.7	44	505	1.6	73	6.2	3
1998/08/11	act	16.0	54	176	12	0.0	*	82.5	46	511	2.7	75	10.3	4
1998/08/12	act	23.2	46	237	20	3.0	*	79.7	39	509	3.1	66	10.5	3
1998/08/13	act	21.7	41	207	11	0.0	*	87.4	42	516	5.2	70	16.3	3
1998/08/14	act	13.7	96	175	1	5.9	*	31.3	26	497	0.0	46	0.0	2
1998/08/15	act	16.2	65	142	6	13.0	*	36.5	13	442	0.0	24	0.0	2
1998/08/16	act	12.9	94	12	5	10.0	*	15.0	6	408	0.0	12	0.0	1
1998/08/17	act	10.5	99	200	6	3.1	*	9.2	4	406	0.0	8	0.0	1
1998/08/18	act	16.9	64	194	10	0.0	*	45.5	5	412	0.1	10	0.1	1
1998/08/19	act	19.1	50	157	15	0.0	*	75.4	7	418	1.7	14	1.7	2
1998/08/20	act	21.7	48	148	5	0.0	*	84.5	10	425	2.5	19	3.9	2
1998/08/21	act	22.5	40	233	14	0.8	*	87.6	13	432	6.1	24	10.4	3
1998/08/22	act	18.6	41	226	13	0.0	*	88.5	15	439	6.6	28	12.0	3
1998/08/23	act	21.4	38	222	12	0.0	*	89.6	18	446	7.6	33	14.5	3
1998/08/24	act	17.3	48	233	16	0.0	*	89.0	20	452	8.1	36	16.2	3
1998/08/25	act	13.5	64	214	15	0.0	*	86.4	21	457	5.4	38	12.0	3
1998/08/26	act	14.8	68	218	10	5.9	*	55.1	14	441	0.5	25	0.5	2
1998/08/27	act	14.5	51	228	29	0.9	*	76.2	15	447	3.6	28	7.1	2
1998/08/28	act	20.9	44	212	14	0.0	*	86.1	18	453	4.8	32	10.0	3
1998/08/29	act	22.4	39	217	23	0.0	*	89.3	21	460	12.3	37	22.2	3
1998/08/30	act	18.9	30	289	6	0.0	*	90.6	23	467	6.4	42	14.6	3
1998/08/31	act	23.3	27	121	9	0.0	*	92.2	27	474	9.1	48	20.3	4
1998/09/01	act	20.6	42	247	18	0.0	*	90.8	29	479	11.7	51	25.1	4
1998/09/02	act	17.5	30	235	32	0.0	*	90.8	32	484	23.9	55	41.7	4
1998/09/03	act	13.9	46	226	7	0.0	*	89.4	33	488	5.6	57	15.5	3
1998/09/04	act	14.0	45	232	9	0.3	*	89.1	35	493	5.8	59	16.4	3
1998/09/05	act	17.4	33	44	9	0.0	*	89.8	37	498	6.7	62	18.6	4
1998/09/06	act	16.9	57	182	6	0.0	*	88.1	38	502	4.3	64	13.5	3
1998/09/07	act	14.0	68	229	7	5.2	*	54.8	25	486	0.4	45	0.6	2
1998/09/08	act	14.7	45	230	13	0.3	*	76.9	27	490	1.7	47	4.9	3
1998/09/09	act	12.7	49	286	6	0.0	*	82.7	28	494	2.1	49	6.2	3
1998/09/10	act	11.1	75	186	10	4.5	*	52.5	19	482	0.4	35	0.5	2

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 1999/08/10 to 1999/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
1999/08/10	act	20.0	50	3	3	0.0	*	87.9	35	326	3.7	55	11.1	3
1999/08/11	act	15.8	57	79	13	0.0	*	87.3	37	331	5.5	58	15.5	3
1999/08/12	act	14.8	78	9	9	0.6	*	83.4	37	337	2.7	59	8.8	3
1999/08/13	act	21.0	48	231	10	0.0	*	86.9	40	344	4.5	62	13.8	3
1999/08/14	act	20.9	43	198	17	0.0	*	88.5	42	351	8.3	65	22.3	4
1999/08/15	act	18.3	54	201	7	0.0	*	88.2	44	357	4.8	68	15.1	3
1999/08/16	act	19.4	50	180	14	0.3	*	88.2	46	363	6.9	70	20.4	4
1999/08/17	act	20.9	47	170	15	0.0	*	88.3	49	370	7.2	73	21.5	4
1999/08/18	act	23.0	49	143	8	0.9	*	86.0	51	377	3.6	77	13.2	4
1999/08/19	act	23.8	44	261	9	0.0	*	88.6	54	385	5.4	80	18.3	4
1999/08/20	act	24.4	43	129	9	0.0	*	89.2	57	392	6.0	84	20.2	4
1999/08/21	act	15.7	58	269	22	2.7	*	73.9	48	398	2.2	74	8.6	4
1999/08/22	act	18.2	49	217	19	0.0	*	84.3	50	404	5.0	77	16.8	4
1999/08/23	act	12.0	87	209	10	3.2	*	53.7	39	402	0.4	63	0.8	2
1999/08/24	act	11.9	99	196	11	6.8	*	18.2	23	384	0.0	40	0.0	2
1999/08/25	act	12.7	74	234	23	19.7	*	35.3	10	319	0.0	18	0.0	1
1999/08/26	act	10.7	62	211	10	0.3	*	59.3	11	324	0.7	20	0.6	2
1999/08/27	act	14.7	73	50	9	1.1	*	66.7	12	329	0.9	22	0.8	2
1999/08/28	act	24.7	41	193	13	0.0	*	85.8	15	337	4.6	27	8.8	3
1999/08/29	act	7.7	84	287	12	0.0	*	82.1	15	341	2.6	27	5.3	2
1999/08/30	act	11.2	70	200	8	1.7	*	70.5	15	346	1.0	27	1.2	2
1999/08/31	act	14.9	49	35	6	4.4	*	59.8	11	341	0.5	20	0.5	2
1999/09/01	act	12.7	64	199	12	0.0	*	73.9	12	345	1.4	22	2.0	2
1999/09/02	act	14.9	55	210	11	0.3	*	81.7	13	349	2.4	24	4.3	2
1999/09/03	act	16.0	53	218	13	0.0	*	85.0	15	354	4.0	27	7.7	2
1999/09/04	act	12.2	85	202	14	1.7	*	68.4	14	358	1.2	25	1.9	2
1999/09/05	act	12.4	83	146	10	5.2	*	43.3	9	347	0.1	16	0.1	1
1999/09/06	act	9.0	91	254	14	8.2	*	23.5	4	325	0.0	8	0.0	1
1999/09/07	act	14.1	60	199	10	0.6	*	54.3	5	330	0.4	10	0.3	1
1999/09/08	act	12.6	73	158	11	0.5	*	68.4	6	334	1.0	12	0.7	1
1999/09/09	act	11.3	78	239	16	14.7	*	37.6	3	291	0.0	6	0.0	1
1999/09/10	act	12.6	53	255	19	0.0	*	67.4	4	295	1.5	8	0.8	1

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2000/08/10 to 2000/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2000/08/10	act	16.5	53	24	8	0.0	*	84.7	20	278	3.1	34	7.1	2
2000/08/11	act	14.3	58	340	4	0.0	*	85.0	21	284	2.6	36	6.3	2
2000/08/12	act	17.8	51	236	13	0.3	*	86.4	23	290	5.0	39	11.5	3
2000/08/13	act	12.3	71	343	7	0.0	*	84.8	24	295	2.9	40	7.3	2
2000/08/14	act	17.5	48	206	16	0.0	*	86.7	26	301	5.8	43	13.8	3
2000/08/15	act	17.8	58	172	8	0.0	*	86.8	28	308	4.0	45	10.5	3
2000/08/16	act	19.2	52	128	12	0.0	*	86.9	30	314	5.0	48	12.9	3
2000/08/17	act	14.6	78	138	2	3.8	*	52.4	22	312	0.2	37	0.3	2
2000/08/18	act	10.9	93	171	4	7.5	*	21.7	12	296	0.0	22	0.0	2
2000/08/19	act	9.9	91	235	13	3.8	*	22.6	8	293	0.0	15	0.0	1
2000/08/20	act	11.5	72	207	20	0.8	*	50.5	9	298	0.5	16	0.4	1
2000/08/21	act	12.0	87	198	14	3.4	*	41.6	6	297	0.1	11	0.1	1
2000/08/22	act	13.8	85	205	18	4.5	*	39.1	4	292	0.1	7	0.0	1
2000/08/23	act	16.4	78	215	14	2.1	*	52.1	3	298	0.4	6	0.2	1
2000/08/24	act	19.2	75	135	12	0.6	*	69.5	4	305	1.1	8	0.6	1
2000/08/25	act	13.4	86	285	5	10.6	*	30.1	2	280	0.0	4	0.0	1
2000/08/26	act	13.1	66	267	19	10.9	*	41.9	1	255	0.1	3	0.0	1
2000/08/27	act	11.1	72	267	7	3.5	*	43.3	1	254	0.1	2	0.0	1
2000/08/28	act	7.4	99	203	8	2.9	*	25.0	0	254	0.0	0	0.0	1
2000/08/29	act	10.8	74	30	15	3.0	*	41.0	1	255	0.1	1	0.0	1
2000/08/30	act	9.8	75	206	10	0.0	*	58.0	1	260	0.6	2	0.2	1
2000/08/31	act	8.5	90	23	17	12.7	*	24.6	0	231	0.0	0	0.0	1
2000/09/01	act	3.1	89	31	22	0.9	*	35.1	0	233	0.0	1	0.0	1
2000/09/02	act	5.1	94	14	14	0.3	*	41.5	0	235	0.1	1	0.0	1
2000/09/03	act	6.8	91	22	7	22.3	*	13.8	0	182	0.0	0	0.0	1
2000/09/04	act	9.9	81	185	10	0.0	*	33.5	1	185	0.0	1	0.0	1
2000/09/05	act	14.8	73	266	12	2.1	*	50.2	1	189	0.3	1	0.1	1
2000/09/06	act	15.3	45	220	17	0.0	*	76.3	2	194	2.0	5	0.8	1
2000/09/07	act	8.6	98	238	11	12.7	*	17.5	1	168	0.0	1	0.0	1
2000/09/08	act	6.5	93	266	12	1.8	*	21.5	0	171	0.0	0	0.0	1
2000/09/09	act	6.1	99	210	12	7.5	*	7.0	0	159	0.0	0	0.0	1
2000/09/10	est	6.0	90	210	12	5.0	*	14.2	0	154	0.0	0	0.0	1

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2001/08/10 to 2001/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2001/08/10	act	23.4	48	199	9	0.0	*	87.5	9	187	4.8	16	6.8	2
2001/08/11	act	24.1	49	186	8	0.0	*	88.1	12	194	5.0	21	8.1	3
2001/08/12	act	26.9	38	81	4	0.0	*	90.4	16	202	5.7	26	10.2	3
2001/08/13	act	26.8	51	224	9	0.0	*	90.0	18	210	6.7	30	12.6	3
2001/08/14	act	26.0	41	215	6	0.0	*	90.1	22	218	6.0	35	12.5	3
2001/08/15	act	26.8	34	225	14	0.0	*	91.4	25	226	10.4	40	20.4	3
2001/08/16	act	28.5	39	125	3	0.0	*	91.4	29	234	6.2	45	14.8	3
2001/08/17	act	22.2	54	242	10	0.0	*	89.2	31	241	6.2	47	15.3	3
2001/08/18	act	15.8	67	169	8	3.2	*	65.0	25	242	0.8	40	1.5	2
2001/08/19	act	13.3	73	249	13	0.0	*	74.8	26	247	1.5	41	3.8	2
2001/08/20	act	9.4	90	241	14	4.1	*	42.7	18	244	0.1	30	0.1	2
2001/08/21	act	10.0	96	131	10	5.0	*	21.9	11	238	0.0	20	0.0	2
2001/08/22	act	17.0	64	171	16	0.0	*	57.9	13	245	0.8	22	0.8	2
2001/08/23	act	14.9	68	225	6	8.3	*	42.9	7	230	0.1	14	0.1	1
2001/08/24	act	13.5	62	240	15	2.1	*	59.3	7	236	0.8	13	0.6	1
2001/08/25	act	16.3	70	212	17	7.1	*	51.6	4	226	0.5	8	0.3	1
2001/08/26	act	18.7	70	223	6	1.1	*	65.1	6	232	0.7	10	0.4	1
2001/08/27	act	20.0	63	214	16	0.8	*	78.2	7	239	2.2	13	2.5	2
2001/08/28	act	18.3	51	238	10	0.3	*	84.5	9	245	3.3	17	4.7	2
2001/08/29	act	20.2	52	197	8	0.0	*	86.4	11	252	3.9	20	6.4	2
2001/08/30	act	21.4	53	148	8	0.0	*	86.9	13	258	4.1	24	7.3	2
2001/08/31	act	15.4	71	213	16	11.7	*	50.7	7	234	0.4	13	0.3	1
2001/09/01	act	13.8	54	233	23	8.6	*	55.3	5	218	0.9	9	0.5	1
2001/09/02	act	13.5	56	207	10	0.0	*	73.2	6	222	1.2	11	0.7	1
2001/09/03	act	11.4	62	231	20	11.0	*	50.3	3	199	0.5	6	0.2	1
2001/09/04	act	9.6	71	289	14	0.0	*	66.0	4	203	1.1	7	0.6	1
2001/09/05	act	10.8	65	237	12	2.3	*	62.7	3	207	0.9	6	0.4	1
2001/09/06	act	7.7	84	273	19	3.1	*	48.7	2	205	0.4	3	0.1	1
2001/09/07	act	14.8	47	209	12	0.3	*	73.6	3	210	1.3	6	0.6	1
2001/09/08	act	12.2	48	263	20	0.0	*	82.7	4	214	4.2	8	4.2	2
2001/09/09	act	8.7	68	200	3	0.0	*	82.7	5	217	1.8	9	1.2	2
2001/09/10	act	10.9	56	42	14	0.0	*	84.2	6	221	3.8	11	4.4	2

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2002/08/10 to 2002/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2002/08/10	act	17.6	45	269	4	0.0	*	89.1	34	310	4.6	54	12.9	3
2002/08/11	act	13.3	73	203	9	3.6	*	60.1	26	308	0.7	43	1.0	2
2002/08/12	act	23.8	42	263	14	0.0	*	83.9	29	316	3.6	47	9.8	3
2002/08/13	act	20.9	51	267	17	0.0	*	86.7	31	323	6.4	50	16.0	3
2002/08/14	act	17.6	49	323	1	0.0	*	87.1	33	329	2.9	53	8.8	3
2002/08/15	act	18.0	33	160	3	0.3	*	89.3	36	335	4.4	56	12.8	3
2002/08/16	act	16.9	36	236	16	3.9	*	74.4	28	332	1.6	46	4.6	3
2002/08/17	act	15.5	55	63	8	1.3	*	76.0	29	338	1.2	48	3.5	3
2002/08/18	act	18.4	50	229	6	0.0	*	83.7	31	344	2.4	51	7.3	3
2002/08/19	act	16.3	54	103	1	0.0	*	85.1	33	350	2.3	53	7.1	3
2002/08/20	act	18.0	41	258	10	0.0	*	87.7	35	356	5.0	56	14.2	3
2002/08/21	act	21.0	36	223	16	0.0	*	89.7	38	363	9.3	60	23.3	4
2002/08/22	act	20.6	52	219	11	0.0	*	88.9	40	370	6.3	63	17.9	4
2002/08/23	act	24.0	50	237	18	0.0	*	88.9	43	377	9.3	67	24.5	4
2002/08/24	act	25.4	39	171	7	0.0	*	90.1	46	385	6.0	71	18.6	4
2002/08/25	act	21.6	66	164	7	3.0	*	69.9	38	386	0.9	61	2.9	3
2002/08/26	act	23.1	39	227	9	0.0	*	85.7	41	393	3.6	65	12.0	3
2002/08/27	act	22.6	46	187	10	0.0	*	88.0	44	400	5.3	69	16.6	3
2002/08/28	act	15.3	100	202	10	10.6	*	19.2	22	367	0.0	38	0.0	2
2002/08/29	act	16.7	81	48	0	2.8	*	22.4	18	368	0.0	32	0.0	2
2002/08/30	act	18.8	49	208	6	0.0	*	60.0	20	374	0.6	35	0.7	2
2002/08/31	act	10.0	100	193	9	10.0	*	13.3	10	345	0.0	18	0.0	1
2002/09/01	act	16.7	48	267	16	0.0	*	58.5	11	350	0.8	21	0.8	2
2002/09/02	act	7.9	100	163	7	12.8	*	10.8	5	311	0.0	10	0.0	1
2002/09/03	act	10.8	70	355	17	3.2	*	37.5	4	309	0.1	7	0.0	1
2002/09/04	act	7.9	67	24	16	1.3	*	54.7	4	312	0.6	8	0.3	1
2002/09/05	act	11.2	58	45	2	0.0	*	68.1	5	316	0.6	10	0.4	1
2002/09/06	act	11.7	57	197	4	0.0	*	76.9	6	320	1.1	12	0.7	1
2002/09/07	act	13.0	64	205	4	0.0	*	80.5	7	324	1.4	13	1.1	2
2002/09/08	act	10.9	71	174	0	0.0	*	81.2	8	327	1.3	14	1.0	1
2002/09/09	act	8.7	100	169	0	2.6	*	46.2	5	331	0.1	10	0.1	1
2002/09/10	act	11.0	82	179	6	1.6	*	49.1	5	334	0.2	10	0.1	1

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2003/08/10 to 2003/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2003/08/10	act	12.5	72	272	4	11.2	*	39.6	30	399	0.0	50	0.1	2
2003/08/11	act	20.4	39	261	10	1.8	*	71.1	30	406	1.1	51	3.2	3
2003/08/12	act	17.2	67	177	9	0.0	*	79.0	31	412	1.6	53	5.0	3
2003/08/13	act	17.0	71	183	13	0.2	*	81.8	32	418	2.7	54	8.4	3
2003/08/14	act	22.5	40	217	12	0.0	*	88.2	35	425	6.2	59	17.1	4
2003/08/15	act	25.5	40	187	12	0.0	*	89.8	39	433	7.5	63	20.5	4
2003/08/16	act	20.9	49	244	15	0.0	*	89.4	41	439	8.3	67	22.6	4
2003/08/17	act	20.7	42	205	14	0.0	*	89.4	44	446	8.0	70	22.5	4
2003/08/18	act	15.7	61	246	22	20.8	*	55.3	19	366	0.9	33	1.4	2
2003/08/19	act	16.6	49	227	12	0.2	*	77.0	21	372	1.6	36	3.9	2
2003/08/20	act	14.5	52	238	12	0.0	*	83.2	22	377	3.0	39	7.4	2
2003/08/21	act	15.4	67	192	15	1.0	*	79.6	23	383	2.4	41	6.1	2
2003/08/22	act	12.0	71	279	14	0.2	*	81.3	24	388	2.7	42	7.0	2
2003/08/23	act	15.2	49	218	18	0.0	*	85.4	26	394	5.4	44	13.1	3
2003/08/24	act	12.9	52	226	12	0.0	*	85.7	27	399	4.3	47	11.3	3
2003/08/25	act	15.6	52	122	12	0.0	*	86.2	29	405	4.7	49	12.4	3
2003/08/26	act	12.7	93	18	7	8.9	*	29.8	15	379	0.0	27	0.0	2
2003/08/27	act	15.4	76	73	4	2.0	*	42.4	14	384	0.1	25	0.1	2
2003/08/28	act	19.6	61	222	8	0.2	*	68.9	15	391	0.9	28	1.1	2
2003/08/29	act	22.5	45	137	6	0.0	*	83.5	18	398	2.3	32	5.1	2
2003/08/30	act	23.7	43	132	8	0.0	*	88.1	21	405	4.8	37	10.9	3
2003/08/31	act	16.2	46	267	10	0.2	*	88.2	23	411	5.5	40	12.6	3
2003/09/01	act	16.2	46	208	13	0.0	*	88.2	24	416	6.3	43	14.5	3
2003/09/02	act	20.8	39	168	14	0.0	*	89.3	27	421	8.0	46	18.2	4
2003/09/03	act	23.6	49	232	10	0.0	*	89.3	29	427	6.6	50	16.4	3
2003/09/04	act	17.8	60	166	10	1.5	*	79.1	30	432	1.7	51	5.3	3
2003/09/05	act	12.6	100	218	9	10.4	*	17.5	14	396	0.0	26	0.0	2
2003/09/06	act	16.6	97	73	6	6.8	*	9.5	8	378	0.0	15	0.0	1
2003/09/07	act	11.2	97	242	14	18.8	*	5.3	3	315	0.0	6	0.0	1
2003/09/08	act	14.5	59	234	8	0.2	*	40.2	4	319	0.1	8	0.0	1
2003/09/09	act	17.4	42	245	9	0.0	*	71.9	6	324	1.1	12	0.7	2
2003/09/10	act	11.2	84	183	6	0.0	*	74.6	7	328	1.0	13	0.7	2

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2004/08/10 to 2004/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2004/08/10	act	23.9	44	135	4	0.0	50	85.4	14	202	2.8	24	5.2	2
2004/08/11	act	26.7	39	136	3	0.0	50	89.5	18	209	4.6	29	9.3	3
2004/08/12	act	26.8	47	99	6	0.0	50	89.5	21	217	5.4	34	11.4	3
2004/08/13	act	27.6	43	358	5	0.0	50	89.8	24	225	5.5	38	12.2	3
2004/08/14	act	26.4	53	17	9	0.0	50	89.6	27	233	6.5	42	14.7	3
2004/08/15	act	26.7	49	52	10	0.0	50	89.6	30	241	6.8	46	15.9	3
2004/08/16	act	25.5	45	59	7	0.0	50	89.7	33	248	5.7	49	14.6	3
2004/08/17	act	28.0	33	112	4	0.0	50	91.5	37	256	6.6	54	17.2	4
2004/08/18	act	28.1	43	240	8	0.0	50	91.5	40	264	7.9	58	20.3	4
2004/08/19	act	26.8	36	188	3	0.0	50	91.6	44	272	6.4	63	18.1	4
2004/08/20	act	18.4	60	249	12	0.0	50	88.0	46	279	5.9	65	17.4	4
2004/08/21	act	16.8	59	28	16	0.0	50	87.1	47	285	6.3	67	18.5	4
2004/08/22	act	11.6	59	24	22	0.0	50	86.3	48	290	7.6	68	21.4	4
2004/08/23	act	9.6	63	333	7	0.0	50	85.5	49	294	3.2	69	11.2	3
2004/08/24	act	16.4	45	209	13	0.0	50	87.1	51	300	5.4	72	17.2	4
2004/08/25	act	20.7	35	57	5	0.0	50	89.5	54	307	5.1	75	17.0	4
2004/08/26	act	18.0	56	254	4	0.0	50	88.2	56	313	4.1	77	14.4	4
2004/08/27	act	12.0	94	203	9	0.5	50	79.8	56	319	1.7	78	7.0	3
2004/08/28	act	16.0	54	261	12	2.5	50	71.6	48	324	1.2	70	4.6	3
2004/08/29	act	10.6	98	163	5	1.8	70	51.7	45	329	0.3	67	0.5	3
2004/08/30	act	14.8	73	249	6	0.8	70	64.3	46	335	0.7	68	2.3	3
2004/08/31	act	12.2	96	213	4	10.4	70	18.7	23	308	0.0	39	0.0	2
2004/09/01	act	9.9	100	358	10	6.4	70	5.6	13	295	0.0	24	0.0	2
2004/09/02	act	16.5	57	342	12	21.6	70	42.2	7	236	0.1	13	0.1	1
2004/09/03	act	18.3	52	293	12	0.0	70	72.2	9	241	1.3	16	1.0	2
2004/09/04	act	15.8	54	273	22	14.2	70	57.6	5	210	1.0	10	0.6	2
2004/09/05	act	16.3	52	204	12	0.2	70	77.1	7	214	1.6	12	1.4	2
2004/09/06	act	12.5	65	204	7	0.0	70	80.8	7	218	1.8	14	1.9	2
2004/09/07	act	13.3	64	168	8	0.0	70	82.7	8	222	2.3	15	3.0	2
2004/09/08	act	1.0	100	32	12	13.0	70	16.0	4	193	0.0	7	0.0	1
2004/09/09	act	3.0	100	15	8	3.3	70	8.6	2	191	0.0	4	0.0	1
2004/09/10	act	6.1	89	106	7	0.8	70	18.4	2	193	0.0	4	0.0	1

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2005/08/10 to 2005/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2005/08/10	act	18.5	46	47	9	0.0	0	86.9	15	269	4.4	26	8.3	3
2005/08/11	act	22.7	50	33	6	0.0	0	87.6	17	277	4.2	30	8.5	3
2005/08/12	act	22.5	58	25	7	1.8	0	78.7	18	284	1.4	31	2.9	2
2005/08/13	act	27.3	38	249	8	0.0	0	89.0	21	292	5.7	36	12.2	3
2005/08/14	act	21.7	58	81	7	0.8	0	85.3	23	298	3.1	39	7.8	3
2005/08/15	act	14.2	68	18	11	2.3	0	69.4	21	304	1.1	36	2.2	2
2005/08/16	act	16.5	60	73	5	0.0	0	78.8	22	310	1.3	38	3.1	2
2005/08/17	act	16.3	44	44	8	0.0	0	85.2	24	316	3.3	41	8.3	3
2005/08/18	act	18.0	54	181	9	0.0	0	86.0	26	322	3.9	43	9.9	3
2005/08/19	act	23.2	44	162	13	0.0	0	88.5	29	329	6.6	47	16.0	3
2005/08/20	act	20.3	58	220	10	1.8	0	78.6	29	336	1.6	47	4.6	3
2005/08/21	act	11.0	100	206	8	14.5	0	14.2	12	295	0.0	22	0.0	2
2005/08/22	act	14.0	69	233	4	0.5	0	38.9	13	300	0.0	24	0.0	2
2005/08/23	act	16.0	72	52	5	4.3	0	41.9	9	297	0.1	17	0.1	1
2005/08/24	act	19.8	53	190	9	0.5	0	71.5	11	303	1.0	21	0.9	2
2005/08/25	act	21.5	49	161	10	0.0	0	83.8	14	310	2.9	25	5.4	2
2005/08/26	act	21.0	43	237	13	0.0	0	87.8	16	317	6.0	29	11.4	3
2005/08/27	act	19.6	52	160	5	0.5	0	87.9	18	323	4.0	32	8.5	3
2005/08/28	act	12.4	85	180	6	6.1	0	42.2	11	312	0.1	20	0.1	2
2005/08/29	act	15.0	63	9	6	0.2	0	64.2	12	318	0.7	22	0.7	2
2005/08/30	act	13.7	97	216	9	3.0	0	37.7	9	318	0.0	16	0.0	1
2005/08/31	act	14.2	59	215	10	4.3	0	49.9	6	314	0.3	12	0.2	1
2005/09/01	act	14.8	62	171	10	0.5	0	69.8	8	318	1.0	14	0.7	2
2005/09/02	act	10.5	95	208	8	6.8	0	26.8	4	303	0.0	7	0.0	1
2005/09/03	act	13.8	59	216	10	0.2	0	57.2	5	307	0.6	9	0.3	1
2005/09/04	act	17.7	48	213	10	0.5	0	78.1	7	312	1.6	13	1.4	2
2005/09/05	act	14.2	44	256	14	0.0	0	84.8	8	316	4.2	15	5.8	2
2005/09/06	act	17.1	47	216	9	0.0	0	86.7	10	321	4.3	18	6.6	2
2005/09/07	act	17.2	56	245	12	0.0	0	86.8	11	326	4.8	21	7.8	3
2005/09/08	act	15.0	56	258	12	5.1	0	62.6	8	317	0.9	15	0.6	2
2005/09/09	act	14.7	57	25	14	0.0	0	77.6	9	322	1.8	17	2.4	2
2005/09/10	act	15.2	55	6	10	0.5	0	83.0	10	326	2.6	19	4.1	2

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2006/08/10 to 2006/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2006/08/10	act	16.7	55	145	6	0.0	50	85.0	25	391	2.9	43	7.6	3
2006/08/11	act	18.0	46	197	7	0.0	50	87.0	27	397	3.9	46	10.4	3
2006/08/12	act	20.0	47	251	12	0.5	80	87.7	29	404	5.7	50	14.7	3
2006/08/13	act	17.9	53	241	12	0.0	80	87.7	31	410	5.7	53	15.1	3
2006/08/14	act	20.4	41	245	11	0.0	80	88.8	34	417	6.2	56	16.7	4
2006/08/15	act	18.6	50	202	10	6.8	80	64.1	21	399	0.8	37	1.6	2
2006/08/16	act	22.2	38	227	10	0.0	80	84.5	24	406	3.3	42	8.5	3
2006/08/17	act	23.2	41	170	9	0.0	80	88.6	27	413	5.4	46	13.5	3
2006/08/18	act	19.7	43	248	14	0.0	80	88.6	29	420	7.0	50	17.1	4
2006/08/19	act	18.0	43	294	6	0.0	80	88.7	32	426	4.7	53	13.0	3
2006/08/20	act	22.8	29	232	7	0.0	80	91.2	35	433	7.2	58	19.1	4
2006/08/21	act	26.2	31	190	9	0.0	80	91.9	39	441	8.6	64	22.8	4
2006/08/22	act	18.5	39	212	9	0.0	80	91.0	42	447	7.8	67	21.8	4
2006/08/23	act	19.1	38	237	7	0.0	80	91.0	44	454	7.0	71	20.6	4
2006/08/24	act	16.1	56	155	4	0.0	80	88.5	46	460	4.3	73	14.6	4
2006/08/25	act	22.6	36	199	13	0.0	80	90.1	49	467	8.3	77	24.3	4
2006/08/26	act	21.5	35	229	12	0.0	80	90.3	52	474	8.0	81	24.5	4
2006/08/27	act	24.0	31	189	10	0.0	80	91.4	55	481	8.8	86	26.8	4
2006/08/28	act	18.4	46	129	3	0.0	90	90.1	58	487	5.1	89	18.4	4
2006/08/29	act	15.0	47	273	7	0.5	90	89.0	59	493	5.3	91	19.4	4
2006/08/30	act	13.2	51	233	6	0.0	90	88.2	61	498	4.5	93	17.2	4
2006/08/31	act	13.6	50	255	13	0.2	90	88.0	62	504	6.1	95	21.8	4
2006/09/01	act	20.0	38	174	14	0.0	90	89.3	65	509	8.0	98	26.9	4
2006/09/02	act	24.7	30	168	8	0.0	90	91.5	68	515	7.8	102	26.8	4
2006/09/03	act	24.1	35	165	8	0.0	90	91.6	71	521	7.9	106	27.5	4
2006/09/04	act	27.4	27	160	7	0.0	90	92.8	74	528	9.0	110	30.6	5
2006/09/05	act	25.3	29	221	15	0.0	90	92.9	78	534	14.0	114	41.7	5
2006/09/06	act	24.3	22	187	7	0.0	90	93.5	81	540	9.9	118	33.6	5
2006/09/07	act	23.3	26	169	4	0.0	90	93.6	85	546	8.8	122	31.6	5
2006/09/08	act	23.6	32	201	11	0.0	90	93.0	88	552	11.2	125	37.4	5
2006/09/09	act	19.6	39	247	11	0.0	90	91.4	90	557	9.2	128	33.1	5
2006/09/10	act	11.1	95	172	8	3.3	90	48.4	66	550	0.2	101	0.6	3

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2007/08/10 to 2007/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2007/08/10	act	19.4	47	225	3	0.0	50	86.6	36	460	3.1	60	10.0	3
2007/08/11	act	17.1	62	61	5	1.8	50	74.4	35	466	0.9	58	3.0	3
2007/08/12	act	7.1	94	38	15	16.0	50	21.0	14	401	0.0	26	0.0	2
2007/08/13	act	13.7	59	35	5	1.8	50	45.7	14	406	0.1	26	0.1	2
2007/08/14	act	20.1	41	243	13	0.0	50	77.7	17	413	1.7	30	3.6	2
2007/08/15	act	22.1	37	168	8	0.0	50	87.5	20	420	4.4	35	9.8	3
2007/08/16	act	25.7	36	60	9	0.0	50	90.4	23	427	7.2	41	15.8	3
2007/08/17	act	14.6	92	269	7	10.2	50	30.9	12	394	0.0	22	0.0	2
2007/08/18	act	19.0	55	345	7	6.1	50	50.1	8	381	0.2	16	0.2	1
2007/08/19	act	12.2	89	246	8	11.4	70	23.3	4	346	0.0	8	0.0	1
2007/08/20	act	14.6	56	241	16	0.2	70	59.6	5	352	0.9	10	0.6	2
2007/08/21	act	17.9	53	227	6	0.0	70	77.0	7	358	1.2	14	0.9	2
2007/08/22	act	19.1	51	213	9	0.0	70	84.3	9	365	3.0	17	4.4	2
2007/08/23	act	22.1	43	147	6	0.0	70	87.9	12	372	4.4	22	7.5	2
2007/08/24	act	16.2	63	190	11	0.0	70	86.6	13	378	4.5	24	8.1	3
2007/08/25	act	14.1	60	270	11	2.5	70	70.3	12	383	1.1	21	1.3	2
2007/08/26	act	11.0	64	341	4	0.8	70	74.2	12	388	0.9	23	0.9	2
2007/08/27	act	12.6	66	2	4	0.0	70	78.9	13	393	1.2	25	1.9	2
2007/08/28	act	17.6	50	141	8	0.2	70	84.6	15	399	3.0	28	6.0	2
2007/08/29	act	11.1	99	161	9	7.9	70	23.8	8	377	0.0	15	0.0	1
2007/08/30	act	14.0	94	162	12	7.6	70	15.8	4	358	0.0	8	0.0	1
2007/08/31	act	16.5	54	236	7	10.7	70	42.1	3	329	0.1	6	0.0	1
2007/09/01	act	14.3	57	207	11	0.0	70	67.2	4	333	1.0	8	0.5	2
2007/09/02	act	14.4	78	119	3	5.3	70	42.0	3	324	0.1	5	0.0	1
2007/09/03	act	15.1	65	190	9	0.0	70	64.8	4	328	0.8	7	0.4	1
2007/09/04	act	17.1	55	235	14	0.5	70	79.8	5	333	2.3	10	2.1	2
2007/09/05	act	10.2	89	260	8	4.3	70	43.2	3	326	0.1	5	0.0	1
2007/09/06	act	13.9	58	253	7	2.8	70	53.9	2	330	0.3	5	0.1	1
2007/09/07	act	12.7	61	181	2	0.8	80	65.3	3	334	0.6	7	0.3	1
2007/09/08	act	12.4	64	105	3	0.0	80	74.2	4	338	0.9	8	0.5	1
2007/09/09	act	18.1	55	181	10	0.0	80	82.6	6	343	2.5	11	2.7	2
2007/09/10	act	21.2	53	197	6	0.0	80	85.8	8	349	3.2	14	4.3	2

Total of 32 records.

Done



Fire Weather System

Bounded Days for MCLEOD LAKE

From 2008/08/10 to 2008/09/10

Guide to
abbreviations

View Ancillary Data

Date	Status	Temp.	RH	Wind Dir.	Wind Sp.	Precip.	Grass Cure	FFMC	DMC	DC	ISI	BUI	FWI	Dgr. Cl.
2008/08/10	act	8.5	100	188	12	17.5	*	15.4	24	354	0.0	41	0.0	2
2008/08/11	act	15.1	76	213	6	26.2	*	25.4	10	272	0.0	18	0.0	1
2008/08/12	act	18.5	61	158	9	0.0	*	59.1	11	279	0.6	21	0.6	2
2008/08/13	act	21.4	49	192	14	0.0	*	81.1	14	285	2.5	24	4.7	2
2008/08/14	act	24.9	44	167	7	0.0	*	87.7	17	293	4.4	29	8.8	3
2008/08/15	act	28.7	39	160	8	0.0	*	90.4	20	301	6.8	35	13.8	3
2008/08/16	act	27.4	37	206	7	0.0	*	90.9	24	309	6.8	40	15.0	3
2008/08/17	act	28.1	35	164	10	0.0	*	91.4	28	317	8.8	46	19.5	4
2008/08/18	act	16.9	75	229	4	0.0	*	86.0	29	323	2.9	47	8.3	3
2008/08/19	act	16.1	74	141	12	0.0	*	84.5	30	329	3.7	49	10.2	3
2008/08/20	act	13.2	93	45	8	13.0	*	26.0	13	294	0.0	24	0.0	2
2008/08/21	act	13.3	68	351	6	4.3	*	38.2	9	290	0.0	17	0.0	1
2008/08/22	act	14.0	75	195	7	0.0	*	56.8	10	296	0.5	19	0.4	1
2008/08/23	act	21.1	49	174	11	0.2	*	79.7	12	302	1.9	23	3.2	2
2008/08/24	act	16.7	69	191	12	2.6	*	67.7	11	308	1.1	20	0.9	2
2008/08/25	act	14.8	55	227	9	5.8	*	55.6	7	299	0.5	14	0.3	1
2008/08/26	act	11.6	56	226	12	0.5	*	72.9	9	304	1.2	16	1.0	2
2008/08/27	act	13.1	73	198	12	5.3	*	51.2	5	297	0.4	10	0.2	1
2008/08/28	act	12.0	70	220	9	2.0	*	56.3	5	302	0.5	9	0.3	1
2008/08/29	act	7.8	89	150	5	0.0	*	61.1	5	306	0.6	10	0.3	1
2008/08/30	act	7.8	88	45	7	2.5	*	45.8	4	311	0.1	7	0.1	1
2008/08/31	act	11.7	70	200	2	0.2	*	59.5	4	316	0.4	8	0.2	1
2008/09/01	act	12.4	62	186	9	0.0	*	73.4	5	320	1.1	10	0.7	2
2008/09/02	act	8.4	91	240	7	0.2	*	74.1	5	323	1.1	10	0.6	2
2008/09/03	act	12.3	64	151	5	1.3	*	72.1	6	327	0.9	12	0.6	2
2008/09/04	act	12.6	67	231	6	0.0	*	78.1	7	331	1.3	13	0.9	2
2008/09/05	act	15.1	60	65	5	0.2	*	82.2	8	335	1.9	15	2.4	2
2008/09/06	act	14.5	63	51	4	0.0	*	83.4	9	339	2.0	17	2.8	2
2008/09/07	act	14.7	64	164	7	0.2	*	83.9	10	344	2.6	19	4.0	2
2008/09/08	act	17.0	72	175	6	2.0	*	69.6	9	349	0.9	18	0.7	2
2008/09/09	act	16.5	42	156	4	0.0	*	81.8	11	353	1.7	21	2.7	2
2008/09/10	act	13.1	62	202	11	0.0	*	83.3	12	357	2.9	22	5.1	2

Total of 32 records.

Done

Rainfall levels for August and September - 10 Year Ave.

Weather station	<u>North Chilco</u>	<u>Fort St. James</u>	<u>Bear Lake</u>
	<u>Total Rainfall</u>	<u>Total Rainfall</u>	<u>Total Rainfall</u>
	<u>in mm</u>	<u>in mm</u>	<u>in mm</u>
<u>Year</u>			
1998	36.1	51.1	52.4
1999	65.7	85	69.5
2000	74.3	76	59.5
2001	49.2	44.7	42.5
2002	47.3	41.1	56.8
2003	72.2	73	73.3
2004	67.8	42.2	77.1
2005	2.1	64.4	49.2
2006	2.4	2.8	8.6
2007	76	70.6	79.8
Total	493.1	550.9	568.7
10 Year Ave	49.31 mm	55.09 mm	56.87 mm
2008 rainfall	90.8 mm	114.6 mm	98.0 mm
Difference	(+) 41.49 mm	(+) 59.51 mm	(+) 41.13 mm

Ministry of Forests And Range

This is to certify that

Michael Boyde

has successfully completed the course and exam for:

**Audit Level Soil
Conservation Surveys**

Certificate No. SD0800020
Issued: June 25, 2008



BRITISH
COLUMBIA

Coordinated By:

Selkirk Management ♦ ♦ ♦
Services

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating	
19980910	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	75	TRUE	186	TRUE	9.6	TRUE	4.5		52.50632	19.26679	481.6715	0.3541	35.03053	0.4645131	2	
19980911	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	47	TRUE	251	TRUE	22.3	TRUE	3.3		66.43981	15.53085	476.5308	1.712726	28.7215	3.418416	2	
19980912	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	56	TRUE	189	TRUE	11.7	TRUE	0		78.21941	16.6331	480.5928	1.730716	30.6171	3.63698	2	
19980913	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	43	TRUE	248	TRUE	10.9	TRUE	3		69.58775	13.84813	476.8202	1.069307	25.82144	1.53822	2	
19980914	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	38	TRUE	232	TRUE	11.9	TRUE	0		83.54515	15.7216	481.3862	3.15626	29.06973	6.507842	2	
19980915	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	65	TRUE	0	TRUE	12.6	TRUE	0		83.59238	16.34099	484.6562	3.289891	30.14131	6.917262	2	
19980916	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	39	TRUE	31	TRUE	7.8	TRUE	0		87.04768	18.06252	489.0062	4.160645	33.07116	9.008211	3	
19980917	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	43	TRUE	14	TRUE	16.2	TRUE	0		87.71011	19.72826	493.4462	6.983222	35.87115	14.35318	3	
19980918	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	75	TRUE	1	TRUE	10.5	TRUE	0		84.38738	20.17772	496.7342	3.290273	36.63507	7.801748	2	
19980919	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	100	TRUE	3	TRUE	5.4	TRUE	3.9		36.50549	13.84137	486.3151	2.23E-02	25.84384	0.0238918	2	
19980920	MCLEOD LAI	1	actual	TRUE	6.7	TRUE	100	TRUE	211	TRUE	12	TRUE	0.3		36.53718	13.84137	489.2251	3.14E-02	25.85406	3.36E-02	2	
19980921	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	56	TRUE	190	TRUE	8.8	TRUE	0.3		65.29788	15.2029	493.8811	0.8314068	28.23309	0.9426203	2	
19980922	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	45	TRUE	37	TRUE	11.8	TRUE	0		81.05416	16.90404	498.5371	2.311697	31.16617	5.030014	2	
19980923	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	76	TRUE	225	TRUE	12.5	TRUE	0		81.14478	17.3664	501.9511	2.41956	31.96776	5.357386	2	
19980924	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	96	TRUE	191	TRUE	6.8	TRUE	2.6		49.47819	13.78928	505.2391	0.2167053	25.81703	0.2315655	2	
19980925	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	61	TRUE	19	TRUE	13.9	TRUE	2.5		56.65185	11.54475	508.7251	0.6482164	21.84987	0.6215791	2	
19980926	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	55	TRUE	187	TRUE	11.9	TRUE	0		74.95329	12.77827	513.0211	1.39161	24.05842	2.235694	2	
19980927	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	52	TRUE	284	TRUE	19	TRUE	0		82.91845	14.08032	517.2811	4.162628	26.36641	7.893583	2	
19980928	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	40	TRUE	221	TRUE	11	TRUE	0		86.63997	15.66655	521.451	4.613562	29.14407	9.14809	3	
19980929	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	51	TRUE	79	TRUE	5.3	TRUE	0		86.68822	16.63762	524.973	3.48552	30.83237	7.393357	2	
19980930	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	45	TRUE	190	TRUE	13.2	TRUE	0		87.45354	18.34088	529.593	5.787257	33.75891	11.9815	3	
19981001	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	87	TRUE	223	TRUE	5.5	TRUE	0.6		81.35732	18.5757	532.313	1.742563	34.17036	3.985635	2	
19981002	MCLEOD LAI	1	actual	TRUE	2.3	TRUE	100	TRUE	3	TRUE	17.2	TRUE	21.7		12.0037	7.597052	424.8857	8.98E-06	14.54398	6.70E-06	1	
19981003	MCLEOD LAI	1	actual	TRUE	-0.1	TRUE	97	TRUE	150	TRUE	0.2	TRUE	1.1		11.74069	7.601598	425.5717	3.33E-06	14.55331	2.49E-06	1	
19981004	MCLEOD LAI	1	actual	TRUE	2.6	TRUE	100	TRUE	185	TRUE	5.3	TRUE	5.7		4.045838	3.923332	407.4733	4.70E-08	7.662226	2.47E-08	1	
19981005	MCLEOD LAI	1	actual	TRUE	5.4	TRUE	100	TRUE	188	TRUE	12.5	TRUE	37.3		0	1.226636	273.234	3.58E-09	2.426044	1.17E-09	1	
19981006	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	85	TRUE	202	TRUE	7.5	TRUE	14.6		31.58054	0.2870395	235.8517	7.67E-03	0.5723377	1.84E-03	1	
19981007	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	98	TRUE	139	TRUE	7.4	TRUE	5.7		13.1503	0.026516	225.5166	9.68E-06	5.30E-02	1.99E-06	1	
19981008	MCLEOD LAI	1	actual	TRUE	0.4	TRUE	100	TRUE	23	TRUE	18.8	TRUE	0.9		12.05988	0.026516	226.2926	1.00E-05	5.30E-02	2.06E-06	1	
19981009	MCLEOD LAI	1	actual	TRUE	1.2	TRUE	99	TRUE	13	TRUE	10.9	TRUE	1.1		11.80018	3.03E-02	227.2126	5.89E-06	6.07E-02	1.22E-06	1	
19981010	MCLEOD LAI	1	actual	TRUE	3.7	TRUE	74	TRUE	355	TRUE	10.2	TRUE	7		23.14896	0.1905515	213.1137	6.91E-04	0.3802531	1.58E-04	1	
19981011	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	82	TRUE	22	TRUE	10.3	TRUE	4.9		23.24258	0.0863058	204.9238	7.17E-04	0.1724301	1.54E-04	1	
19981012	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	100	TRUE	13	TRUE	11	TRUE	0.8		21.77588	0.0863058	205.7718	4.42E-04	0.1724308	9.50E-05	1	
19981013	MCLEOD LAI	1	actual	TRUE	6.7	TRUE	100	TRUE	184	TRUE	5.5	TRUE	12.2		3.516785	5.91E-03	179.5357	3.31E-08	1.18E-02	6.68E-09	1	
19981014	MCLEOD LAI	1	actual	TRUE	4.6	TRUE	100	TRUE	180	TRUE	6.6	TRUE	1.6		1.877937	0	181.0677	1.10E-08	0	2.20E-09	1	
19981015	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	91	TRUE	8	TRUE	3.8	TRUE	0.3		8.706171	6.058638	182.3477	7.78E-07	11.18796	4.99E-07	1	
19981021	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	64	TRUE	211	TRUE	14.1	TRUE	16.3		35.08448	0.6869765	2.792	2.52E-02	0.8506767	6.43E-03	1	
19981022	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	50	TRUE	188	TRUE	10.8	TRUE	4.8		49.90929	1.037912	2.972	0.2796269	1.108244	7.49E-02	1	
19981023	MCLEOD LAI	1	actual	TRUE	11.9	TRUE	48	TRUE	138	TRUE	7.6	TRUE	0		70.76456	2.064157	5.818	0.9406014	2.1878	0.2990496	1	
19981024	MCLEOD LAI	1	actual	TRUE	11	TRUE	49	TRUE	138	TRUE	7.7	FALSE	288.3		39.66661	1.219467	2.684	4.80E-02	1.160899	1.30E-02	1	
19981105	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	100	TRUE	14	TRUE	11	TRUE	0									

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
19981106	MCLEOD LAI	1	actual	TRUE	5.1	TRUE	68	TRUE	30	TRUE	13	TRUE	0								
19981129	MCLEOD LAI	1	actual	TRUE	-5.9	TRUE	95	TRUE	21	TRUE	13.8	TRUE	147.8								
19981130	MCLEOD LAI	1	actual	TRUE	-3.4	TRUE	99	TRUE	211	TRUE	8.9	TRUE	0								
19981205	MCLEOD LAI	1	actual	TRUE	-3.7	TRUE	99	TRUE	180	TRUE	5.2	TRUE	121.4								
19981207	MCLEOD LAI	1	actual	TRUE	-2.4	TRUE	98	TRUE	179	TRUE	12.1	TRUE	17								
19981208	MCLEOD LAI	1	actual	TRUE	-3	TRUE	94	TRUE	222	TRUE	8.8	TRUE	0								
19981209	MCLEOD LAI	1	actual	TRUE	-2.1	TRUE	100	TRUE	208	TRUE	15.2	TRUE	0.3								
19981210	MCLEOD LAI	1	actual	TRUE	2.9	TRUE	82	TRUE	212	TRUE	20.4	TRUE	1.8								
19981211	MCLEOD LAI	1	actual	TRUE	0.4	TRUE	75	TRUE	170	TRUE	9.6	TRUE	39.4								
19981212	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	97	TRUE	154	TRUE	7.8	TRUE	0								
19981213	MCLEOD LAI	1	actual	TRUE	-0.2	TRUE	100	TRUE	204	TRUE	12.1	TRUE	0								
19981214	MCLEOD LAI	1	actual	TRUE	-6	TRUE	88	TRUE	224	TRUE	8	TRUE	0								
19981215	MCLEOD LAI	1	actual	TRUE	-3.6	TRUE	100	TRUE	229	TRUE	9	TRUE	0								
19981216	MCLEOD LAI	1	actual	TRUE	0	TRUE	100	TRUE	193	TRUE	16.3	TRUE	0								
19981217	MCLEOD LAI	1	actual	TRUE	-4.5	TRUE	95	TRUE	345	TRUE	11.8	TRUE	0								
19990517	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	52	TRUE	78	TRUE	10.2	TRUE	0								
19990518	MCLEOD LAI	1	actual	TRUE	6.8	TRUE	88	TRUE	258	TRUE	10	TRUE	0.3								
19990519	MCLEOD LAI	1	actual	TRUE	10	TRUE	75	TRUE	196	TRUE	9	TRUE	5								
19990520	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	89	TRUE	11	TRUE	6	TRUE	8								
19990521	MCLEOD LAI	1	actual	TRUE	11.8	TRUE	44	TRUE	243	TRUE	22	TRUE	2								
19990522	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	96	TRUE	171	TRUE	6.8	TRUE	4								
19990523	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	66	TRUE	204	TRUE	12.6	TRUE	2.8								
19990524	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	36	TRUE	196	TRUE	11.3	TRUE	0								
19990525	MCLEOD LAI	5	startup	TRUE	10.1	TRUE	32	TRUE	255	TRUE	23.8	TRUE	0		85	6	15				
19990526	MCLEOD LAI	1	actual	TRUE	10	TRUE	35	TRUE	218	TRUE	24.4	TRUE	0		87.51955	7.890697	19.204	10.27237	7.87812	9.333354	2
19990527	MCLEOD LAI	1	actual	TRUE	3.9	TRUE	91	TRUE	252	TRUE	13.1	TRUE	6.2		35.82117	4.119979	14.3839	2.83E-02	4.801631	1.20E-02	1
19990528	MCLEOD LAI	1	actual	TRUE	9	TRUE	44	TRUE	252	TRUE	17.3	TRUE	1.3		61.57299	5.611671	18.4079	1.073479	6.369197	0.515215	1
19990529	MCLEOD LAI	1	actual	TRUE	15	TRUE	32	TRUE	6	TRUE	8.9	TRUE	0		81.12836	8.498146	23.5119	2.014367	8.928496	1.541699	2
19990530	MCLEOD LAI	1	actual	TRUE	6.1	TRUE	94	TRUE	214	TRUE	18.4	TRUE	1.8		60.16454	7.42993	27.0139	1.045239	8.805307	0.5893144	1
19990531	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	43	TRUE	241	TRUE	28.9	TRUE	4		67.74349	6.488924	27.55366	2.496922	8.168573	2.080101	2
19990601	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	39	TRUE	41	TRUE	12.5	TRUE	0		81.89497	8.800452	33.33366	2.642406	10.60278	2.744991	2
19990602	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	36	TRUE	274	TRUE	8.5	TRUE	0		87.78304	12.07938	40.03166	4.787198	13.77066	6.186524	2
19990603	MCLEOD LAI	1	actual	TRUE	14.3	TRUE	49	TRUE	239	TRUE	20.2	TRUE	0.9		84.48851	14.16734	46.00966	5.438131	16.01008	7.559217	2
19990604	MCLEOD LAI	1	actual	TRUE	12.5	TRUE	47	TRUE	210	TRUE	17.6	TRUE	0		86.07364	16.06496	51.66366	5.939477	18.07711	8.722188	2
19990605	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	45	TRUE	273	TRUE	10	TRUE	19.9		48.50467	8.428699	24.18583	0.2247289	9.008661	0.1282282	1
19990606	MCLEOD LAI	2	estimate	TRUE	8	TRUE	70	TRUE	315	TRUE	10	TRUE	3		47.846	6.365263	26.48668	0.2057998	7.95261	0.1101095	1
19990607	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	80	TRUE	161	TRUE	8.8	TRUE	5.4		33.78108	3.590407	24.34342	1.42E-02	5.246354	6.24E-03	1
19990608	MCLEOD LAI	1	actual	TRUE	11	TRUE	66	TRUE	194	TRUE	13.2	TRUE	2.5		49.28944	3.174983	29.72742	0.2921587	5.01178	0.1258049	1
19990609	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	85	TRUE	5	TRUE	4.3	TRUE	5.3		29.85352	1.564719	28.06321	4.11E-03	2.746585	1.41E-03	1
19990610	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	42	TRUE	241	TRUE	13.8	TRUE	0.5		67.83264	4.188112	34.38321	1.1701	6.420938	0.5637392	1
19990611	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	49	TRUE	195	TRUE	7.4	TRUE	1.9		72.43951	5.607599	40.90121	0.9883427	8.352393	0.5421984	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
19990612	MCLEOD LAI	1	actual	TRUE	21.7	TRUE	35	TRUE	159	TRUE	9.5	TRUE	0		86.63673	9.491194	48.21121	4.27574	12.72135	5.299986	2
19990613	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	51	TRUE	85	TRUE	6.5	TRUE	0		86.96264	12.07402	54.99921	3.849957	15.59118	5.378029	2
19990614	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	39	TRUE	63	TRUE	4.4	TRUE	0		89.41667	16.09899	62.68721	4.921977	19.60856	7.732006	2
19990615	MCLEOD LAI	1	actual	TRUE	26.7	TRUE	34	TRUE	104	TRUE	13.4	TRUE	0		91.30019	20.95867	70.89721	10.14008	24.10356	15.57569	3
19990616	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	57	TRUE	234	TRUE	11.7	TRUE	0.5		88.493	23.34149	77.88321	6.227468	26.68748	11.18895	3
19990617	MCLEOD LAI	1	actual	TRUE	22.3	TRUE	40	TRUE	249	TRUE	9	TRUE	0		89.38059	27.0439	85.30121	6.173877	30.17282	11.87204	3
19990618	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	62	TRUE	205	TRUE	17.2	TRUE	0		87.03883	28.89487	91.85521	6.673052	32.34939	13.1115	3
19990619	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	44	TRUE	245	TRUE	21.9	TRUE	0		87.45469	31.1558	97.79721	8.97296	34.68618	17.06113	3
19990620	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	80	TRUE	164	TRUE	11.3	TRUE	2.6		62.3165	26.20046	103.1272	0.82525	32.04657	1.128056	2
19990621	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	60	TRUE	216	TRUE	20.5	TRUE	5.1		57.78857	17.99726	101.3575	0.9878691	24.92858	1.18294	2
19990622	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	56	TRUE	233	TRUE	19	TRUE	1.3		70.79421	19.53889	106.9755	1.672293	26.8277	3.145816	2
19990623	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	58	TRUE	201	TRUE	9.6	TRUE	0		79.39188	21.09406	112.7375	1.734636	28.74301	3.47185	2
19990624	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	46	TRUE	34	TRUE	12	TRUE	0		85.66362	23.79588	119.3455	4.229162	31.76031	8.922542	3
19990625	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	42	TRUE	35	TRUE	10.7	TRUE	0		87.33476	26.261	125.4675	5.016458	34.47992	10.79437	3
19990626	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	71	TRUE	238	TRUE	17.5	TRUE	0		84.93846	27.33723	131.1935	5.046801	35.94796	11.10497	3
19990627	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	58	TRUE	267	TRUE	12.3	TRUE	0.3		84.98615	28.74244	136.7035	3.908978	37.67932	9.219719	3
19990628	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	66	TRUE	186	TRUE	12.9	TRUE	0		84.94913	29.93482	142.3215	4.008533	39.2374	9.645683	3
19990629	MCLEOD LAI	1	actual	TRUE	12	TRUE	57	TRUE	236	TRUE	25.3	TRUE	0.8		82.87557	31.4178	147.8855	5.68679	41.03905	13.15245	3
19990630	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	64	TRUE	215	TRUE	9.4	TRUE	0		83.48313	32.73518	153.5935	2.76018	42.71231	7.333742	2
19990701	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	66	TRUE	55	TRUE	12.7	TRUE	0		83.53033	33.74722	159.3675	3.279723	44.13152	8.717571	3
19990702	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	59	TRUE	42	TRUE	20	TRUE	0.9		81.7721	35.19596	165.5555	3.799546	45.96324	10.1212	3
19990703	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	47	TRUE	41	TRUE	11.4	TRUE	0		85.66493	37.27002	172.0495	4.103964	48.35365	11.11024	3
19990704	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	51	TRUE	192	TRUE	13.7	TRUE	0		86.61646	39.47954	179.0115	5.26837	50.89685	13.95381	3
19990705	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	90	TRUE	192	TRUE	8.6	TRUE	9.4		30.94387	20.36313	164.637	6.86E-03	31.10744	8.30E-03	2
19990706	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	62	TRUE	162	TRUE	4.5	TRUE	1.1		55.19146	21.99632	171.437	0.3562279	33.30848	0.4514779	2
19990707	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	62	TRUE	19	TRUE	2	TRUE	0		69.58241	23.49752	178.003	0.6827474	35.33419	0.9009558	2
19990708	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	61	TRUE	161	TRUE	14.3	TRUE	0		80.64616	25.27888	184.983	2.505081	37.68361	6.182205	2
19990709	MCLEOD LAI	1	actual	TRUE	21.7	TRUE	43	TRUE	173	TRUE	10.5	TRUE	0		87.27171	28.35248	192.593	4.921679	41.4499	11.78863	3
19990710	MCLEOD LAI	1	actual	TRUE	24.3	TRUE	36	TRUE	228	TRUE	10.3	TRUE	0		90.19832	32.19416	200.671	7.411628	45.95616	17.12106	4
19990711	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	53	TRUE	225	TRUE	16.1	TRUE	0		88.69511	34.45219	207.867	8.002028	48.71792	18.68306	4
19990712	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	48	TRUE	263	TRUE	18.6	TRUE	0		88.74403	36.69847	214.703	9.140304	51.42302	21.15836	4
19990713	MCLEOD LAI	1	actual	TRUE	15	TRUE	51	TRUE	306	TRUE	3.2	TRUE	0		88.25372	38.55125	221.107	3.920923	53.69669	11.3777	3
19990714	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	56	TRUE	33	TRUE	25.3	TRUE	0		87.23767	40.09796	227.295	10.32498	55.65164	24.01516	4
19990715	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	49	TRUE	36	TRUE	22.7	TRUE	0		87.28612	41.67901	233.177	9.119933	57.61304	22.39244	4
19990716	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	35	TRUE	46	TRUE	9.7	TRUE	0		88.87119	44.24364	239.707	5.944559	60.54823	16.82875	3
19990717	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	28	TRUE	65	TRUE	4.7	TRUE	0		91.31662	48.22323	247.461	6.556377	64.8519	18.77692	4
19990718	MCLEOD LAI	1	actual	TRUE	25.3	TRUE	39	TRUE	210	TRUE	9.7	TRUE	0		91.36641	51.99295	255.719	8.494903	68.94238	23.3571	4
19990719	MCLEOD LAI	1	actual	TRUE	23.1	TRUE	45	TRUE	201	TRUE	18.8	TRUE	0		90.47729	55.10752	263.581	11.83746	72.38222	30.09857	4
19990720	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	51	TRUE	215	TRUE	8.8	TRUE	0		89.39796	57.71794	271.137	6.127215	75.34073	19.36607	4
19990721	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	41	TRUE	240	TRUE	20.3	TRUE	0		89.44711	60.99637	278.909	11.01524	78.87083	29.92299	4
19990722	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	84	TRUE	240	TRUE	21.4	TRUE	2.9		61.95827	48.94587	280.3572	1.347477	68.14791	5.094568	3

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
19990723	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	45	TRUE	249	TRUE	10.3	TRUE	1.9		73.05283	47.1995	287.2292	1.172356	66.91086	4.347799	3
19990724	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	89	TRUE	321	TRUE	4.6	TRUE	1.3		63.25829	47.47852	292.7152	0.6166119	67.56098	1.922526	3
19990725	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	62	TRUE	209	TRUE	7.6	TRUE	7.2		48.95792	28.73536	280.2749	0.2112132	45.7455	0.3336612	2
19990726	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	60	TRUE	229	TRUE	12.9	TRUE	0		72.45179	30.46521	287.1289	1.304597	48.15655	3.768219	3
19990727	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	83	TRUE	225	TRUE	21.7	TRUE	0.3		76.65948	31.07819	293.3349	2.535827	49.14054	7.429076	3
19990728	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	97	TRUE	224	TRUE	17.7	TRUE	19.3		18.42721	11.96487	243.0307	1.71E-04	21.30725	1.61E-04	2
19990729	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	67	TRUE	235	TRUE	12.8	TRUE	2.9		43.5126	9.780441	245.1304	0.1235663	17.78671	0.1041099	1
19990730	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	56	TRUE	33	TRUE	12.7	TRUE	0.9		67.30366	11.42723	251.4984	1.08779	20.5232	1.031568	2
19990731	MCLEOD LAI	1	actual	TRUE	17	TRUE	46	TRUE	58	TRUE	19.2	TRUE	0.8		81.15773	13.70996	258.2624	3.396283	24.20728	6.22266	2
19990801	MCLEOD LAI	1	actual	TRUE	19.8	TRUE	47	TRUE	77	TRUE	11.6	TRUE	0		86.36115	16.00539	264.8304	4.57127	27.80908	8.835642	3
19990802	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	41	TRUE	216	TRUE	5.4	TRUE	0		88.71634	18.88234	271.9024	4.681273	32.17813	9.800644	3
19990803	MCLEOD LAI	1	actual	TRUE	27.3	TRUE	38	TRUE	142	TRUE	4	TRUE	0		90.4443	22.5233	279.8204	5.588892	37.5004	12.34468	3
19990804	MCLEOD LAI	1	actual	TRUE	27	TRUE	36	TRUE	20	TRUE	6	TRUE	0		91.02213	26.23603	287.6844	6.712907	42.72993	15.28646	3
19990805	MCLEOD LAI	1	actual	TRUE	28.5	TRUE	39	TRUE	72	TRUE	4.6	TRUE	0		91.07183	29.98195	295.8184	6.300098	47.84171	15.47718	3
19990806	MCLEOD LAI	1	actual	TRUE	27.6	TRUE	44	TRUE	72	TRUE	14	TRUE	0		91.12154	33.30588	303.7904	10.18902	52.28199	23.05277	4
19990807	MCLEOD LAI	1	actual	TRUE	24.7	TRUE	49	TRUE	225	TRUE	8.3	TRUE	3.3		76.92964	27.80882	305.1076	1.316057	45.29638	3.622526	3
19990808	MCLEOD LAI	1	actual	TRUE	23.7	TRUE	43	TRUE	245	TRUE	17.1	TRUE	0		87.41472	30.74762	312.3776	7.005078	49.35107	17.04645	4
19990809	MCLEOD LAI	1	actual	TRUE	20.1	TRUE	47	TRUE	250	TRUE	14.3	TRUE	0.3		87.87889	33.08038	318.9996	6.500842	52.53978	16.66817	3
19990810	MCLEOD LAI	1	actual	TRUE	20	TRUE	50	TRUE	3	TRUE	3.1	TRUE	0		87.92755	35.24967	325.6036	3.723011	55.48296	11.11881	3
19990811	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	57	TRUE	79	TRUE	12.8	TRUE	0		87.27395	36.74643	331.4516	5.528221	57.54384	15.49505	3
19990812	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	78	TRUE	9	TRUE	9.1	TRUE	0.6		83.43655	37.46857	337.1196	2.702282	58.64277	8.787808	3
19990813	MCLEOD LAI	1	actual	TRUE	21	TRUE	48	TRUE	231	TRUE	9.8	TRUE	0		86.93377	39.85474	343.9036	4.527828	61.80355	13.82838	3
19990814	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	43	TRUE	198	TRUE	17.2	TRUE	0		88.54165	42.46628	350.6696	8.273826	65.19476	22.27155	4
19990815	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	54	TRUE	201	TRUE	7.3	TRUE	0		88.17401	44.32062	356.9676	4.765937	67.64458	15.13535	3
19990816	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	50	TRUE	180	TRUE	14.5	TRUE	0.3		88.22276	46.44516	363.4636	6.898429	70.40013	20.35507	4
19990817	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	47	TRUE	170	TRUE	15.2	TRUE	0		88.27153	48.85232	370.2296	7.196257	73.46884	21.46145	4
19990818	MCLEOD LAI	1	actual	TRUE	23	TRUE	49	TRUE	143	TRUE	8.1	TRUE	0.9		86.00567	51.41462	377.3736	3.645035	76.70342	13.20845	4
19990819	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	44	TRUE	261	TRUE	8.7	TRUE	0		88.579	54.31901	384.6616	5.420257	80.29233	18.31294	4
19990820	MCLEOD LAI	1	actual	TRUE	24.4	TRUE	43	TRUE	129	TRUE	8.9	TRUE	0		89.21776	57.31444	392.0576	6.000951	83.94817	20.21079	4
19990821	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	58	TRUE	269	TRUE	22.2	TRUE	2.7		73.92054	48.21574	397.8876	2.219014	74.01022	8.583969	4
19990822	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	49	TRUE	217	TRUE	18.9	TRUE	0		84.31487	50.26373	404.1676	4.975187	76.68531	16.76518	4
19990823	MCLEOD LAI	1	actual	TRUE	12	TRUE	87	TRUE	209	TRUE	10.2	TRUE	3.2		53.66436	39.23029	401.9068	0.4109952	63.06989	0.8175035	2
19990824	MCLEOD LAI	1	actual	TRUE	11.9	TRUE	99	TRUE	196	TRUE	11.3	TRUE	6.8		18.20339	22.69914	384.2013	1.13E-04	39.55576	1.61E-04	2
19990825	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	74	TRUE	234	TRUE	22.6	TRUE	19.7		35.34227	9.956037	318.5909	4.10E-02	18.46916	3.54E-02	1
19990826	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	62	TRUE	211	TRUE	10.5	TRUE	0.3		59.31581	10.88905	323.5209	0.6647938	20.08781	0.6042982	2
19990827	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	73	TRUE	50	TRUE	8.6	TRUE	1.1		66.6779	11.76975	329.1709	0.866002	21.60797	0.8245227	2
19990828	MCLEOD LAI	1	actual	TRUE	24.7	TRUE	41	TRUE	193	TRUE	13.4	TRUE	0		85.83456	14.89096	336.6209	4.648023	26.81627	8.778997	3
19990829	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	84	TRUE	287	TRUE	11.9	TRUE	0		82.12296	15.18709	341.0109	2.63556	27.33116	5.253885	2
19990830	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	70	TRUE	200	TRUE	8.1	TRUE	1.7		70.48705	14.77634	346.0309	0.955824	26.70207	1.231322	2
19990831	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	49	TRUE	35	TRUE	5.7	TRUE	4.4		59.77803	11.05279	340.7319	0.5379306	20.44738	0.4944929	2
19990901	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	64	TRUE	199	TRUE	12.5	TRUE	0		73.89564	11.94464	344.7219	1.359493	21.98484	1.969762	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
19990902	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	55	TRUE	210	TRUE	10.8	TRUE	0.3		81.73053	13.22365	349.1079	2.378178	24.1595	4.345183	2
19990903	MCLEOD LAI	1	actual	TRUE	16	TRUE	53	TRUE	218	TRUE	12.9	TRUE	0		84.98527	14.66366	353.6919	4.028477	26.5731	7.701954	2
19990904	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	85	TRUE	202	TRUE	13.9	TRUE	1.7		68.39507	13.85187	357.5919	1.197587	25.25775	1.852093	2
19990905	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	83	TRUE	146	TRUE	10.2	TRUE	5.2		43.31045	8.608808	347.1308	0.1048191	16.21245	8.34E-02	1
19990906	MCLEOD LAI	1	actual	TRUE	9	TRUE	91	TRUE	254	TRUE	14.3	TRUE	8.2		23.45061	4.302726	325.3069	9.43E-04	8.330008	5.16E-04	1
19990907	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	60	TRUE	199	TRUE	10.1	TRUE	0.6		54.30873	5.374361	329.549	0.4353282	10.32766	0.2672506	1
19990908	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	73	TRUE	158	TRUE	11.1	TRUE	0.5		68.37757	6.028038	333.5209	1.039413	11.53487	0.6783513	1
19990909	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	78	TRUE	239	TRUE	15.6	TRUE	14.7		37.59676	2.892851	290.5594	4.72E-02	5.64519	2.14E-02	1
19990910	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	53	TRUE	255	TRUE	18.6	TRUE	0		67.36225	4.05142	294.5314	1.467284	7.833457	0.7790774	1
19990911	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	56	TRUE	220	TRUE	8.9	TRUE	0.3		78.63578	5.250243	298.7734	1.559265	10.0586	0.9436058	1
19990912	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	49	TRUE	230	TRUE	7.7	TRUE	0		84.56545	6.926719	303.6094	2.927063	13.10592	3.602109	2
19990913	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	49	TRUE	152	TRUE	8.6	TRUE	0		86.53694	8.673466	308.5714	4.028814	16.20798	5.754029	2
19990914	MCLEOD LAI	1	actual	TRUE	19	TRUE	48	TRUE	200	TRUE	8.2	TRUE	0		87.34217	10.54146	313.6954	4.427372	19.44899	6.9932	2
19990915	MCLEOD LAI	1	actual	TRUE	15	TRUE	60	TRUE	215	TRUE	6.8	TRUE	0		86.68501	11.68227	318.0994	3.757475	21.39977	6.351106	2
19990916	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	52	TRUE	249	TRUE	15	TRUE	0		86.73327	13.03813	322.4494	5.718981	23.68229	9.773345	3
19990917	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	83	TRUE	145	TRUE	4.8	TRUE	0		82.8966	13.35592	325.8454	2.029574	24.22906	3.654561	2
19990918	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	57	TRUE	187	TRUE	10.2	TRUE	0		84.66534	14.64828	330.4114	3.365448	26.37349	6.504804	2
19990919	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	55	TRUE	177	TRUE	11.5	TRUE	0		86.12012	16.34568	335.6974	4.396363	29.14371	8.776811	3
19990920	MCLEOD LAI	1	actual	TRUE	18	TRUE	37	TRUE	230	TRUE	14.8	TRUE	0		88.68654	18.47778	340.6414	7.485429	32.54247	14.38517	3
19990921	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	91	TRUE	205	TRUE	8.3	TRUE	2.9		54.19588	14.28695	339.2045	0.3933198	25.85177	0.4206629	2
19990922	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	76	TRUE	242	TRUE	8.6	TRUE	0.3		67.1713	14.91069	343.2845	0.8808121	26.90032	0.9670804	2
19990923	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	52	TRUE	259	TRUE	20	TRUE	3.8		62.95605	11.04935	338.4043	1.320632	20.43095	1.728893	2
19990924	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	59	TRUE	231	TRUE	17	TRUE	0		75.16765	11.73215	341.6023	1.82098	21.60893	2.935768	2
19990925	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	51	TRUE	253	TRUE	17.6	TRUE	0.5		81.66054	12.5749	344.8543	3.322335	23.04867	5.910578	2
19990926	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	43	TRUE	251	TRUE	13.2	TRUE	0		84.93696	13.56418	348.1243	4.062799	24.72037	7.437132	2
19990927	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	45	TRUE	256	TRUE	7.9	TRUE	0		85.76566	14.44546	351.2503	3.489146	26.19744	6.69979	2
19990928	MCLEOD LAI	1	actual	TRUE	0.2	TRUE	99	TRUE	195	TRUE	9.4	TRUE	0		77.59288	14.448	352.9903	1.463282	26.21367	2.598751	2
19990929	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	78	TRUE	62	TRUE	5	TRUE	16		29.05937	6.608781	302.2931	3.41E-03	12.53259	2.33E-03	1
19990930	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	100	TRUE	349	TRUE	3.6	TRUE	0.3		29.29819	6.610277	304.3031	3.40E-03	12.53957	2.33E-03	1
19991001	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	50	TRUE	38	TRUE	10.8	TRUE	0		52.78831	6.937999	305.5831	0.3875031	13.1307	0.2722806	1
19991002	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	56	TRUE	184	TRUE	8.8	TRUE	0		67.3342	7.336194	307.1691	0.8946271	13.84569	0.6483219	1
19991003	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	85	TRUE	192	TRUE	4.2	TRUE	0.5		70.24158	7.47438	308.7551	0.7790486	14.09569	0.5705246	1
19991004	MCLEOD LAI	1	actual	TRUE	8.2	TRUE	70	TRUE	168	TRUE	5	TRUE	0.5		75.47325	7.901348	310.9351	1.012444	14.85874	0.7649324	1
19991005	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	59	TRUE	39	TRUE	7	TRUE	0.3		80.5126	8.64422	313.5831	1.70891	16.17382	2.090381	2
19991006	MCLEOD LAI	1	actual	TRUE	13	TRUE	63	TRUE	193	TRUE	11.3	TRUE	0		82.71941	9.432564	316.6271	2.753596	17.5575	4.091437	2
19991007	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	62	TRUE	245	TRUE	18.7	TRUE	7.3		53.82439	5.384975	298.8677	0.6407678	10.30573	0.3929156	1
19991008	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	60	TRUE	255	TRUE	8.8	TRUE	0		68.2328	5.888991	300.8857	0.9213738	11.22856	0.5923333	1
19991009	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	64	TRUE	208	TRUE	10.3	TRUE	0.3		75.92783	6.374462	302.9937	1.359683	12.11189	0.9121585	1
19991010	MCLEOD LAI	1	actual	TRUE	5.3	TRUE	65	TRUE	261	TRUE	9.4	TRUE	0.3		79.1879	6.715806	304.6517	1.683562	12.73005	1.591652	2
19991011	MCLEOD LAI	1	actual	TRUE	7.1	TRUE	60	TRUE	200	TRUE	9.6	TRUE	0		81.59201	7.210307	306.6337	2.202163	13.61995	2.601444	2
19991012	MCLEOD LAI	1	actual	TRUE	7.1	TRUE	55	TRUE	173	TRUE	16.2	TRUE	0		83.37356	7.770658	308.6157	3.833049	14.62096	5.153048	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating	
19991013	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	68	TRUE	227	TRUE	26.1	TRUE	7.9		51.90331	4.161546	288.9661	0.7619687	8.033843	0.4097854	1	
19991014	MCLEOD LAI	1	actual	TRUE	4.4	TRUE	57	TRUE	271	TRUE	15	TRUE	0.5		67.84323	4.519891	290.4621	1.243466	8.701279	0.696748	1	
19991015	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	53	TRUE	208	TRUE	10.7	TRUE	0		76.78319	4.997027	292.1741	1.469612	9.584258	0.8665312	1	
19991016	MCLEOD LAI	1	actual	TRUE	2.6	TRUE	65	TRUE	213	TRUE	15.9	TRUE	0		79.47157	5.192685	293.3461	2.401532	9.945254	2.29259	2	
19991017	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	52	TRUE	272	TRUE	19	TRUE	0		83.66381	6.083532	296.0661	4.58478	11.57258	5.385149	2	
19991018	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	61	TRUE	194	TRUE	10.5	TRUE	0		83.82245	6.705976	298.4441	3.050721	12.69861	3.699009	2	
19991019	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	63	TRUE	224	TRUE	9.9	TRUE	0.3		83.86977	7.293813	300.8581	2.978492	13.75402	3.793691	2	
19991020	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	54	TRUE	246	TRUE	17.1	TRUE	0		85.12557	8.289996	303.9201	5.075074	15.52154	6.980526	2	
19991021	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	96	TRUE	226	TRUE	11.1	TRUE	6		32.66608	4.35955	290.8201	1.21E-02	8.404143	6.68E-03	1	
19991022	MCLEOD LAI	1	actual	TRUE	11.9	TRUE	64	TRUE	202	TRUE	8	TRUE	0.3		56.70282	5.078512	293.6661	0.4835052	9.736097	0.2875013	1	
19991023	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	38	TRUE	165	TRUE	19.9	TRUE	0		79.48341	6.471481	296.8541	2.941259	12.27402	3.467478	2	
19991024	MCLEOD LAI	1	actual	TRUE	7	TRUE	50	TRUE	220	TRUE	22.7	TRUE	0		83.22552	7.080227	298.8181	5.217399	13.36856	6.600239	2	
19991025	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	99	TRUE	164	TRUE	6.8	TRUE	0.3		76.76202	7.082652	299.6121	1.205586	13.37487	0.8562104	1	
19991026	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	76	TRUE	209	TRUE	16.1	TRUE	4.6		46.46861	3.943894	290.0983	0.2306825	7.628514	0.1208644	1	
19991027	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	64	TRUE	31	TRUE	6.6	TRUE	0		59.60281	4.1219	291.1983	0.5565715	7.962044	0.2979627	1	
19991028	MCLEOD LAI	1	actual	TRUE	0	TRUE	100	TRUE	28	TRUE	7.2	TRUE	0		59.74976	4.122566	291.9023	0.5791172	7.963943	0.3100701	1	
19991029	MCLEOD LAI	1	actual	TRUE	0	TRUE	100	TRUE	160	TRUE	16.4	TRUE	0		59.78913	4.122566	292.6064	0.9229841	7.964597	0.4942033	1	
19991030	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	57	TRUE	229	TRUE	18.6	TRUE	8.1		44.84653	1.981432	272.484	0.2050247	3.892108	7.95E-02	1	
19991101	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	66	TRUE	206	TRUE	14.5	TRUE	0									
19991102	MCLEOD LAI	1	actual	TRUE	0.3	TRUE	72	TRUE	188	TRUE	6.4	TRUE	0									
19991103	MCLEOD LAI	1	actual	TRUE	0	TRUE	100	TRUE	217	TRUE	5.2	TRUE	0									
19991104	MCLEOD LAI	1	actual	TRUE	-0.6	TRUE	82	TRUE	205	TRUE	11.9	TRUE	0									
19991105	MCLEOD LAI	1	actual	TRUE	-2.2	TRUE	77	TRUE	128	TRUE	5.7	TRUE	1.9									
19991106	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	99	TRUE	51	TRUE	1.1	TRUE	0									
19991107	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	99	TRUE	148	TRUE	3.7	TRUE	0.3									
19991108	MCLEOD LAI	1	actual	TRUE	1.1	TRUE	100	TRUE	24	TRUE	9	TRUE	3.1									
19991109	MCLEOD LAI	1	actual	TRUE	5.5	TRUE	79	TRUE	197	TRUE	13.7	TRUE	14.5									
19991110	MCLEOD LAI	1	actual	TRUE	4.3	TRUE	89	TRUE	219	TRUE	5.7	TRUE	4.1									
19991111	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	83	TRUE	234	TRUE	2.3	TRUE	0									
19991112	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	95	TRUE	159	TRUE	4.1	TRUE	2.1									
19991113	MCLEOD LAI	1	actual	TRUE	-1.6	TRUE	99	TRUE	201	TRUE	13.4	TRUE	0.6									
19991114	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	100	TRUE	161	TRUE	2.5	TRUE	4.3									
19991115	MCLEOD LAI	1	actual	TRUE	4.1	TRUE	100	TRUE	13	TRUE	9.6	TRUE	11.4									
19991116	MCLEOD LAI	1	actual	TRUE	-3.3	TRUE	89	TRUE	11	TRUE	23.9	TRUE	0.8									
19991117	MCLEOD LAI	1	actual	TRUE	-2.3	TRUE	100	TRUE	61	TRUE	3.5	TRUE	0									
19991118	MCLEOD LAI	1	actual	TRUE	0.1	TRUE	100	TRUE	192	TRUE	7	TRUE	0									
19991119	MCLEOD LAI	1	actual	TRUE	1.5	TRUE	98	TRUE	105	TRUE	2.8	TRUE	0									
19991120	MCLEOD LAI	1	actual	TRUE	2.8	TRUE	88	TRUE	226	TRUE	12.7	TRUE	14									
19991121	MCLEOD LAI	1	actual	TRUE	-1	TRUE	90	TRUE	162	TRUE	8.5	TRUE	0.3									
19991122	MCLEOD LAI	1	actual	TRUE	-1.5	TRUE	94	TRUE	214	TRUE	11.8	TRUE	0									
19991123	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	89	TRUE	216	TRUE	3.7	TRUE	0									

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
19991125	MCLEOD LAI	1	actual	TRUE	-2.4	TRUE	89	TRUE	223	TRUE	16.1	TRUE	0								
19991126	MCLEOD LAI	1	actual	TRUE	-4.2	TRUE	82	TRUE	214	TRUE	7.9	TRUE	1.1								
19991127	MCLEOD LAI	1	actual	TRUE	-7.6	TRUE	91	TRUE	26	TRUE	8	TRUE	0.5								
19991128	MCLEOD LAI	1	actual	TRUE	-1.5	TRUE	93	TRUE	118	TRUE	4.4	TRUE	0								
19991129	MCLEOD LAI	1	actual	TRUE	4.3	TRUE	71	TRUE	157	TRUE	14.9	TRUE	7.2								
19991130	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	62	TRUE	225	TRUE	20.8	TRUE	0.3								
19991201	MCLEOD LAI	1	actual	TRUE	-3.6	TRUE	98	TRUE	198	TRUE	8.9	TRUE	0								
19991202	MCLEOD LAI	1	actual	TRUE	-1.3	TRUE	97	TRUE	270	TRUE	7.8	TRUE	0								
19991203	MCLEOD LAI	1	actual	TRUE	-6.4	TRUE	95	TRUE	224	TRUE	5.6	TRUE	0								
19991204	MCLEOD LAI	1	actual	TRUE	0.4	TRUE	87	TRUE	181	TRUE	17.5	TRUE	0								
19991205	MCLEOD LAI	1	actual	TRUE	-2	TRUE	100	TRUE	192	TRUE	4.6	TRUE	1.2								
19991206	MCLEOD LAI	1	actual	TRUE	-1.9	TRUE	99	TRUE	236	TRUE	7.6	TRUE	0								
19991207	MCLEOD LAI	1	actual	TRUE	-6.7	TRUE	98	TRUE	203	TRUE	3.2	TRUE	0								
19991208	MCLEOD LAI	1	actual	TRUE	-6.3	TRUE	97	TRUE	109	TRUE	4.5	TRUE	0								
19991209	MCLEOD LAI	1	actual	TRUE	-2.2	TRUE	98	TRUE	130	TRUE	2	TRUE	0								
19991210	MCLEOD LAI	1	actual	TRUE	-2.1	TRUE	98	TRUE	212	TRUE	9.9	TRUE	0								
19991212	MCLEOD LAI	1	actual	TRUE	-0.3	TRUE	99	TRUE	200	TRUE	10.3	TRUE	0.3								
19991213	MCLEOD LAI	1	actual	TRUE	-4.3	TRUE	92	TRUE	223	TRUE	4.5	TRUE	0								
19991214	MCLEOD LAI	1	actual	TRUE	-4	TRUE	91	TRUE	234	TRUE	2.7	TRUE	0								
19991215	MCLEOD LAI	1	actual	TRUE	-2.4	TRUE	100	TRUE	184	TRUE	9.5	TRUE	0								
19991216	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	97	TRUE	223	TRUE	11.2	TRUE	0.3								
19991217	MCLEOD LAI	1	actual	TRUE	-3.9	TRUE	99	TRUE	14	TRUE	11.1	TRUE	0								
19991218	MCLEOD LAI	1	actual	TRUE	-4	TRUE	78	TRUE	293	TRUE	3.2	TRUE	0								
19991219	MCLEOD LAI	1	actual	TRUE	-10	TRUE	97	TRUE	206	TRUE	11.1	TRUE	0								
19991220	MCLEOD LAI	1	actual	TRUE	-5.4	TRUE	100	TRUE	141	TRUE	9.3	TRUE	0								
19991221	MCLEOD LAI	1	actual	TRUE	-1.1	TRUE	99	TRUE	223	TRUE	0	TRUE	0								
19991222	MCLEOD LAI	1	actual	TRUE	-2.3	TRUE	100	TRUE	147	TRUE	0	TRUE	2.3								
19991223	MCLEOD LAI	1	actual	TRUE	-3.3	TRUE	100	TRUE	184	TRUE	0	TRUE	0								
19991224	MCLEOD LAI	1	actual	TRUE	-2.5	TRUE	100	TRUE	229	TRUE	0.2	TRUE	0								
19991225	MCLEOD LAI	1	actual	TRUE	-2	TRUE	99	TRUE	165	TRUE	0	TRUE	0.3								
19991226	MCLEOD LAI	1	actual	TRUE	-0.6	TRUE	96	TRUE	221	TRUE	5.5	TRUE	3.6								
20000204	MCLEOD LAI	1	actual	TRUE	-9	TRUE	92	TRUE	17	TRUE	11.4	TRUE	0								
20000206	MCLEOD LAI	1	actual	TRUE	-4.3	TRUE	68	TRUE	254	TRUE	4	TRUE	0								
20000220	MCLEOD LAI	1	actual	TRUE	1.9	TRUE	51	TRUE	189	TRUE	13.4	TRUE	0								
20000303	MCLEOD LAI	1	actual	TRUE	0.9	TRUE	92	TRUE	189	TRUE	13.6	TRUE	1.3								
20000304	MCLEOD LAI	1	actual	TRUE	2	TRUE	52	TRUE	242	TRUE	10.1	TRUE	0								
20000305	MCLEOD LAI	1	actual	TRUE	-0.7	TRUE	65	TRUE	31	TRUE	9.9	TRUE	0								
20000310	MCLEOD LAI	1	actual	TRUE	4.8	TRUE	61	TRUE	112	TRUE	2.3	TRUE	0								
20000311	MCLEOD LAI	1	actual	TRUE	-7.4	TRUE	86	TRUE	22	TRUE	16.5	TRUE	0								
20000313	MCLEOD LAI	1	actual	TRUE	4.8	TRUE	56	TRUE	55	TRUE	7.3	TRUE	0								
20000314	MCLEOD LAI	1	actual	TRUE	-6.6	TRUE	87	TRUE	18	TRUE	13.4	TRUE	0								

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20000315	MCLEOD LAI		1 actual	TRUE	-2	TRUE	89	TRUE	131	TRUE	6.4	TRUE	0.3								
20000316	MCLEOD LAI		1 actual	TRUE	0.9	TRUE	95	TRUE	206	TRUE	13.1	TRUE	2.5								
20000317	MCLEOD LAI		1 actual	TRUE	1.4	TRUE	79	TRUE	221	TRUE	17.8	TRUE	0.5								
20000318	MCLEOD LAI		1 actual	TRUE	-0.5	TRUE	100	TRUE	176	TRUE	12.5	TRUE	0								
20000319	MCLEOD LAI		1 actual	TRUE	1.2	TRUE	91	TRUE	238	TRUE	4.6	TRUE	3.6								
20000320	MCLEOD LAI		1 actual	TRUE	-0.8	TRUE	96	TRUE	205	TRUE	20.8	TRUE	4.4								
20000321	MCLEOD LAI		1 actual	TRUE	6.2	TRUE	62	TRUE	247	TRUE	29.1	TRUE	2.3								
20000322	MCLEOD LAI		1 actual	TRUE	3.9	TRUE	55	TRUE	35	TRUE	7.9	TRUE	0								
20000323	MCLEOD LAI		1 actual	TRUE	4.4	TRUE	51	TRUE	263	TRUE	17.4	TRUE	0								
20000324	MCLEOD LAI		1 actual	TRUE	3.8	TRUE	58	TRUE	224	TRUE	20.1	TRUE	0								
20000325	MCLEOD LAI		1 actual	TRUE	4	TRUE	68	TRUE	242	TRUE	10.6	TRUE	0.3								
20000327	MCLEOD LAI		1 actual	TRUE	3.7	TRUE	84	TRUE	189	TRUE	10.4	TRUE	3.3								
20000328	MCLEOD LAI		1 actual	TRUE	3.7	TRUE	46	TRUE	233	TRUE	20.6	TRUE	0.3								
20000330	MCLEOD LAI		1 actual	TRUE	5.6	TRUE	73	TRUE	222	TRUE	9.5	TRUE	0.5								
20000331	MCLEOD LAI		1 actual	TRUE	1.5	TRUE	97	TRUE	204	TRUE	13.1	TRUE	26.4								
20000401	MCLEOD LAI		1 actual	TRUE	3.8	TRUE	91	TRUE	5	TRUE	13	TRUE	2.1								
20000403	MCLEOD LAI		1 actual	TRUE	4.4	TRUE	96	TRUE	153	TRUE	7.8	TRUE	3.4								
20000404	MCLEOD LAI		1 actual	TRUE	5.6	TRUE	44	TRUE	258	TRUE	20.4	TRUE	0								
20000405	MCLEOD LAI		1 actual	TRUE	0.9	TRUE	88	TRUE	201	TRUE	8.9	TRUE	0.5								
20000406	MCLEOD LAI		1 actual	TRUE	4.9	TRUE	47	TRUE	242	TRUE	18.7	TRUE	2.4								
20000407	MCLEOD LAI		1 actual	TRUE	0.1	TRUE	85	TRUE	201	TRUE	19.4	TRUE	1.8								
20000408	MCLEOD LAI		1 actual	TRUE	7.1	TRUE	35	TRUE	230	TRUE	13.7	TRUE	0								
20000409	MCLEOD LAI		1 actual	TRUE	4.2	TRUE	48	TRUE	28	TRUE	11.6	TRUE	0								
20000410	MCLEOD LAI		1 actual	TRUE	9	TRUE	36	TRUE	233	TRUE	8.8	TRUE	0								
20000411	MCLEOD LAI		1 actual	TRUE	8	TRUE	37	TRUE	221	TRUE	5.6	TRUE	0								
20000412	MCLEOD LAI		1 actual	TRUE	-0.5	TRUE	97	TRUE	28	TRUE	17.2	TRUE	2.4								
20000413	MCLEOD LAI		1 actual	TRUE	-7.3	TRUE	44	TRUE	34	TRUE	28.5	TRUE	0.6								
20000414	MCLEOD LAI		1 actual	TRUE	-4.3	TRUE	42	TRUE	44	TRUE	27.4	TRUE	0								
20000415	MCLEOD LAI		1 actual	TRUE	1.8	TRUE	38	TRUE	221	TRUE	8.7	TRUE	0								
20000416	MCLEOD LAI		1 actual	TRUE	4	TRUE	39	TRUE	253	TRUE	19.2	TRUE	0								
20000417	MCLEOD LAI		1 actual	TRUE	7.5	TRUE	24	TRUE	250	TRUE	9.3	TRUE	0								
20000418	MCLEOD LAI		1 actual	TRUE	9.3	TRUE	32	TRUE	157	TRUE	11.1	TRUE	0								
20000419	MCLEOD LAI		1 actual	TRUE	9.8	TRUE	42	TRUE	214	TRUE	15.2	TRUE	0								
20000420	MCLEOD LAI		1 actual	TRUE	8	TRUE	53	TRUE	206	TRUE	15.9	TRUE	0								
20000421	MCLEOD LAI		1 actual	TRUE	4.6	TRUE	96	TRUE	168	TRUE	11.3	TRUE	5.6								
20000422	MCLEOD LAI		1 actual	TRUE	7.3	TRUE	76	TRUE	279	TRUE	7	TRUE	8.4								
20000423	MCLEOD LAI		1 actual	TRUE	5.9	TRUE	47	TRUE	210	TRUE	11.2	TRUE	0								
20000424	MCLEOD LAI		1 actual	TRUE	6.5	TRUE	37	TRUE	243	TRUE	14	TRUE	0								
20000425	MCLEOD LAI		1 actual	TRUE	7.7	TRUE	33	TRUE	141	TRUE	7	TRUE	0								
20000426	MCLEOD LAI		1 actual	TRUE	8.9	TRUE	42	TRUE	139	TRUE	8.7	TRUE	0								
20000427	MCLEOD LAI		1 actual	TRUE	12.9	TRUE	43	TRUE	60	TRUE	11.5	TRUE	0.3								

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20000428	MCLEOD LAI	1	actual	TRUE	9	TRUE	40	TRUE	195	TRUE	11.6	TRUE	4.4								
20000429	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	41	TRUE	221	TRUE	21.2	TRUE	0								
20000430	MCLEOD LAI	1	actual	TRUE	5.5	TRUE	75	TRUE	178	TRUE	15.5	TRUE	0.9								
20000501	MCLEOD LAI	5	startup	TRUE	10.3	TRUE	37	TRUE	279	TRUE	16.5	TRUE	0.8		85	6	15				
20000502	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	50	TRUE	99	TRUE	9.6	TRUE	0		85.61055	7.572699	19.348	3.719787	7.655044	3.394134	2
20000503	MCLEOD LAI	1	actual	TRUE	8	TRUE	70	TRUE	132	TRUE	19.1	TRUE	0		84.12671	8.281832	23.192	4.900124	8.751125	4.944544	2
20000504	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	41	TRUE	276	TRUE	13.2	TRUE	0.8		83.78745	9.895257	27.252	3.479182	10.37372	3.775774	2
20000505	MCLEOD LAI	1	actual	TRUE	3.7	TRUE	92	TRUE	5	TRUE	6.9	TRUE	0.8		76.95667	10.00141	30.322	1.228838	10.96285	0.7795534	1
20000506	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	60	TRUE	281	TRUE	9.5	TRUE	2.1		66.22475	9.025419	34.076	0.8917139	10.85991	0.5627427	1
20000507	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	35	TRUE	225	TRUE	11.9	TRUE	0		81.45574	11.29435	38.676	2.433487	13.05659	2.872322	2
20000508	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	42	TRUE	186	TRUE	6.9	TRUE	0		85.10061	13.05942	42.952	3.02503	14.83926	4.056726	2
20000509	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	51	TRUE	77	TRUE	16	TRUE	0		85.24396	14.27742	46.868	4.88056	16.20982	6.898151	2
20000510	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	49	TRUE	38	TRUE	16.4	TRUE	0		85.54805	15.57469	50.82	5.194561	17.63669	7.649278	2
20000511	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	48	TRUE	28	TRUE	10.7	TRUE	0		85.85207	16.97642	54.862	4.066735	19.1435	6.403342	2
20000512	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	29	TRUE	227	TRUE	10.9	TRUE	0		89.28782	19.92974	59.912	6.704328	21.76181	10.6613	3
20000513	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	36	TRUE	236	TRUE	8.7	TRUE	0		89.33694	22.6002	64.962	6.043272	24.17461	10.34911	3
20000514	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	34	TRUE	216	TRUE	18.1	TRUE	0		89.66093	25.62813	70.3	10.16646	26.8163	16.45372	3
20000515	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	28	TRUE	151	TRUE	10.1	TRUE	0		90.57949	28.75405	75.45799	7.748352	29.4513	14.02416	3
20000516	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	47	TRUE	10	TRUE	6.7	TRUE	0		89.09014	30.60981	80.05799	5.273742	31.30056	10.65512	3
20000517	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	85	TRUE	224	TRUE	7.3	TRUE	1.7		68.51593	29.25964	84.22599	0.862085	31.31909	1.244204	2
20000518	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	36	TRUE	228	TRUE	15.6	TRUE	0.5		83.65214	31.95969	89.31199	3.856961	33.73752	8.537096	3
20000519	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	55	TRUE	239	TRUE	26.8	TRUE	0.6		84.50969	33.74464	94.21799	7.605572	35.60711	15.26572	3
20000520	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	48	TRUE	211	TRUE	16	TRUE	0		85.36331	34.97006	98.02599	4.961898	36.96903	11.12612	3
20000521	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	96	TRUE	172	TRUE	7.9	TRUE	7		28.79496	19.66444	90.66511	3.66E-03	25.50135	3.88E-03	2
20000522	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	43	TRUE	228	TRUE	19.8	TRUE	5.2		54.19447	14.12212	87.84946	0.7020277	20.14734	0.6393369	2
20000523	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	42	TRUE	268	TRUE	18	TRUE	0		75.2363	15.77691	91.99947	1.922574	22.08533	3.195023	2
20000524	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	34	TRUE	254	TRUE	20.8	TRUE	0		84.35574	17.48927	95.98746	5.505325	24.03182	9.540742	3
20000525	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	33	TRUE	208	TRUE	13.5	TRUE	0		87.28686	19.23812	99.97546	5.737252	25.97865	10.3075	3
20000526	MCLEOD LAI	1	actual	TRUE	9	TRUE	49	TRUE	310	TRUE	10.4	TRUE	1.9		74.16431	18.56559	103.9995	1.238777	25.67339	1.994472	2
20000527	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	53	TRUE	65	TRUE	18.9	TRUE	0		81.34356	19.8731	108.0955	3.417761	27.23053	6.730264	2
20000528	MCLEOD LAI	1	actual	TRUE	8	TRUE	84	TRUE	196	TRUE	3.5	TRUE	0.8		76.02832	20.26121	111.9395	0.9714198	27.89832	1.391521	2
20000529	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	56	TRUE	272	TRUE	12.1	TRUE	1.7		72.08987	20.25416	116.2335	1.235975	28.2163	2.190581	2
20000530	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	47	TRUE	237	TRUE	4.3	TRUE	0		81.03277	22.3214	121.1215	1.580321	30.56212	3.264163	2
20000531	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	24	TRUE	19	TRUE	10	TRUE	0		89.82295	26.30198	126.9275	6.918269	34.6523	13.99025	3
20000601	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	38	TRUE	314	TRUE	6.3	TRUE	0		89.87225	29.38694	133.5355	5.782224	37.91444	12.75959	3
20000602	MCLEOD LAI	1	actual	TRUE	18	TRUE	32	TRUE	332	TRUE	14.2	TRUE	0		90.34978	32.82132	140.1795	9.21879	41.40591	19.05434	3
20000603	MCLEOD LAI	1	actual	TRUE	22.8	TRUE	23	TRUE	265	TRUE	21.6	TRUE	0		92.82024	37.6662	147.6875	19.00077	46.00172	33.19378	4
20000604	MCLEOD LAI	1	actual	TRUE	21.3	TRUE	32	TRUE	199	TRUE	8	TRUE	0		92.54185	41.67037	154.9255	9.207865	49.83224	20.93079	4
20000605	MCLEOD LAI	1	actual	TRUE	21.1	TRUE	41	TRUE	55	TRUE	13.3	TRUE	0.3		91.16547	45.13032	162.1275	9.897573	53.2226	22.78943	4
20000606	MCLEOD LAI	1	actual	TRUE	14	TRUE	80	TRUE	226	TRUE	7.3	TRUE	15.7		37.20153	20.56336	134.7544	2.86E-02	29.76968	3.35E-02	2
20000607	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	95	TRUE	290	TRUE	3.4	TRUE	2.6		26.73719	16.61355	139.8324	1.58E-03	25.61791	1.68E-03	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20000608	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	91	TRUE	272	TRUE	5.8	TRUE	8.6		15.73795	8.783138	129.0501	2.98E-05	15.01199	2.27E-05	1
20000609	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	64	TRUE	21	TRUE	8.9	TRUE	3.4		39.68472	6.96631	130.6338	0.0511847	12.29366	3.46E-02	1
20000610	MCLEOD LAI	1	actual	TRUE	8.9	TRUE	86	TRUE	37	TRUE	12.2	TRUE	4.1		33.08315	4.299482	129.8613	0.0142281	7.941629	7.61E-03	1
20000611	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	71	TRUE	195	TRUE	14.1	TRUE	8.3		36.29281	2.551954	120.0833	3.31E-02	4.846423	1.40E-02	1
20000612	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	84	TRUE	159	TRUE	0.8	TRUE	0.5		44.42266	2.991476	125.1793	7.82E-02	5.645659	3.55E-02	1
20000613	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	63	TRUE	225	TRUE	18.6	TRUE	1.3		64.25082	4.380652	130.9593	1.305296	8.085172	0.7042637	1
20000614	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	52	TRUE	241	TRUE	19.2	TRUE	0.3		79.31689	6.24784	136.8473	2.793264	11.21555	3.065212	2
20000615	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	42	TRUE	254	TRUE	14	TRUE	0		86.1405	9.005815	143.2933	5.000914	15.56589	6.897566	2
20000616	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	42	TRUE	222	TRUE	12	TRUE	0		87.89777	11.87647	149.8833	5.805107	19.82558	8.987292	2
20000617	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	69	TRUE	231	TRUE	14.6	TRUE	2.6		69.46118	10.31592	156.0233	1.283304	17.70525	1.346242	2
20000618	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	82	TRUE	299	TRUE	17.5	TRUE	0.3		74.34262	10.83818	161.1913	1.787275	18.55702	2.523956	2
20000619	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	55	TRUE	286	TRUE	10.6	TRUE	0.5		81.53378	12.56363	167.0073	2.30014	21.14964	3.813826	2
20000620	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	57	TRUE	257	TRUE	15	TRUE	0		84.16382	14.30434	172.9493	4.005365	23.70681	7.162635	2
20000621	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	66	TRUE	243	TRUE	22.3	TRUE	0		84.21125	15.31276	178.1713	5.823185	25.20909	10.26579	3
20000622	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	38	TRUE	262	TRUE	18.3	TRUE	0.3		87.64874	17.92015	184.2573	7.694839	28.83045	13.795	3
20000623	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	38	TRUE	223	TRUE	12.7	TRUE	0		88.52824	20.65348	190.4873	6.582526	32.49801	13.003	3
20000624	MCLEOD LAI	1	actual	TRUE	17	TRUE	38	TRUE	339	TRUE	4.3	TRUE	0		88.92654	23.61262	196.9513	4.564542	36.33474	10.28558	3
20000625	MCLEOD LAI	1	actual	TRUE	23.6	TRUE	36	TRUE	161	TRUE	12.1	TRUE	0		90.25028	27.75482	204.6033	8.175885	41.45202	17.45069	3
20000626	MCLEOD LAI	1	actual	TRUE	24.1	TRUE	42	TRUE	211	TRUE	7	TRUE	0.3		90.29972	31.57617	212.3453	6.367929	46.03763	15.28361	3
20000627	MCLEOD LAI	1	actual	TRUE	25.7	TRUE	34	TRUE	287	TRUE	6.5	TRUE	0		91.12133	36.22577	220.3753	6.982137	51.34927	17.36743	4
20000628	MCLEOD LAI	1	actual	TRUE	25.4	TRUE	34	TRUE	241	TRUE	14.1	TRUE	0.3		91.19698	40.81634	228.3513	10.35104	56.42062	24.22492	4
20000629	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	43	TRUE	253	TRUE	14.6	TRUE	3.3		75.36578	33.9748	229.8919	1.631998	49.61763	4.902812	3
20000630	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	61	TRUE	265	TRUE	5.1	TRUE	2.5		64.66698	29.90919	235.8339	0.6727656	45.4182	1.277673	3
20000701	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	51	TRUE	258	TRUE	8.7	TRUE	0		79.00153	31.84671	242.3459	1.59665	47.94295	4.67393	3
20000702	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	88	TRUE	349	TRUE	7.6	TRUE	8.7		33.30146	16.57723	227.2415	1.19E-02	28.04057	1.34E-02	2
20000703	MCLEOD LAI	1	actual	TRUE	10	TRUE	96	TRUE	100	TRUE	3.9	TRUE	15.3		8.435343	7.434935	194.8878	6.70E-07	13.57515	4.80E-07	1
20000704	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	76	TRUE	240	TRUE	9.9	TRUE	0		37.08102	8.397656	201.4178	3.17E-02	15.20995	2.43E-02	1
20000705	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	66	TRUE	46	TRUE	12.1	TRUE	1.6		59.02217	9.121821	208.1278	0.7065297	16.44208	0.5673101	1
20000706	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	75	TRUE	192	TRUE	10.1	TRUE	0.3		71.80375	10.16576	214.7838	1.105839	18.18032	0.9444101	1
20000707	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	81	TRUE	211	TRUE	9.9	TRUE	5.1		46.03553	6.416055	211.1157	0.1584202	11.926	0.1053503	1
20000708	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	77	TRUE	65	TRUE	13	TRUE	2.7		52.64698	5.193802	217.6817	0.426567	9.802872	0.2545781	1
20000709	MCLEOD LAI	1	actual	TRUE	18	TRUE	63	TRUE	0	TRUE	8.8	TRUE	0		72.47869	6.862501	224.6257	1.062196	12.75111	0.7338344	1
20000710	MCLEOD LAI	1	actual	TRUE	21.7	TRUE	57	TRUE	161	TRUE	9.9	TRUE	0		82.86503	9.186448	232.2357	2.613787	16.71948	3.734169	2
20000711	MCLEOD LAI	1	actual	TRUE	16	TRUE	62	TRUE	207	TRUE	12.7	TRUE	2.9		68.77627	7.896125	234.8398	1.1411	14.56771	0.8520722	1
20000712	MCLEOD LAI	1	actual	TRUE	20.3	TRUE	42	TRUE	222	TRUE	7.2	TRUE	0		83.49223	10.79105	242.1978	2.473483	19.41908	3.894557	2
20000713	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	70	TRUE	18	TRUE	9.4	TRUE	6.7		52.79921	6.877378	233.6157	0.361519	12.81184	0.2504445	1
20000714	MCLEOD LAI	1	actual	TRUE	9	TRUE	94	TRUE	212	TRUE	18.3	TRUE	9.7		22.07419	3.195025	215.6913	7.11E-04	6.161863	3.36E-04	1
20000715	MCLEOD LAI	1	actual	TRUE	16	TRUE	66	TRUE	245	TRUE	9	TRUE	2.6		46.22853	3.088275	222.2753	0.1557572	5.969212	7.25E-02	1
20000716	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	69	TRUE	130	TRUE	4.3	TRUE	0		63.53484	4.271175	228.7153	0.6151901	8.161325	0.3335119	1
20000717	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	56	TRUE	190	TRUE	5.7	TRUE	6.1		55.53742	3.828388	222.7369	0.3902465	7.34132	0.2006025	1
20000718	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	52	TRUE	254	TRUE	13.2	TRUE	0		79.78454	6.466666	230.4909	2.162997	12.08564	2.303822	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20000719	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	72	TRUE	222	TRUE	13.8	TRUE	0		82.25482	7.81474	237.6869	2.94761	14.44238	3.872385	2
20000720	MCLEOD LAI	1	actual	TRUE	19	TRUE	60	TRUE	263	TRUE	17.7	TRUE	0		84.79202	9.721865	244.8109	4.99668	17.68771	7.398665	2
20000721	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	41	TRUE	247	TRUE	17.1	TRUE	0		88.41166	12.77546	252.2769	8.080101	22.67965	12.6657	3
20000722	MCLEOD LAI	1	actual	TRUE	26.1	TRUE	45	TRUE	352	TRUE	3.1	TRUE	0		89.14745	16.30807	260.6789	4.435156	28.2049	8.678106	3
20000723	MCLEOD LAI	1	actual	TRUE	21.3	TRUE	68	TRUE	235	TRUE	7.4	TRUE	18.3		50.2744	8.625162	218.8221	0.246261	15.70294	0.1923124	1
20000724	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	50	TRUE	212	TRUE	13.8	TRUE	0		77.77204	11.17626	226.2701	1.853065	19.89573	2.807265	2
20000725	MCLEOD LAI	1	actual	TRUE	21.6	TRUE	58	TRUE	225	TRUE	5.9	TRUE	3.1		69.07046	10.03412	229.3714	0.8176421	18.08984	0.6961297	1
20000726	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	62	TRUE	179	TRUE	13.5	TRUE	1.1		76.86247	11.82412	236.4594	1.701977	21.02043	2.627236	2
20000727	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	69	TRUE	180	TRUE	13.8	TRUE	5.1		58.75431	8.213895	232.8616	0.7556779	15.09651	0.576364	1
20000728	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	51	TRUE	248	TRUE	20.1	TRUE	0.8		78.83054	10.48084	239.8776	2.790989	18.89749	4.361031	2
20000729	MCLEOD LAI	1	actual	TRUE	17	TRUE	46	TRUE	251	TRUE	19.5	TRUE	0		85.67358	12.78908	246.6416	6.180003	22.64291	10.17836	3
20000730	MCLEOD LAI	1	actual	TRUE	21	TRUE	44	TRUE	217	TRUE	7.9	TRUE	0		87.96117	15.70085	254.1256	4.764636	27.20034	9.041073	3
20000731	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	79	TRUE	47	TRUE	7.7	TRUE	0.5		84.40086	16.76552	261.5736	2.862511	28.90016	5.909275	2
20000801	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	98	TRUE	202	TRUE	5.7	TRUE	14.7		17.5659	7.521543	227.2885	6.54E-05	13.89365	4.75E-05	1
20000802	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	73	TRUE	173	TRUE	5.3	TRUE	1		42.21879	8.528421	233.2985	6.80E-02	15.62856	5.29E-02	1
20000803	MCLEOD LAI	1	actual	TRUE	22.4	TRUE	52	TRUE	43	TRUE	7.5	TRUE	0.3		73.41632	10.86198	240.3345	1.034021	19.5186	0.923074	1
20000804	MCLEOD LAI	1	actual	TRUE	26.7	TRUE	50	TRUE	247	TRUE	8.1	TRUE	0		85.68622	13.75454	248.1445	3.48559	24.161	6.369728	2
20000805	MCLEOD LAI	1	actual	TRUE	26.2	TRUE	44	TRUE	232	TRUE	15.6	TRUE	0		89.07973	16.93887	255.8645	8.2459	29.06697	14.61554	3
20000806	MCLEOD LAI	1	actual	TRUE	22.1	TRUE	53	TRUE	30	TRUE	5.5	TRUE	4.6		68.05509	12.98928	253.4488	0.7757598	23.02808	0.7694343	2
20000807	MCLEOD LAI	1	actual	TRUE	21.1	TRUE	43	TRUE	284	TRUE	9.5	TRUE	0		83.80119	15.58331	260.2508	2.89265	27.1086	5.728366	2
20000808	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	74	TRUE	33	TRUE	9.8	TRUE	0		83.8485	16.52087	266.1888	2.955174	28.60357	6.052635	2
20000809	MCLEOD LAI	1	actual	TRUE	17	TRUE	49	TRUE	227	TRUE	12.9	TRUE	1.3		81.36093	18.43778	272.2527	2.531123	31.53624	5.550729	2
20000810	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	53	TRUE	24	TRUE	8.5	TRUE	0		84.71964	20.1346	278.2267	3.11211	34.09988	7.097767	2
20000811	MCLEOD LAI	1	actual	TRUE	14.3	TRUE	58	TRUE	340	TRUE	4.5	TRUE	0		84.9822	21.47307	283.8047	2.63713	36.11489	6.312626	2
20000812	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	51	TRUE	236	TRUE	13.3	TRUE	0.3		86.37244	23.37717	290.0128	4.988064	38.9127	11.5007	3
20000813	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	71	TRUE	343	TRUE	6.7	TRUE	0		84.80899	24.18495	295.2307	2.877162	40.14776	7.321913	2
20000814	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	48	TRUE	206	TRUE	15.5	TRUE	0		86.70521	26.17017	301.3847	5.8416	43.00476	13.78086	3
20000815	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	58	TRUE	172	TRUE	7.8	TRUE	0		86.75348	27.82455	307.5927	3.990236	45.38531	10.46347	3
20000816	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	52	TRUE	128	TRUE	11.8	TRUE	0		86.88939	29.83616	314.0527	4.976434	48.2197	12.94845	3
20000817	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	78	TRUE	138	TRUE	2.1	TRUE	3.8		52.44677	21.9529	311.6343	0.2411271	37.33133	0.3304714	2
20000818	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	93	TRUE	171	TRUE	4.3	TRUE	7.5		21.70847	12.07407	295.8875	3.08E-04	21.91271	2.95E-04	2
20000819	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	91	TRUE	235	TRUE	12.8	TRUE	3.8		22.61113	8.042608	292.9771	6.52E-04	15.05221	4.97E-04	1
20000820	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	72	TRUE	207	TRUE	20.2	TRUE	0.8		50.49428	8.778753	298.0511	0.4818497	16.35333	0.3856333	1
20000821	MCLEOD LAI	1	actual	TRUE	12	TRUE	87	TRUE	198	TRUE	14.4	TRUE	3.4		41.60976	5.974278	296.8301	0.0965729	11.37614	6.25E-02	1
20000822	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	85	TRUE	205	TRUE	18.3	TRUE	4.5		39.09419	3.582639	292.2545	7.32E-02	6.952216	3.67E-02	1
20000823	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	78	TRUE	215	TRUE	13.9	TRUE	2.1		52.07435	3.148639	298.2104	0.4198276	6.135329	0.1979921	1
20000824	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	75	TRUE	135	TRUE	11.6	TRUE	0.6		69.45646	4.217307	304.6704	1.103093	8.152493	0.5976872	1
20000825	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	86	TRUE	285	TRUE	5.4	TRUE	10.6		30.11729	1.973221	279.5428	4.67E-03	3.878008	1.81E-03	1
20000826	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	66	TRUE	267	TRUE	18.6	TRUE	10.9		41.90874	1.325847	255.2392	0.1258449	2.617699	4.23E-02	1
20000827	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	72	TRUE	267	TRUE	7.1	TRUE	3.5		43.34656	0.8858181	254.1949	9.02E-02	1.756335	2.69E-02	1
20000828	MCLEOD LAI	1	actual	TRUE	7.4	TRUE	99	TRUE	203	TRUE	8.4	TRUE	2.9		24.99127	1.40E-02	254.3275	1.17E-03	2.81E-02	2.39E-04	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20000829	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	74	TRUE	30	TRUE	15.2	TRUE	3		41.04577	0.6436573	254.7655	9.08E-02	1.279235	2.51E-02	1
20000830	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	75	TRUE	206	TRUE	10.5	TRUE	0		58.00301	1.206223	259.5335	0.6064192	2.384737	0.1979664	1
20000831	MCLEOD LAI	1	actual	TRUE	8.5	TRUE	90	TRUE	23	TRUE	17.4	TRUE	12.7		24.55264	0.1902606	230.5905	1.60E-03	0.3797379	3.65E-04	1
20000901	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	89	TRUE	31	TRUE	22.3	TRUE	0.9		35.05774	0.2717655	232.8525	3.79E-02	0.5419497	9.02E-03	1
20000902	MCLEOD LAI	1	actual	TRUE	5.1	TRUE	94	TRUE	14	TRUE	14.2	TRUE	0.3		41.47543	0.3413064	235.4745	9.33E-02	0.6801482	2.29E-02	1
20000903	MCLEOD LAI	1	actual	TRUE	6.8	TRUE	91	TRUE	22	TRUE	6.8	TRUE	22.3		13.79179	0.133616	181.5095	1.28E-05	0.2667412	2.83E-06	1
20000904	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	81	TRUE	185	TRUE	10.3	TRUE	0		33.50762	0.5037529	184.9955	0.0143444	1.000693	3.77E-03	1
20000905	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	73	TRUE	266	TRUE	12.1	TRUE	2.1		50.24664	0.7558162	189.3634	0.3110301	1.496698	8.92E-02	1
20000906	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	45	TRUE	220	TRUE	17.3	TRUE	0		76.26456	2.361701	193.8214	1.977462	4.583769	0.8197325	1
20000907	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	98	TRUE	238	TRUE	11.2	TRUE	12.7		17.45585	0.5567724	168.4915	8.24E-05	1.104421	2.21E-05	1
20000908	MCLEOD LAI	1	actual	TRUE	6.5	TRUE	93	TRUE	266	TRUE	11.8	TRUE	1.8		21.48774	9.20E-02	171.3654	4.14E-04	0.1837714	8.94E-05	1
20000909	MCLEOD LAI	1	actual	TRUE	6.1	TRUE	99	TRUE	210	TRUE	12.1	TRUE	7.5		6.96513	1.54E-02	159.4703	4.26E-07	3.08E-02	8.68E-08	1
20000910	MCLEOD LAI	2	estimate	TRUE	6	TRUE	90	TRUE	210	TRUE	12	TRUE	5		14.22116	0.1264056	153.8958	2.04E-05	0.2522931	4.49E-06	1
20000911	MCLEOD LAI	1	actual	TRUE	5.4	TRUE	100	TRUE	185	TRUE	13.5	TRUE	6.2		4.462486	0	145.5159	9.37E-08	0	1.87E-08	1
20000912	MCLEOD LAI	1	actual	TRUE	10	TRUE	75	TRUE	266	TRUE	8.6	TRUE	1.1		26.47189	0.5000976	149.0199	1.90E-03	0.9918735	4.97E-04	1
20000913	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	78	TRUE	204	TRUE	9.1	TRUE	0		46.58154	0.996818	152.7579	0.164783	1.961635	0.0507482	1
20000914	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	72	TRUE	213	TRUE	11.8	TRUE	1.1		63.89887	1.920718	157.612	0.9125331	3.727863	0.3481348	1
20000915	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	33	TRUE	229	TRUE	7.6	TRUE	0		82.87	4.188647	162.52	2.329225	7.870196	1.796796	2
20000916	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	72	TRUE	188	TRUE	7.6	TRUE	0.5		83.18996	5.178082	167.536	2.426666	9.613358	2.266426	2
20000917	MCLEOD LAI	2	estimate	TRUE	15	TRUE	75	TRUE	160	TRUE	12	TRUE	3		62.81443	3.795015	168.3057	0.8764395	7.185005	0.4457745	1
20000918	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	51	TRUE	233	TRUE	15.8	TRUE	0		79.52679	5.27234	172.8537	2.402585	9.797572	2.267123	2
20000919	MCLEOD LAI	2	estimate	TRUE	14	TRUE	45	TRUE	90	TRUE	3	TRUE	0.4		84.26271	6.750929	177.0777	2.217185	12.32697	2.42561	2
20000920	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	63	TRUE	23	TRUE	18.6	TRUE	1		79.6501	7.494692	180.5997	2.801002	13.58045	3.505939	2
20000921	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	42	TRUE	50	TRUE	13.3	TRUE	0		84.15956	8.385798	183.6537	3.674441	15.05323	5.024779	2
20000922	MCLEOD LAI	1	actual	TRUE	7.6	TRUE	51	TRUE	152	TRUE	11.5	TRUE	0		84.81657	9.144765	186.7257	3.668247	16.2945	5.262952	2
20000923	MCLEOD LAI	1	actual	TRUE	13.6	TRUE	40	TRUE	214	TRUE	4.6	TRUE	0		86.92832	10.70457	190.8777	3.481418	18.77663	5.448817	2
20000924	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	51	TRUE	166	TRUE	7	TRUE	0		86.97666	12.19587	195.4797	3.956073	21.10061	6.60945	2
20000925	MCLEOD LAI	1	actual	TRUE	18	TRUE	50	TRUE	202	TRUE	9.3	TRUE	0		87.0676	13.89952	200.4237	4.500064	23.69148	7.949421	2
20000926	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	53	TRUE	193	TRUE	12.4	TRUE	0		87.11599	15.4057	205.1697	5.297275	25.94166	9.633942	3
20000927	MCLEOD LAI	1	actual	TRUE	17	TRUE	49	TRUE	172	TRUE	10.8	TRUE	0		87.1644	17.05882	209.9337	4.92077	28.35704	9.514537	3
20000928	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	53	TRUE	190	TRUE	10.8	TRUE	0		87.21282	18.46812	214.4457	4.954854	30.39267	9.95162	3
20000929	MCLEOD LAI	1	actual	TRUE	14.3	TRUE	72	TRUE	204	TRUE	19	TRUE	5.8		57.37274	11.62178	206.9729	0.8874505	20.38234	0.8141462	2
20000930	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	51	TRUE	276	TRUE	15.6	TRUE	1.3		68.07748	12.38634	210.0629	1.291431	21.59005	1.76922	2
20001001	MCLEOD LAI	1	actual	TRUE	8	TRUE	70	TRUE	246	TRUE	15.5	TRUE	0		75.52468	12.80413	212.2069	1.723775	22.2517	2.803143	2
20001002	MCLEOD LAI	1	actual	TRUE	1.5	TRUE	76	TRUE	26	TRUE	7.5	TRUE	0.9		71.91951	12.89828	213.1809	0.9741324	22.40725	0.949322	2
20001003	MCLEOD LAI	1	actual	TRUE	-1	TRUE	96	TRUE	105	TRUE	4.6	TRUE	0		71.96634	12.89884	213.7049	0.8431373	22.41532	0.8218535	2
20001004	MCLEOD LAI	1	actual	TRUE	0.6	TRUE	69	TRUE	110	TRUE	5.3	TRUE	3.6		47.15296	8.716763	208.788	0.1475863	15.7859	0.1156207	1
20001005	MCLEOD LAI	1	actual	TRUE	4.1	TRUE	60	TRUE	143	TRUE	8.5	TRUE	0.3		62.49195	9.029561	210.23	0.723067	16.30801	0.5777106	1
20001006	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	39	TRUE	166	TRUE	12.3	TRUE	0		78.15736	9.993956	212.608	1.774365	17.88601	2.420444	2
20001007	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	31	TRUE	179	TRUE	20	TRUE	0		86.8785	11.4514	215.616	7.510965	20.2183	11.26106	3
20001008	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	88	TRUE	194	TRUE	10.6	TRUE	1.1		74.8206	11.65431	218.066	1.294032	20.56141	1.677215	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20001009	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	59	TRUE	24	TRUE	7	TRUE	0		79.87399	12.30039	220.444	1.597179	21.58919	2.465155	2
20001010	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	42	TRUE	15	TRUE	10.7	TRUE	0		84.63918	13.30052	223.002	3.439045	23.1493	6.125907	2
20001011	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	69	TRUE	191	TRUE	5.8	TRUE	0		84.04835	13.7178	225.128	2.480832	23.80874	4.498981	2
20001012	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	33	TRUE	22	TRUE	2	TRUE	0		87.68359	15.36267	228.568	3.401367	26.30523	6.559213	2
20001013	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	66	TRUE	209	TRUE	11	TRUE	0		85.67572	15.98451	231.234	4.028131	27.25831	7.817888	2
20001014	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	57	TRUE	221	TRUE	14.8	TRUE	0		85.72365	16.66526	233.612	4.910999	28.28591	9.485081	3
20001015	MCLEOD LAI	1	actual	TRUE	6.5	TRUE	70	TRUE	204	TRUE	15.7	TRUE	0		84.09676	17.00727	235.486	4.11207	28.81233	8.225615	3
20001016	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	64	TRUE	191	TRUE	6.9	TRUE	3.9		56.14038	11.9786	230.768	0.436653	21.2054	0.4107797	2
20001017	MCLEOD LAI	1	actual	TRUE	5	TRUE	90	TRUE	129	TRUE	9.2	TRUE	0.6		59.78685	12.07288	232.372	0.6420453	21.37006	0.6069871	2
20001018	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	57	TRUE	226	TRUE	24.8	TRUE	10.4		49.74589	6.430463	209.6649	0.5549241	11.94503	0.369361	1
20001019	MCLEOD LAI	1	actual	TRUE	3.5	TRUE	82	TRUE	133	TRUE	9.4	TRUE	0.3		58.48036	6.553133	210.9989	0.5938699	12.16196	0.399339	1
20001020	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	100	TRUE	248	TRUE	17.6	TRUE	27.9		6.649455	2.50242	145.3221	4.64E-07	4.798277	1.96E-07	1
20001021	MCLEOD LAI	1	actual	TRUE	4.6	TRUE	65	TRUE	260	TRUE	19.2	TRUE	0.3		34.84919	2.809021	146.8541	0.0308752	5.361648	0.0136945	1
20001022	MCLEOD LAI	1	actual	TRUE	2	TRUE	93	TRUE	197	TRUE	16	TRUE	0		41.14923	2.840492	147.9181	9.63E-02	5.420745	4.29E-02	1
20001023	MCLEOD LAI	1	actual	TRUE	4.6	TRUE	100	TRUE	204	TRUE	12.9	TRUE	31.7		3.024506	0.7039186	83.79649	3.42E-08	1.37888	9.62E-09	1
20001024	MCLEOD LAI	1	actual	TRUE	3.9	TRUE	100	TRUE	17	TRUE	7	TRUE	6.5		0.1082969	7.58E-04	75.31329	2.95E-09	1.52E-03	5.91E-10	1
20001025	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	100	TRUE	354	TRUE	7.4	TRUE	0		0.1279766	7.58E-04	75.87329	3.06E-09	1.52E-03	6.12E-10	1
20001026	MCLEOD LAI	1	actual	TRUE	0.4	TRUE	100	TRUE	22	TRUE	2.2	TRUE	0		0.1476627	7.58E-04	76.64929	2.39E-09	1.52E-03	4.79E-10	1
20001027	MCLEOD LAI	1	actual	TRUE	1	TRUE	100	TRUE	19	TRUE	6.7	TRUE	5.7		0	0	69.36528	2.67E-09	0	5.34E-10	1
20001028	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	100	TRUE	4	TRUE	16	TRUE	12.2		0	0	49.94467	4.27E-09	0	8.53E-10	1
20001029	MCLEOD LAI	1	actual	TRUE	-1.6	TRUE	100	TRUE	43	TRUE	2.1	TRUE	0.3		2.96E-02	0.01	50.45067	2.17E-09	2.00E-02	4.39E-10	1
20001030	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	100	TRUE	169	TRUE	4.2	TRUE	0.6		0	0.01	51.29867	2.35E-09	2.00E-02	4.77E-10	1
20001031	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	100	TRUE	217	TRUE	10.9	TRUE	6.7		0	0	42.83748	3.30E-09	0	6.60E-10	1
20001101	MCLEOD LAI	1	actual	TRUE	-0.1	TRUE	100	TRUE	206	TRUE	7.8	TRUE	6.1		0	0	35.89811	2.82E-09	0	5.65E-10	1
20001102	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	100	TRUE	203	TRUE	10.5	TRUE	0.6		0	0.01	37.29211	3.23E-09	0.0199866	6.55E-10	1
20001103	MCLEOD LAI	1	actual	TRUE	3.6	TRUE	100	TRUE	219	TRUE	9.6	TRUE	17.3		0	0	11.9159	3.09E-09	0	6.18E-10	1
20001104	MCLEOD LAI	1	actual	TRUE	0.9	TRUE	100	TRUE	25	TRUE	14.4	TRUE	17.7		0.249506	5.30E-04	1.466	4.78E-09	1.06E-03	9.57E-10	1
20001105	MCLEOD LAI	1	actual	TRUE	-3.7	TRUE	100	TRUE	103	TRUE	5.2	TRUE	0.9		0	5.30E-04	2.266	2.48E-09	1.06E-03	4.96E-10	1
20001106	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	100	TRUE	91	TRUE	1	TRUE	0		0.1351151	5.83E-04	3.408	2.23E-09	1.17E-03	4.46E-10	1
20001107	MCLEOD LAI	1	actual	TRUE	0	TRUE	100	TRUE	205	TRUE	7.5	TRUE	0		0.1548037	5.83E-04	4.712	3.14E-09	1.17E-03	6.28E-10	1
20001108	MCLEOD LAI	1	actual	TRUE	-1.1	TRUE	94	TRUE	0	TRUE	17.1	TRUE	0		6.550813	5.83E-04	5.818	4.26E-07	1.17E-03	8.53E-08	1
20001109	MCLEOD LAI	1	actual	TRUE	-4.1	TRUE	74	TRUE	24	TRUE	15.3	TRUE	0.3		22.98863	5.83E-04	6.618	8.45E-04	1.17E-03	1.69E-04	1
20001110	MCLEOD LAI	1	actual	TRUE	-4	TRUE	63	TRUE	226	TRUE	5	TRUE	0.3		37.25816	5.83E-04	7.418	2.57E-02	1.17E-03	5.15E-03	1
20001111	MCLEOD LAI	1	actual	TRUE	-4.8	TRUE	85	TRUE	174	TRUE	7	TRUE	0.6		43.43309	5.83E-04	8.218	9.10E-02	1.17E-03	1.82E-02	1
20001112	MCLEOD LAI	1	actual	TRUE	-2.6	TRUE	91	TRUE	229	TRUE	5.3	TRUE	0		47.5205	5.83E-04	9.324	0.1553278	1.17E-03	3.11E-02	1
20001113	MCLEOD LAI	1	actual	TRUE	-1.3	TRUE	89	TRUE	187	TRUE	1.6	TRUE	0		51.15117	5.83E-04	10.43	0.2037662	1.17E-03	4.08E-02	1
20001114	MCLEOD LAI	1	actual	TRUE	-2.9	TRUE	98	TRUE	186	TRUE	2.8	TRUE	0		51.83853	5.83E-04	11.23	0.2338524	1.17E-03	4.68E-02	1
20001115	MCLEOD LAI	1	actual	TRUE	-4.1	TRUE	95	TRUE	206	TRUE	5.5	TRUE	0		53.78327	5.83E-04	12.03	0.3281536	1.17E-03	6.57E-02	1
20001116	MCLEOD LAI	1	actual	TRUE	-1.9	TRUE	90	TRUE	224	TRUE	6.5	TRUE	0		57.47652	5.83E-04	13.136	0.4764959	1.17E-03	9.54E-02	1
20001117	MCLEOD LAI	1	actual	TRUE	-3.6	TRUE	94	TRUE	194	TRUE	14.8	TRUE	0		59.79676	5.83E-04	13.936	0.8519052	1.17E-03	0.170607	1
20001118	MCLEOD LAI	1	actual	TRUE	-0.6	TRUE	87	TRUE	185	TRUE	6	TRUE	0.5		63.47595	9.47E-03	15.132	0.6684051	1.89E-02	0.1353688	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating	
20001119	MCLEOD LAI	1	actual	TRUE	-1.6	TRUE	100	TRUE	11	TRUE	5.3	TRUE	0.8		58.68834	9.47E-03	16.238	0.4901469	1.89E-02	9.93E-02	1	
20001120	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	88	TRUE	127	TRUE	3.4	TRUE	0.3		61.76065	1.43E-02	17.398	0.5383056	2.85E-02	0.1095559	1	
20001121	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	71	TRUE	202	TRUE	10.2	TRUE	0.3		69.76817	0.1801762	19.278	1.038186	0.3521248	0.2355708	1	
20001122	MCLEOD LAI	1	actual	TRUE	1.9	TRUE	74	TRUE	192	TRUE	15.1	TRUE	1.9		60.56877	0.1054011	20.924	0.9071515	0.2081805	0.1973844	1	
20001123	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	66	TRUE	205	TRUE	14.4	TRUE	0.9		67.06362	0.3076519	22.84	1.175503	0.5952587	0.283466	1	
20001124	MCLEOD LAI	1	actual	TRUE	-0.5	TRUE	100	TRUE	181	TRUE	16.5	TRUE	0		67.10541	0.3076519	24.054	1.308572	0.596239	0.3156265	1	
20001125	MCLEOD LAI	1	actual	TRUE	2.9	TRUE	93	TRUE	210	TRUE	9.5	TRUE	5.7		29.23129	3.77E-02	18.70941	4.49E-03	7.49E-02	9.33E-04	1	
20001126	MCLEOD LAI	1	actual	TRUE	-0.1	TRUE	94	TRUE	216	TRUE	2.8	TRUE	0.5		32.79735	4.60E-02	19.99541	8.25E-03	0.0914843	1.73E-03	1	
20001127	MCLEOD LAI	1	actual	TRUE	-1.4	TRUE	98	TRUE	222	TRUE	6.9	TRUE	0.8		32.40508	4.60E-02	21.10141	9.20E-03	9.15E-02	1.92E-03	1	
20001128	MCLEOD LAI	1	actual	TRUE	-5.4	TRUE	100	TRUE	219	TRUE	2.8	TRUE	0		32.57627	4.60E-02	21.90141	7.81E-03	9.15E-02	1.63E-03	1	
20001129	MCLEOD LAI	1	actual	TRUE	-3.8	TRUE	91	TRUE	18	TRUE	10.7	TRUE	0		38.33009	4.60E-02	22.70141	4.29E-02	9.15E-02	8.96E-03	1	
20001130	MCLEOD LAI	1	actual	TRUE	-3.9	TRUE	97	TRUE	27	TRUE	10.6	TRUE	0		40.32364	4.60E-02	23.50141	6.30E-02	9.16E-02	1.32E-02	1	
20001201	MCLEOD LAI	1	actual	TRUE	2.8	TRUE	77	TRUE	187	TRUE	18.6	TRUE	1.5		48.94513	0.1497131	23.70941	0.3670555	0.2947729	8.20E-02	1	
20001202	MCLEOD LAI	1	actual	TRUE	1.2	TRUE	84	TRUE	219	TRUE	12.5	TRUE	2.9		39.41497	4.23E-02	21.26157	5.82E-02	8.43E-02	1.21E-02	1	
20001203	MCLEOD LAI	1	actual	TRUE	0.6	TRUE	77	TRUE	177	TRUE	6	TRUE	0.6		49.32412	8.66E-02	21.07357	0.2041526	0.1714041	4.39E-02	1	
20001204	MCLEOD LAI	1	actual	TRUE	-3.6	TRUE	99	TRUE	205	TRUE	6.5	TRUE	0		49.73399	8.66E-02	20.27357	0.2203517	0.1713353	4.74E-02	1	
20001205	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	100	TRUE	209	TRUE	13	TRUE	0		49.77005	8.66E-02	19.77957	0.3071112	0.1712901	0.066035	1	
20001206	MCLEOD LAI	1	actual	TRUE	1	TRUE	100	TRUE	229	TRUE	13.4	TRUE	0		49.80613	8.66E-02	19.66357	0.3147597	0.1712792	6.77E-02	1	
20001207	MCLEOD LAI	1	actual	TRUE	-4.8	TRUE	100	TRUE	218	TRUE	2.3	TRUE	2.4		30.95276	0	18.86357	5.01E-03	0	1.00E-03	1	
20001208	MCLEOD LAI	1	actual	TRUE	-9	TRUE	96	TRUE	5	TRUE	17.6	TRUE	0		33.92306	0	18.06358	2.29E-02	0	4.58E-03	1	
20001211	MCLEOD LAI	1	actual	TRUE	-17	TRUE	79	TRUE	125	TRUE	0.5	TRUE	0									
20001212	MCLEOD LAI	1	actual	TRUE	-14.9	TRUE	83	TRUE	14	TRUE	12.3	TRUE	0									
20001213	MCLEOD LAI	1	actual	TRUE	-17.1	TRUE	65	TRUE	14	TRUE	12	TRUE	0									
20001214	MCLEOD LAI	1	actual	TRUE	-21.8	TRUE	66	TRUE	21	TRUE	15.6	TRUE	0									
20001218	MCLEOD LAI	1	actual	TRUE	-3.5	TRUE	99	TRUE	203	TRUE	14.2	TRUE	0									
20001219	MCLEOD LAI	1	actual	TRUE	-4.9	TRUE	95	TRUE	211	TRUE	6.4	TRUE	0									
20001222	MCLEOD LAI	1	actual	TRUE	-12	TRUE	93	TRUE	20	TRUE	13.4	TRUE	0									
20001223	MCLEOD LAI	1	actual	TRUE	-9.6	TRUE	96	TRUE	13	TRUE	13.2	TRUE	0									
20001224	MCLEOD LAI	1	actual	TRUE	-7.4	TRUE	96	TRUE	32	TRUE	6.9	TRUE	0									
20001225	MCLEOD LAI	1	actual	TRUE	-0.3	TRUE	100	TRUE	197	TRUE	12.9	TRUE	0									
20001226	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	100	TRUE	237	TRUE	7.2	TRUE	0.3									
20001227	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	91	TRUE	265	TRUE	15.4	TRUE	1									
20010106	MCLEOD LAI	1	actual	TRUE	-0.7	TRUE	74	TRUE	182	TRUE	9.2	TRUE	0									
20010110	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	61	TRUE	192	TRUE	1.1	TRUE	0									
20010112	MCLEOD LAI	1	actual	TRUE	-7.1	TRUE	81	TRUE	17	TRUE	14.1	TRUE	0									
20010115	MCLEOD LAI	1	actual	TRUE	-8.4	TRUE	97	TRUE	154	TRUE	4.1	TRUE	0									
20010219	MCLEOD LAI	1	actual	TRUE	-7.6	TRUE	62	TRUE	6	TRUE	9.1	TRUE	0									
20010220	MCLEOD LAI	1	actual	TRUE	-4.5	TRUE	70	TRUE	227	TRUE	7.5	TRUE	0									
20010221	MCLEOD LAI	1	actual	TRUE	-5.2	TRUE	63	TRUE	11	TRUE	9	TRUE	0									
20010222	MCLEOD LAI	1	actual	TRUE	-3.3	TRUE	70	TRUE	227	TRUE	6.8	TRUE	0									
20010223	MCLEOD LAI	1	actual	TRUE	-9.3	TRUE	59	TRUE	28	TRUE	11.4	TRUE	0									

weather	display	data	status	temp	rh	relative	wdir	wind	wspeed	wind	precip	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger
date	name			valid		humidity	valid	direction	valid	speed	valid									rating
20010224	MCLEOD LAI	1	actual	TRUE	-13.2	TRUE	53	TRUE	45	TRUE	11.1	TRUE	0							
20010225	MCLEOD LAI	1	actual	TRUE	-12.1	TRUE	79	TRUE	69	TRUE	4.7	TRUE	0							
20010226	MCLEOD LAI	1	actual	TRUE	-5.6	TRUE	71	TRUE	218	TRUE	7.8	TRUE	0							
20010227	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	56	TRUE	211	TRUE	18.3	TRUE	0.3							
20010228	MCLEOD LAI	1	actual	TRUE	4.1	TRUE	48	TRUE	223	TRUE	43.1	TRUE	0							
20010301	MCLEOD LAI	1	actual	TRUE	0.2	TRUE	58	TRUE	132	TRUE	18.5	TRUE	0							
20010302	MCLEOD LAI	1	actual	TRUE	0	TRUE	82	TRUE	193	TRUE	10.6	TRUE	1.8							
20010303	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	68	TRUE	215	TRUE	13.4	TRUE	2.3							
20010304	MCLEOD LAI	1	actual	TRUE	2.8	TRUE	53	TRUE	86	TRUE	2.8	TRUE	0							
20010305	MCLEOD LAI	1	actual	TRUE	2.7	TRUE	53	TRUE	168	TRUE	4.2	TRUE	0							
20010306	MCLEOD LAI	1	actual	TRUE	6.9	TRUE	47	TRUE	235	TRUE	8.2	TRUE	0							
20010307	MCLEOD LAI	1	actual	TRUE	8	TRUE	57	TRUE	193	TRUE	8.9	TRUE	0							
20010308	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	38	TRUE	325	TRUE	11.3	TRUE	0							
20010309	MCLEOD LAI	1	actual	TRUE	2.3	TRUE	45	TRUE	184	TRUE	8.5	TRUE	0							
20010310	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	75	TRUE	251	TRUE	12.8	TRUE	1.8							
20010311	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	63	TRUE	202	TRUE	12.4	TRUE	0							
20010312	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	98	TRUE	204	TRUE	9.7	TRUE	0.3							
20010313	MCLEOD LAI	1	actual	TRUE	3	TRUE	82	TRUE	352	TRUE	5.8	TRUE	4.1							
20010316	MCLEOD LAI	1	actual	TRUE	1.9	TRUE	61	TRUE	210	TRUE	16.1	TRUE	0							
20010317	MCLEOD LAI	1	actual	TRUE	2.9	TRUE	82	TRUE	181	TRUE	11.1	TRUE	1.5							
20010318	MCLEOD LAI	1	actual	TRUE	1.6	TRUE	95	TRUE	123	TRUE	13.2	TRUE	1.5							
20010319	MCLEOD LAI	1	actual	TRUE	1.1	TRUE	72	TRUE	193	TRUE	9.5	TRUE	6.6							
20010320	MCLEOD LAI	1	actual	TRUE	-7.6	TRUE	83	TRUE	18	TRUE	11.9	TRUE	0.3							
20010321	MCLEOD LAI	1	actual	TRUE	-11	TRUE	69	TRUE	17	TRUE	15.8	TRUE	0.8							
20010322	MCLEOD LAI	1	actual	TRUE	-11.3	TRUE	68	TRUE	25	TRUE	15.7	TRUE	0							
20010323	MCLEOD LAI	1	actual	TRUE	-11.8	TRUE	66	TRUE	23	TRUE	17.3	TRUE	0							
20010324	MCLEOD LAI	1	actual	TRUE	-2.9	TRUE	57	TRUE	20	TRUE	16.1	TRUE	0							
20010325	MCLEOD LAI	1	actual	TRUE	2.3	TRUE	56	TRUE	27	TRUE	16.5	TRUE	0							
20010326	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	38	TRUE	234	TRUE	18.1	TRUE	0							
20010327	MCLEOD LAI	1	actual	TRUE	1.6	TRUE	57	TRUE	172	TRUE	23.6	TRUE	0							
20010328	MCLEOD LAI	1	actual	TRUE	1.1	TRUE	76	TRUE	259	TRUE	18.9	TRUE	2.5							
20010329	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	58	TRUE	217	TRUE	9.2	TRUE	0							
20010330	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	64	TRUE	155	TRUE	8.9	TRUE	1							
20010402	MCLEOD LAI	1	actual	TRUE	4.3	TRUE	50	TRUE	35	TRUE	14.5	TRUE	0							
20010403	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	45	TRUE	58	TRUE	8.7	TRUE	0							
20010404	MCLEOD LAI	1	actual	TRUE	5.4	TRUE	47	TRUE	209	TRUE	13.9	TRUE	0							
20010405	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	80	TRUE	205	TRUE	8.3	TRUE	34.2							
20010406	MCLEOD LAI	1	actual	TRUE	4.2	TRUE	56	TRUE	37	TRUE	22.2	TRUE	0.3							
20010407	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	84	TRUE	8	TRUE	9.5	TRUE	2							
20010408	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	36	TRUE	359	TRUE	5.9	TRUE	0							
20010409	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	37	TRUE	251	TRUE	10.1	TRUE	0							

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20010410	MCLEOD LAI	1	actual	TRUE	4.4	TRUE	47	TRUE	22	TRUE	13.3	TRUE	0.3								
20010411	MCLEOD LAI	1	actual	TRUE	5	TRUE	37	TRUE	156	TRUE	7.8	TRUE	0								
20010412	MCLEOD LAI	1	actual	TRUE	8.9	TRUE	29	TRUE	218	TRUE	8	TRUE	0								
20010413	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	52	TRUE	219	TRUE	14.2	TRUE	0								
20010414	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	34	TRUE	152	TRUE	7.9	TRUE	0								
20010415	MCLEOD LAI	5	startup	TRUE	8.4	TRUE	41	TRUE	43	TRUE	12.8	TRUE	0		85	6	15				
20010416	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	33	TRUE	135	TRUE	17.1	TRUE	0		87.8568	7.940426	17.916	7.462276	7.892425	7.048031	2
20010417	MCLEOD LAI	1	actual	TRUE	2.6	TRUE	97	TRUE	184	TRUE	6.9	TRUE	7.3		26.92697	3.888594	9.598552	2.00E-03	3.882708	7.76E-04	1
20010418	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	46	TRUE	216	TRUE	15.9	TRUE	4.6		47.03178	2.993572	6.995712	0.2475207	2.962443	8.68E-02	1
20010419	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	38	TRUE	358	TRUE	7.8	TRUE	0		70.69836	4.770065	9.875711	0.9480469	4.682912	0.3965528	1
20010420	MCLEOD LAI	1	actual	TRUE	4	TRUE	42	TRUE	28	TRUE	11.9	TRUE	0		79.35398	5.488415	11.54971	1.940573	5.408594	0.8640737	1
20010421	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	33	TRUE	157	TRUE	1.6	TRUE	0		84.5873	7.168929	14.15971	2.158879	7.059371	1.379037	2
20010422	MCLEOD LAI	1	actual	TRUE	7.6	TRUE	46	TRUE	171	TRUE	13.2	TRUE	0		85.50406	8.301547	16.48171	4.394012	8.193909	4.256489	2
20010423	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	80	TRUE	194	TRUE	10.9	TRUE	3.7		52.42791	5.446913	14.91027	0.3749327	5.693789	0.1708487	1
20010424	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	65	TRUE	185	TRUE	9.4	TRUE	2		56.69082	4.96131	17.41227	0.5183419	5.794807	0.2380962	1
20010425	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	39	TRUE	226	TRUE	13.5	TRUE	1.6		69.30058	5.953641	20.11227	1.207945	6.843065	0.5999651	1
20010426	MCLEOD LAI	1	actual	TRUE	15	TRUE	48	TRUE	142	TRUE	7.8	TRUE	0		80.76962	7.967669	23.76627	1.830229	8.669331	1.149351	2
20010427	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	63	TRUE	152	TRUE	10.8	TRUE	1.2		76.22761	9.065013	26.73627	1.421669	9.812571	0.8489131	1
20010428	MCLEOD LAI	3	forecast	TRUE	11	TRUE	54	TRUE	250	TRUE	14	TRUE	1		78.16649	10.41439	29.67027	1.934573	11.09383	1.785808	2
20010429	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	50	TRUE	174	TRUE	17.7	TRUE	0		83.01775	11.61181	32.19027	3.948444	12.21132	4.773766	2
20010430	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	42	TRUE	194	TRUE	14	TRUE	2		73.47147	11.0134	34.49427	1.438232	12.24932	0.9710637	1
20010501	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	49	TRUE	275	TRUE	14.4	TRUE	2.2		68.56318	10.12089	38.39227	1.234758	12.20087	0.831804	1
20010502	MCLEOD LAI	1	actual	TRUE	6	TRUE	53	TRUE	210	TRUE	19.9	TRUE	3.3		60.23777	7.618481	38.70583	1.132412	10.21192	0.6909406	1
20010503	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	96	TRUE	216	TRUE	13.3	TRUE	2.7		39.01219	5.315285	41.95583	5.60E-02	8.073529	3.02E-02	1
20010504	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	74	TRUE	160	TRUE	11.5	TRUE	0.8		54.02866	5.887783	45.65583	0.4547571	8.90469	0.2579049	1
20010505	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	94	TRUE	264	TRUE	22.3	TRUE	9.7		19.72985	2.547764	33.74855	3.62E-04	4.286526	1.46E-04	1
20010506	MCLEOD LAI	1	actual	TRUE	8.5	TRUE	47	TRUE	141	TRUE	10.8	TRUE	1.9		47.14555	2.99631	37.68254	0.1945166	4.998906	0.0836665	1
20010507	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	56	TRUE	163	TRUE	14.8	TRUE	0		68.84422	4.337519	41.95855	1.27121	6.893481	0.6336342	1
20010508	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	38	TRUE	281	TRUE	14.7	TRUE	2.6		67.5033	4.211011	45.91055	1.211178	6.851043	0.60191	1
20010509	MCLEOD LAI	1	actual	TRUE	9	TRUE	35	TRUE	252	TRUE	16.8	TRUE	0		81.22088	5.931376	49.93454	3.031303	9.1466	2.956584	2
20010510	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	49	TRUE	228	TRUE	17.3	TRUE	0		83.94392	7.056996	53.65254	4.36735	10.62138	4.887198	2
20010511	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	64	TRUE	217	TRUE	13.7	TRUE	0.3		83.99127	8.147233	57.94654	3.665847	12.0566	4.38255	2
20010512	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	52	TRUE	146	TRUE	12.8	TRUE	1		81.78374	10.0458	62.83454	2.6471	14.3543	3.40871	2
20010513	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	34	TRUE	245	TRUE	15.4	TRUE	3.1		71.25446	8.928834	64.1925	1.416718	13.25012	1.014479	2
20010514	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	52	TRUE	150	TRUE	14.3	TRUE	0		80.02784	10.28508	68.3425	2.344387	14.94671	3.028982	2
20010515	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	55	TRUE	40	TRUE	3.7	TRUE	3.5		58.88662	8.096334	68.83644	0.458436	12.51324	0.3133155	1
20010516	MCLEOD LAI	1	actual	TRUE	6.9	TRUE	73	TRUE	175	TRUE	7.6	TRUE	0		68.20309	8.671308	72.48244	0.8664822	13.34989	0.6147097	1
20010517	MCLEOD LAI	1	actual	TRUE	7	TRUE	58	TRUE	203	TRUE	16.1	TRUE	0.6		76.3541	9.560541	76.14645	1.87261	14.55307	2.182842	2
20010518	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	47	TRUE	220	TRUE	23.4	TRUE	0.9		79.73185	10.74366	79.86445	3.597043	16.0796	5.11886	2
20010519	MCLEOD LAI	1	actual	TRUE	7	TRUE	61	TRUE	283	TRUE	23.6	TRUE	6.9		52.99227	6.437332	72.95691	0.7543653	10.54793	0.4684861	1
20010520	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	40	TRUE	214	TRUE	16.8	TRUE	0		75.71749	8.382973	77.39491	1.862059	13.19337	1.977646	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20010521	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	85	TRUE	265	TRUE	10.4	TRUE	6.2		39.29256	4.722491	72.28375	5.11E-02	8.118908	2.77E-02	1
20010522	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	61	TRUE	253	TRUE	17.9	TRUE	0		67.56141	6.377908	77.36975	1.42585	10.57621	0.8868025	1
20010523	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	43	TRUE	225	TRUE	8.6	TRUE	0		82.83643	9.424159	83.22975	2.439177	14.68994	3.140785	2
20010524	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	30	TRUE	203	TRUE	8.9	TRUE	1.9		81.05011	11.42688	88.78375	1.996491	17.29038	2.761142	2
20010525	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	28	TRUE	58	TRUE	9.2	TRUE	0		88.74412	14.95254	94.33775	5.691877	21.41814	9.215287	3
20010526	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	34	TRUE	76	TRUE	14	TRUE	0		89.98512	18.58482	100.3238	8.662156	25.40435	14.17117	3
20010527	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	82	TRUE	94	TRUE	4.8	TRUE	3.2		56.11211	14.27928	101.4329	0.3918715	21.12415	0.3677516	2
20010528	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	66	TRUE	204	TRUE	17.1	TRUE	0.8		69.70496	15.3681	105.8349	1.466903	22.55006	2.271622	2
20010529	MCLEOD LAI	1	actual	TRUE	7.4	TRUE	76	TRUE	257	TRUE	21.3	TRUE	6.4		45.32598	9.110003	99.3363	0.2529348	14.82179	0.1908171	1
20010530	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	43	TRUE	218	TRUE	15.7	TRUE	0		74.12162	11.50435	104.4043	1.614652	18.03931	2.123257	2
20010531	MCLEOD LAI	1	actual	TRUE	17	TRUE	53	TRUE	161	TRUE	16.7	TRUE	0		83.13295	13.73443	109.8683	3.810345	20.92833	6.349832	2
20010601	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	98	TRUE	227	TRUE	13.2	TRUE	10.5		21.39436	6.642878	95.94686	4.29E-04	11.32546	2.77E-04	1
20010602	MCLEOD LAI	1	actual	TRUE	11	TRUE	58	TRUE	240	TRUE	18.5	TRUE	1.3		52.46513	7.977611	101.3309	0.5520697	13.33134	0.3913394	1
20010603	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	45	TRUE	201	TRUE	11.2	TRUE	0		74.80917	10.13115	107.2189	1.332936	16.39046	1.31404	2
20010604	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	36	TRUE	62	TRUE	15.6	TRUE	0		86.42986	13.36617	113.8809	5.646615	20.66788	8.976559	3
20010605	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	82	TRUE	214	TRUE	8	TRUE	1.6		69.74827	13.10991	119.1569	0.9286561	20.56367	0.856739	2
20010606	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	53	TRUE	233	TRUE	6.5	TRUE	0		79.83743	15.05668	125.1889	1.551604	23.15203	2.5203	2
20010607	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	43	TRUE	211	TRUE	11.9	TRUE	0		86.08392	17.81244	131.6889	4.463099	26.62242	8.439909	3
20010608	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	39	TRUE	170	TRUE	11.3	TRUE	0		88.42883	20.96574	138.4409	6.047267	30.41589	11.72644	3
20010609	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	88	TRUE	170	TRUE	17.6	TRUE	0.8		79.82643	21.31262	143.5909	2.711472	31.08915	5.879986	2
20010610	MCLEOD LAI	1	actual	TRUE	12	TRUE	58	TRUE	277	TRUE	18.4	TRUE	9.4		54.2293	12.1551	131.1548	0.6563939	19.73721	0.5900806	1
20010611	MCLEOD LAI	1	actual	TRUE	11	TRUE	57	TRUE	242	TRUE	9.9	TRUE	0		71.28934	13.53125	136.5388	1.075083	21.68895	1.159935	2
20010612	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	51	TRUE	32	TRUE	9	TRUE	0		81.84364	15.84506	142.9668	2.201537	24.8146	4.073266	2
20010613	MCLEOD LAI	1	actual	TRUE	21.5	TRUE	34	TRUE	241	TRUE	12.8	TRUE	0		89.03049	19.77194	150.2408	7.11038	29.75451	13.18428	3
20010614	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	55	TRUE	196	TRUE	6.8	TRUE	0		87.56592	21.33708	155.8408	4.259798	31.79206	8.98327	3
20010615	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	57	TRUE	218	TRUE	10.8	TRUE	0		86.83831	22.8462	161.4408	4.697664	33.75157	10.10043	3
20010616	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	69	TRUE	5	TRUE	11.2	TRUE	0		85.05656	23.85151	166.8428	3.734195	35.14306	8.504325	3
20010617	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	38	TRUE	25	TRUE	9.3	TRUE	0		87.80341	26.58927	173.0728	4.998672	38.42167	11.43855	3
20010618	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	42	TRUE	213	TRUE	7.7	TRUE	0		88.48676	29.7434	180.0228	5.086124	42.09814	12.2096	3
20010619	MCLEOD LAI	1	actual	TRUE	19.5	TRUE	36	TRUE	196	TRUE	15.5	TRUE	0		89.67572	33.236	186.9368	8.937007	46.01788	19.66406	4
20010620	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	57	TRUE	200	TRUE	8.2	TRUE	0		88.08428	35.51209	193.7787	4.923308	48.70833	12.91203	3
20010621	MCLEOD LAI	1	actual	TRUE	19.3	TRUE	47	TRUE	223	TRUE	11	TRUE	0		88.133	38.33704	200.6568	5.709081	51.88939	15.00459	3
20010622	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	52	TRUE	235	TRUE	15.7	TRUE	3.1		70.35841	31.62948	202.2052	1.39597	45.47548	3.88478	3
20010623	MCLEOD LAI	1	actual	TRUE	14	TRUE	41	TRUE	251	TRUE	15.8	TRUE	0		82.97672	33.96697	208.1292	3.56917	48.24842	9.885573	3
20010624	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	80	TRUE	125	TRUE	5.6	TRUE	3.5		52.5146	25.67373	208.0442	0.2897148	39.24108	0.4110297	2
20010625	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	67	TRUE	232	TRUE	2.2	TRUE	1.3		58.49788	26.78166	213.5182	0.413681	40.77672	0.6028082	2
20010626	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	53	TRUE	55	TRUE	6.6	TRUE	4.4		56.26639	19.91599	211.7225	0.4346745	32.24828	0.5389161	2
20010627	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	89	TRUE	26	TRUE	12.4	TRUE	2.3		47.87449	17.05064	217.3405	0.2331551	28.50972	0.2660674	2
20010628	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	79	TRUE	51	TRUE	3.4	TRUE	10.2		29.90288	9.232937	199.8777	3.98E-03	16.55416	3.21E-03	1
20010629	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	96	TRUE	56	TRUE	8.4	TRUE	19.3		8.036428	3.97621	160.0792	6.68E-07	7.487466	3.47E-07	1
20010630	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	67	TRUE	322	TRUE	3.3	TRUE	2.6		33.17117	3.870531	166.4352	9.29E-03	7.315735	4.76E-03	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20010701	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	97	TRUE	233	TRUE	11.4	TRUE	14.7		9.526366	1.396333	140.706	1.81E-06	2.725058	6.16E-07	1
20010702	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	43	TRUE	257	TRUE	7.7	TRUE	0.6		56.06404	4.171015	147.956	0.451691	7.792814	0.2392045	1
20010703	MCLEOD LAI	1	actual	TRUE	22.1	TRUE	43	TRUE	158	TRUE	13.1	TRUE	0		81.76366	7.271303	155.638	2.680978	13.02169	3.233572	2
20010704	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	93	TRUE	212	TRUE	7.1	TRUE	8.1		31.56961	3.676838	146.5977	7.50E-03	6.919785	3.75E-03	1
20010705	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	53	TRUE	260	TRUE	17.4	TRUE	0		66.38516	5.513083	153.0917	1.335398	10.11548	0.810604	1
20010706	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	59	TRUE	237	TRUE	17.1	TRUE	0		78.83893	6.993521	159.3517	2.401278	12.60414	2.749926	2
20010707	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	62	TRUE	231	TRUE	17.9	TRUE	3.5		66.67632	5.707439	161.1165	1.38362	10.48621	0.8565153	1
20010708	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	49	TRUE	249	TRUE	13.2	TRUE	0.3		81.42329	7.918961	167.9525	2.588403	14.16788	3.288746	2
20010709	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	50	TRUE	214	TRUE	8.3	TRUE	0		86.07114	10.54524	175.5085	3.715985	18.3362	5.725146	2
20010710	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	94	TRUE	16	TRUE	6	TRUE	11.7		25.08858	5.009202	156.1842	1.07E-03	9.274745	6.21E-04	1
20010711	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	52	TRUE	263	TRUE	8.5	TRUE	2.3		54.70356	5.432114	162.9303	0.4167864	10.02836	0.2518119	1
20010712	MCLEOD LAI	1	actual	TRUE	21	TRUE	36	TRUE	74	TRUE	5.3	TRUE	0		80.10332	8.748727	170.4142	1.501427	15.50718	1.596282	2
20010713	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	48	TRUE	229	TRUE	12.2	TRUE	0		86.4888	11.60871	178.1682	4.797351	19.96528	7.633799	2
20010714	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	57	TRUE	224	TRUE	14.2	TRUE	0		86.53699	13.37189	184.8242	5.342342	22.64746	9.000261	3
20010715	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	55	TRUE	222	TRUE	7.7	TRUE	0		86.58521	15.44792	191.8582	3.876587	25.71882	7.297451	2
20010716	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	66	TRUE	134	TRUE	7	TRUE	0		85.8962	16.8455	198.4962	3.395941	27.7941	6.775259	2
20010717	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	97	TRUE	235	TRUE	5.1	TRUE	7		28.22833	9.308738	190.1419	2.70E-03	16.58732	2.18E-03	1
20010718	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	96	TRUE	310	TRUE	8.1	TRUE	12.1		10.73594	4.318918	169.2744	2.94E-06	8.119903	1.59E-06	1
20010719	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	69	TRUE	293	TRUE	5.3	TRUE	3.5		37.21731	3.655237	171.4243	2.59E-02	6.940498	1.30E-02	1
20010720	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	90	TRUE	22	TRUE	8.7	TRUE	10.5		23.07225	1.689625	156.2833	6.24E-04	3.290318	2.27E-04	1
20010721	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	56	TRUE	132	TRUE	6.6	TRUE	0.8		63.08056	4.286098	164.2713	0.6762835	8.047281	0.3640132	1
20010722	MCLEOD LAI	1	actual	TRUE	24	TRUE	57	TRUE	160	TRUE	8.3	TRUE	0		80.63085	6.820899	172.2953	1.848358	12.41325	1.842068	2
20010723	MCLEOD LAI	1	actual	TRUE	16	TRUE	86	TRUE	217	TRUE	10.3	TRUE	2.8		57.52404	5.078038	178.8793	0.5791582	9.483062	0.339561	1
20010724	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	83	TRUE	170	TRUE	11.5	TRUE	5		41.82233	3.018815	176.2078	8.67E-02	5.789658	0.0397906	1
20010725	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	63	TRUE	271	TRUE	1.6	TRUE	1.8		53.23126	3.719754	182.8818	0.2551287	7.07952	0.128827	1
20010726	MCLEOD LAI	1	actual	TRUE	20	TRUE	51	TRUE	206	TRUE	12.1	TRUE	0		77.67007	6.138019	190.1858	1.686941	11.3595	1.388108	2
20010727	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	70	TRUE	190	TRUE	13.6	TRUE	4.7		58.39038	4.400252	188.5594	0.7291569	8.315382	0.3990992	1
20010728	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	90	TRUE	232	TRUE	14	TRUE	0.6		64.27264	4.778418	195.0534	1.036209	9.005305	0.5911356	1
20010729	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	77	TRUE	219	TRUE	11.3	TRUE	6.2		47.06126	3.027622	189.3835	0.1971291	5.822536	9.07E-02	1
20010730	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	61	TRUE	174	TRUE	8.8	TRUE	2.9		56.98344	3.033968	192.354	0.5148563	5.837741	0.2372949	1
20010731	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	62	TRUE	196	TRUE	6.5	TRUE	0		73.57453	4.685287	199.226	0.9901186	8.850237	0.5597233	1
20010801	MCLEOD LAI	1	actual	TRUE	16	TRUE	74	TRUE	214	TRUE	7.6	TRUE	0		78.42527	5.596086	205.11	1.433177	10.47752	0.8867901	1
20010802	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	76	TRUE	176	TRUE	13.7	TRUE	2.8		62.39696	4.289049	210.706	0.935167	8.162706	0.507024	1
20010803	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	92	TRUE	179	TRUE	6.3	TRUE	3.4		39.35503	2.49418	211.1255	4.21E-02	4.84526	1.79E-02	1
20010804	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	96	TRUE	174	TRUE	4.8	TRUE	17.8		8.883673	0.647422	173.1386	9.05E-07	1.282852	2.50E-07	1
20010805	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	61	TRUE	176	TRUE	13.9	TRUE	7.4		43.26916	1.391942	164.5222	0.1254361	2.72622	4.28E-02	1
20010806	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	54	TRUE	210	TRUE	17.1	TRUE	5.6		58.72157	1.860925	160.7851	0.8903588	3.617186	0.3357826	1
20010807	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	63	TRUE	235	TRUE	13.7	TRUE	0		74.92889	3.110254	166.5431	1.521703	5.943036	0.7071292	1
20010808	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	65	TRUE	301	TRUE	6.1	TRUE	0.8		78.33596	4.480312	172.7331	1.31846	8.414961	0.726082	1
20010809	MCLEOD LAI	1	actual	TRUE	22.7	TRUE	57	TRUE	183	TRUE	8.2	TRUE	0		84.589	6.617647	179.8231	3.011365	12.12021	3.534342	2
20010810	MCLEOD LAI	1	actual	TRUE	23.4	TRUE	48	TRUE	199	TRUE	9.3	TRUE	0		87.49749	9.227537	187.0391	4.78467	16.4288	6.824106	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20010811	MCLEOD LAI	1	actual	TRUE	24.1	TRUE	49	TRUE	186	TRUE	8.5	TRUE	0		88.14582	11.89639	194.3811	5.042593	20.63548	8.128575	3
20010812	MCLEOD LAI	1	actual	TRUE	26.9	TRUE	38	TRUE	81	TRUE	4.5	TRUE	0		90.35355	15.50919	202.2271	5.657598	26.02803	10.19896	3
20010813	MCLEOD LAI	1	actual	TRUE	26.8	TRUE	51	TRUE	224	TRUE	8.7	TRUE	0		90.03035	18.3488	210.0551	6.675047	30.11997	12.62397	3
20010814	MCLEOD LAI	1	actual	TRUE	26	TRUE	41	TRUE	215	TRUE	6.4	TRUE	0		90.07972	21.67204	217.7391	5.986755	34.70774	12.49817	3
20010815	MCLEOD LAI	1	actual	TRUE	26.8	TRUE	34	TRUE	225	TRUE	13.7	TRUE	0		91.3956	25.49658	225.5671	10.43509	39.75817	20.42461	3
20010816	MCLEOD LAI	1	actual	TRUE	28.5	TRUE	39	TRUE	125	TRUE	3.3	TRUE	0		91.44542	29.25472	233.7011	6.222649	44.56334	14.75424	3
20010817	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	54	TRUE	242	TRUE	9.8	TRUE	0		89.15134	31.45298	240.7011	6.219779	47.41604	15.25274	3
20010818	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	67	TRUE	169	TRUE	8.1	TRUE	3.2		65.0252	25.0806	241.5998	0.7940078	39.82545	1.525168	2
20010819	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	73	TRUE	249	TRUE	13.4	TRUE	0		74.7554	25.89516	246.9978	1.484937	41.03506	3.83993	2
20010820	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	90	TRUE	241	TRUE	14.1	TRUE	4.1		42.74638	17.97193	243.9828	0.1160101	30.3541	0.1380661	2
20010821	MCLEOD LAI	1	actual	TRUE	10	TRUE	96	TRUE	131	TRUE	10.5	TRUE	5		21.89495	11.20373	238.4871	4.50E-04	20.05239	4.08E-04	2
20010822	MCLEOD LAI	1	actual	TRUE	17	TRUE	64	TRUE	171	TRUE	15.7	TRUE	0		57.87739	12.53772	244.5511	0.7807885	22.22664	0.756956	2
20010823	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	68	TRUE	225	TRUE	6.5	TRUE	8.3		42.93091	7.381898	230.3545	8.16E-02	13.66873	5.87E-02	1
20010824	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	62	TRUE	240	TRUE	15	TRUE	2.1		59.27374	6.887279	235.7885	0.8316678	12.83714	0.5767975	1
20010825	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	70	TRUE	212	TRUE	17	TRUE	7.1		51.59318	4.330432	225.6458	0.4654445	8.264355	0.2539549	1
20010826	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	70	TRUE	223	TRUE	6.2	TRUE	1.1		65.11745	5.54037	232.0158	0.7241645	10.45651	0.4475907	1
20010827	MCLEOD LAI	1	actual	TRUE	20	TRUE	63	TRUE	214	TRUE	16.5	TRUE	0.8		78.1511	7.160807	238.6198	2.19141	13.32214	2.539321	2
20010828	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	51	TRUE	238	TRUE	10.1	TRUE	0.3		84.48582	9.115273	244.9178	3.267852	16.67869	4.747132	2
20010829	MCLEOD LAI	1	actual	TRUE	20.2	TRUE	52	TRUE	197	TRUE	8.4	TRUE	0		86.42873	11.23037	251.5578	3.927834	20.20563	6.398473	2
20010830	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	53	TRUE	148	TRUE	7.7	TRUE	0		86.907	13.3996	258.4138	4.057706	23.72381	7.25078	2
20010831	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	71	TRUE	213	TRUE	16.4	TRUE	11.7		50.74823	7.24753	233.6806	0.4099699	13.45203	0.2921374	1
20010901	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	54	TRUE	233	TRUE	23.2	TRUE	8.6		55.27167	4.556556	217.6696	0.9206257	8.659909	0.5145751	1
20010902	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	56	TRUE	207	TRUE	9.8	TRUE	0		73.21799	5.700259	221.8036	1.151176	10.71227	0.7210187	1
20010903	MCLEOD LAI	1	actual	TRUE	11.4	TRUE	62	TRUE	231	TRUE	20.1	TRUE	11		50.34286	3.182164	199.4892	0.470855	6.120258	0.2218026	1
20010904	MCLEOD LAI	1	actual	TRUE	9.6	TRUE	71	TRUE	289	TRUE	13.6	TRUE	0		65.98726	3.734609	202.9212	1.086903	7.140672	0.551145	1
20010905	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	65	TRUE	237	TRUE	12.4	TRUE	2.3		62.70515	3.081122	206.5692	0.8894957	5.94072	0.4132707	1
20010906	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	84	TRUE	273	TRUE	18.6	TRUE	3.1		48.72477	1.709854	205.3832	0.356745	3.349985	0.1307361	1
20010907	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	47	TRUE	209	TRUE	11.9	TRUE	0.3		73.64725	3.215825	209.7512	1.304014	6.194231	0.6177255	1
20010908	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	48	TRUE	263	TRUE	19.9	TRUE	0		82.69216	4.451858	213.6512	4.232645	8.462863	4.16166	2
20010909	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	68	TRUE	200	TRUE	2.7	TRUE	0		82.73911	5.010179	216.9212	1.789686	9.473349	1.247247	2
20010910	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	56	TRUE	42	TRUE	14	TRUE	0		84.20879	5.960891	220.5872	3.831591	11.16735	4.388013	2
20010911	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	60	TRUE	43	TRUE	7.9	TRUE	0		84.25623	6.703372	223.9652	2.835668	12.47341	3.357392	2
20010912	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	62	TRUE	169	TRUE	4.8	TRUE	0		84.3037	7.607902	227.8652	2.441122	14.04359	3.042448	2
20010913	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	60	TRUE	229	TRUE	8.2	TRUE	0		84.81376	8.844808	232.5212	3.105088	16.15347	4.408628	2
20010914	MCLEOD LAI	2	estimate	TRUE	20	TRUE	45	TRUE	120	TRUE	6	TRUE	0		87.36765	10.91092	237.8252	3.977224	19.57651	6.353868	2
20010915	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	49	TRUE	51	TRUE	6.3	TRUE	0		87.66425	12.90584	243.2552	4.212639	22.78902	7.326555	2
20010916	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	45	TRUE	351	TRUE	6.5	TRUE	0		88.17939	15.02885	248.6852	4.581167	26.11254	8.538626	3
20010917	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	50	TRUE	215	TRUE	5.5	TRUE	0		88.22815	16.97333	254.1152	4.386604	29.0892	8.750504	3
20010918	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	53	TRUE	228	TRUE	16.4	TRUE	1.1		82.63267	18.32855	258.5551	3.521824	31.13868	7.507733	2
20010919	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	64	TRUE	215	TRUE	9.7	TRUE	0		83.16831	19.07616	262.1491	2.69001	32.27993	5.979852	2
20010920	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	65	TRUE	212	TRUE	5.7	TRUE	3.1		60.50529	14.94898	260.8876	0.5627512	26.1517	0.6064606	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20010921	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	92	TRUE	173	TRUE	11.5	TRUE	11.5		23.34417	7.219817	234.5157	7.89E-04	13.40771	5.61E-04	1
20010922	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	92	TRUE	192	TRUE	13.2	TRUE	13.5		15.90339	3.250076	204.9052	4.66E-05	6.252229	2.22E-05	1
20010923	MCLEOD LAI	1	actual	TRUE	16	TRUE	75	TRUE	211	TRUE	8.8	TRUE	0		43.2579	4.014224	209.4892	9.68E-02	7.661427	5.08E-02	1
20010924	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	61	TRUE	185	TRUE	7.5	TRUE	0		67.61827	5.30819	214.3072	0.8458542	9.997318	0.5101875	1
20010925	MCLEOD LAI	1	actual	TRUE	15	TRUE	65	TRUE	154	TRUE	6.5	TRUE	0		76.85035	6.299957	218.7112	1.195046	11.75352	0.7882017	1
20010926	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	94	TRUE	214	TRUE	7.1	TRUE	5.2		33.99299	3.317174	212.2578	1.37E-02	6.384889	6.59E-03	1
20010927	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	52	TRUE	205	TRUE	9.7	TRUE	0		62.29646	4.475654	216.1938	0.7605456	8.510829	0.4212916	1
20010928	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	73	TRUE	160	TRUE	5.1	TRUE	0		69.92708	4.893647	219.2478	0.806992	9.270023	0.4674622	1
20010929	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	69	TRUE	183	TRUE	13.1	TRUE	1.1		72.27456	5.599097	223.0398	1.308895	10.53691	0.8124015	1
20010930	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	44	TRUE	257	TRUE	14.9	TRUE	2.3		70.9174	5.168992	226.8138	1.365759	9.780736	0.814104	1
20011001	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	42	TRUE	305	TRUE	7.2	TRUE	0		81.53107	6.377576	229.8038	1.937358	11.92761	1.919627	2
20011002	MCLEOD LAI	1	actual	TRUE	12	TRUE	41	TRUE	254	TRUE	8.8	TRUE	0		85.55972	7.540734	232.6678	3.547604	13.95109	4.6269	2
20011003	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	47	TRUE	129	TRUE	5.2	TRUE	0		86.22469	8.568313	235.4598	3.248016	15.70763	4.54163	2
20011004	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	34	TRUE	208	TRUE	8.7	TRUE	0		88.10564	9.834081	238.2338	5.064407	17.82832	7.521978	2
20011005	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	39	TRUE	182	TRUE	6.2	TRUE	0		88.15437	11.06941	241.1338	4.496273	19.85964	7.178213	2
20011006	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	59	TRUE	252	TRUE	11.1	TRUE	0		86.63876	11.79179	243.7278	4.636075	21.03889	7.626774	2
20011007	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	72	TRUE	146	TRUE	12.8	TRUE	0		84.22266	12.14015	245.7278	3.613495	21.61108	6.156825	2
20011008	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	96	TRUE	191	TRUE	13.6	TRUE	0.8		75.40492	12.16426	247.0078	1.55535	21.66163	2.381837	2
20011009	MCLEOD LAI	1	actual	TRUE	7.6	TRUE	67	TRUE	238	TRUE	19.5	TRUE	3.4		58.902	8.685803	243.4544	1.017434	15.94906	0.802027	1
20011010	MCLEOD LAI	1	actual	TRUE	1	TRUE	100	TRUE	174	TRUE	18.6	TRUE	14.7		9.925389	3.733573	206.6256	3.23E-06	7.144411	1.64E-06	1
20011011	MCLEOD LAI	1	actual	TRUE	8	TRUE	69	TRUE	248	TRUE	14.1	TRUE	11.8		29.29611	1.704101	181.5877	5.77E-03	3.330075	2.11E-03	1
20011012	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	94	TRUE	177	TRUE	6.7	TRUE	4		18.67502	0.4269512	177.0137	1.08E-04	0.8487843	2.76E-05	1
20011013	MCLEOD LAI	1	actual	TRUE	3	TRUE	53	TRUE	266	TRUE	12.7	TRUE	1.1		42.63206	0.7195514	178.2577	0.1060156	1.424725	3.00E-02	1
20011014	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	50	TRUE	186	TRUE	8.8	TRUE	0		62.44394	1.196839	179.8977	0.7323037	2.354518	0.2381111	1
20011015	MCLEOD LAI	1	actual	TRUE	1	TRUE	73	TRUE	137	TRUE	6.5	TRUE	0		68.63881	1.282751	180.7817	0.8312738	2.520787	0.2761961	1
20011016	MCLEOD LAI	1	actual	TRUE	8.1	TRUE	63	TRUE	239	TRUE	14.8	TRUE	5.7		50.15168	0.5394533	172.3786	0.3523043	1.070531	9.38E-02	1
20011017	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	61	TRUE	255	TRUE	16.9	TRUE	0		66.02509	0.8260382	173.7666	1.285322	1.632673	0.3766894	1
20011018	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	89	TRUE	215	TRUE	16.8	TRUE	2.8		46.86237	0.1092156	175.4966	0.2528619	0.2180919	5.52E-02	1
20011019	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	63	TRUE	237	TRUE	17.2	TRUE	0.3		66.24599	0.6347779	177.6946	1.315425	1.258318	0.3622527	1
20011020	MCLEOD LAI	1	actual	TRUE	4.8	TRUE	61	TRUE	275	TRUE	9.4	TRUE	0		74.37176	0.9834254	179.2626	1.190047	1.940241	0.3653638	1
20011021	MCLEOD LAI	1	actual	TRUE	2	TRUE	89	TRUE	29	TRUE	7.2	TRUE	0.3		74.81521	1.034154	180.3266	1.089967	2.039074	0.3394214	1
20011022	MCLEOD LAI	1	actual	TRUE	1.3	TRUE	100	TRUE	99	TRUE	1.2	TRUE	0.3		73.16599	1.034882	181.2646	0.7446961	2.040637	0.2319537	1
20011023	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	94	TRUE	212	TRUE	4.7	TRUE	6.4		26.60014	1.38E-02	169.7325	1.62E-03	2.76E-02	3.30E-04	1
20011024	MCLEOD LAI	1	actual	TRUE	-1.4	TRUE	99	TRUE	160	TRUE	4.7	TRUE	3		15.08721	0	166.5302	2.10E-05	0	4.21E-06	1
20011025	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	98	TRUE	193	TRUE	6.1	TRUE	0		17.06683	7.27E-04	167.0722	5.40E-05	1.45E-03	1.08E-05	1
20011026	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	88	TRUE	209	TRUE	14.6	TRUE	6.4		18.46127	0.1028214	156.7194	1.48E-04	0.2053061	3.22E-05	1
20011027	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	71	TRUE	211	TRUE	8.3	TRUE	9.7		21.43073	0.0837754	138.2887	3.40E-04	0.1672974	7.30E-05	1
20011028	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	63	TRUE	212	TRUE	13.6	TRUE	0.9		42.15149	0.2677813	139.3887	0.1020794	0.5330027	2.43E-02	1
20011029	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	63	TRUE	187	TRUE	13.9	TRUE	0		59.16378	0.4496053	140.4707	0.7810531	0.8920724	0.2007894	1
20011030	MCLEOD LAI	1	actual	TRUE	5.4	TRUE	59	TRUE	157	TRUE	14.2	TRUE	0		71.86176	0.8573456	142.1467	1.362475	1.68922	0.402842	1
20011031	MCLEOD LAI	1	actual	TRUE	2.8	TRUE	97	TRUE	231	TRUE	11	TRUE	14.2		16.81278	2.01E-02	114.8603	6.20E-05	4.02E-02	1.27E-05	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20011101	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	95	TRUE	163	TRUE	7.8	TRUE	0.8		20.24967	3.79E-02	116.4703	2.13E-04	0.075759	4.42E-05	1
20011102	MCLEOD LAI	1	actual	TRUE	3.7	TRUE	68	TRUE	210	TRUE	18.1	TRUE	3.7		35.00805	0.2036429	113.7247	3.03E-02	0.4054706	6.97E-03	1
20011103	MCLEOD LAI	1	actual	TRUE	0.2	TRUE	98	TRUE	184	TRUE	13.7	TRUE	0		36.68069	0.2067453	115.0647	3.53E-02	0.4116414	8.13E-03	1
20011104	MCLEOD LAI	1	actual	TRUE	4	TRUE	81	TRUE	216	TRUE	11.7	TRUE	20.3		20.45437	0.1257654	78.15737	2.80E-04	0.2505229	6.17E-05	1
20011105	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	85	TRUE	149	TRUE	6	TRUE	0.3		30.12395	0.1298754	79.29937	4.82E-03	0.2586915	1.07E-03	1
20011106	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	85	TRUE	195	TRUE	11.6	TRUE	0		40.20292	0.1298754	80.27937	0.0647473	0.2587044	0.014307	1
20011107	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	67	TRUE	207	TRUE	14.7	TRUE	0		56.54247	0.2389224	81.83537	0.6688811	0.4743824	0.1566802	1
20011108	MCLEOD LAI	1	actual	TRUE	1	TRUE	94	TRUE	204	TRUE	7.3	TRUE	3.7		30.80927	1.59E-02	78.99274	6.20E-03	0.0317237	1.26E-03	1
20011109	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	100	TRUE	54	TRUE	2.4	TRUE	2.4		19.42848	0	80.44074	1.18E-04	0	2.36E-05	1
20011110	MCLEOD LAI	1	actual	TRUE	5	TRUE	88	TRUE	126	TRUE	3.8	TRUE	20.9		10.07115	0.0938136	45.70693	1.66E-06	0.1866693	3.59E-07	1
20011111	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	95	TRUE	12	TRUE	8.7	TRUE	1.8		12.94911	2.33E-02	47.38893	9.37E-06	4.66E-02	1.92E-06	1
20011112	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	94	TRUE	76	TRUE	0.9	TRUE	4.2		9.388391	5.06E-02	44.81997	9.87E-07	0.1009794	2.07E-07	1
20011113	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	77	TRUE	152	TRUE	8.2	TRUE	1.2		27.46246	0.3083147	47.47397	2.51E-03	0.6067778	6.08E-04	1
20011114	MCLEOD LAI	1	actual	TRUE	5.3	TRUE	80	TRUE	237	TRUE	4.8	TRUE	0		40.50983	0.4805627	49.73197	4.87E-02	0.9384546	1.26E-02	1
20011115	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	96	TRUE	233	TRUE	14.8	TRUE	1.5		35.73573	0.5017225	51.59397	3.03E-02	0.9796291	7.92E-03	1
20011116	MCLEOD LAI	1	actual	TRUE	1	TRUE	99	TRUE	215	TRUE	10.9	TRUE	0		37.05787	0.5058988	53.07797	3.32E-02	0.9882494	8.70E-03	1
20011117	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	67	TRUE	246	TRUE	10.3	TRUE	0.3		53.20412	0.6323934	54.70597	0.3944134	1.229262	0.1080602	1
20011118	MCLEOD LAI	1	actual	TRUE	-3.7	TRUE	91	TRUE	26	TRUE	5.6	TRUE	0		56.28825	0.6323934	55.50597	0.4140691	1.229759	0.1134555	1
20011119	MCLEOD LAI	1	actual	TRUE	1.9	TRUE	65	TRUE	92	TRUE	1.7	TRUE	0		64.29179	0.7704091	57.15197	0.5579918	1.490585	0.1598429	1
20011120	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	84	TRUE	196	TRUE	3.9	TRUE	0		68.20875	0.9255277	59.60797	0.7192296	1.781887	0.2156921	1
20011121	MCLEOD LAI	1	actual	TRUE	4.3	TRUE	78	TRUE	198	TRUE	13	TRUE	0		73.04387	1.083749	61.68597	1.342717	2.076302	0.4203348	1
20011122	MCLEOD LAI	1	actual	TRUE	3.3	TRUE	89	TRUE	231	TRUE	2.2	TRUE	0		73.67631	1.146751	63.58397	0.8008993	2.194553	0.2548693	1
20011123	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	96	TRUE	222	TRUE	5.8	TRUE	0		73.72028	1.148381	64.74397	0.9621224	2.199241	0.3063716	1
20011124	MCLEOD LAI	1	actual	TRUE	-6.4	TRUE	89	TRUE	5	TRUE	15.1	TRUE	0		74.02783	1.148381	65.54398	1.559518	2.200382	0.4966798	1
20011125	MCLEOD LAI	1	actual	TRUE	-11.9	TRUE	79	TRUE	24	TRUE	18.1	TRUE	0		74.95889	1.148381	66.34397	1.902533	2.201496	0.6060163	1
20011126	MCLEOD LAI	1	actual	TRUE	-15.8	TRUE	93	TRUE	24	TRUE	17.5	TRUE	0		74.49774	1.148381	67.14397	1.80135	2.202584	0.5738718	1
20011127	MCLEOD LAI	1	actual	TRUE	-16.1	TRUE	92	TRUE	14	TRUE	8.3	TRUE	0		74.29945	1.148381	67.94397	1.121821	2.203648	0.3574402	1
20011128	MCLEOD LAI	1	actual	TRUE	-18.1	TRUE	87	TRUE	25	TRUE	28.4	TRUE	0		74.34363	1.148381	68.74397	3.095636	2.204689	0.9864876	1
20011129	MCLEOD LAI	1	actual	TRUE	-18.1	TRUE	89	TRUE	18	TRUE	16.6	TRUE	0		74.38781	1.148381	69.54398	1.711907	2.205706	0.54561	1
20011130	MCLEOD LAI	1	actual	TRUE	-17.9	TRUE	90	TRUE	20	TRUE	17.6	TRUE	0		74.43201	1.148381	70.34397	1.804403	2.206701	0.575168	1
20011201	MCLEOD LAI	1	actual	TRUE	-11.8	TRUE	95	TRUE	23	TRUE	16.9	TRUE	0		73.96242	1.148381	69.54398	1.702284	2.205706	0.5425428	1
20011202	MCLEOD LAI	1	actual	TRUE	-10.3	TRUE	95	TRUE	237	TRUE	3.4	TRUE	0		73.72001	1.148381	68.74397	0.8525173	2.204689	0.271672	1
20011203	MCLEOD LAI	1	actual	TRUE	-14	TRUE	89	TRUE	172	TRUE	3.2	TRUE	0		73.77745	1.148381	67.94397	0.8461956	2.203648	0.2696191	1
20011204	MCLEOD LAI	1	actual	TRUE	-7.3	TRUE	97	TRUE	219	TRUE	5.3	TRUE	0		73.35567	1.148381	67.14397	0.9230728	2.202584	0.2940713	1
20011205	MCLEOD LAI	1	actual	TRUE	-6.1	TRUE	92	TRUE	211	TRUE	8.3	TRUE	0		73.48716	1.148381	66.34397	1.079917	2.201496	0.3439875	1
20011206	MCLEOD LAI	1	actual	TRUE	-4.8	TRUE	96	TRUE	200	TRUE	15.8	TRUE	0		73.53107	1.148381	65.54398	1.578945	2.200382	0.5028667	1
20011207	MCLEOD LAI	1	actual	TRUE	-3	TRUE	96	TRUE	197	TRUE	14.3	TRUE	0		73.57499	1.148381	64.74397	1.466871	2.199241	0.4671003	1
20011208	MCLEOD LAI	1	actual	TRUE	0.2	TRUE	99	TRUE	210	TRUE	11.2	TRUE	0		72.72948	1.150007	64.48397	1.210651	2.201844	0.3856487	1
20011209	MCLEOD LAI	1	actual	TRUE	-6.7	TRUE	94	TRUE	202	TRUE	6.1	TRUE	0		72.77313	1.150007	63.68397	0.9379311	2.200664	0.2987264	1
20011210	MCLEOD LAI	1	actual	TRUE	-3.8	TRUE	99	TRUE	211	TRUE	8.9	TRUE	0		72.17298	1.150007	62.88397	1.055183	2.199455	0.3360151	1
20011211	MCLEOD LAI	1	actual	TRUE	-5.1	TRUE	99	TRUE	217	TRUE	1.5	TRUE	0		71.90215	1.150007	62.08397	0.7195125	2.198217	0.2290845	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating	
20011212	MCLEOD LAI	1	actual	TRUE	-3.5	TRUE	99	TRUE	206	TRUE	5.6	TRUE	0		71.66915	1.150007	61.28397	0.8772386	2.196948	0.2792541	1	
20011213	MCLEOD LAI	1	actual	TRUE	-2.3	TRUE	100	TRUE	204	TRUE	7.7	TRUE	0		71.37127	1.150007	60.57397	0.9650002	2.195794	0.3071431	1	
20011214	MCLEOD LAI	1	actual	TRUE	-6	TRUE	95	TRUE	252	TRUE	19	TRUE	0		71.48852	1.150007	59.77397	1.712352	2.194463	0.5449131	1	
20011215	MCLEOD LAI	1	actual	TRUE	-6.3	TRUE	98	TRUE	156	TRUE	10.8	TRUE	0		71.53176	1.150007	58.97397	1.134496	2.193098	0.3609574	1	
20011216	MCLEOD LAI	1	actual	TRUE	-1	TRUE	100	TRUE	234	TRUE	6.1	TRUE	0		71.30733	1.150007	58.49797	0.8882844	2.192269	0.2825893	1	
20011217	MCLEOD LAI	1	actual	TRUE	-7.6	TRUE	97	TRUE	230	TRUE	6.6	TRUE	0		71.35052	1.150007	57.69797	0.9123102	2.190846	0.2901759	1	
20011218	MCLEOD LAI	1	actual	TRUE	-4.2	TRUE	96	TRUE	163	TRUE	12.9	TRUE	0		71.4426	1.150007	56.89797	1.257195	2.189385	0.3997925	1	
20011219	MCLEOD LAI	1	actual	TRUE	-5	TRUE	92	TRUE	216	TRUE	6.5	TRUE	0		71.84687	1.150007	56.09797	0.9238178	2.187884	0.2937168	1	
20011220	MCLEOD LAI	1	actual	TRUE	-7.5	TRUE	90	TRUE	144	TRUE	0	TRUE	0		72.05532	1.150007	55.29797	0.6708966	2.186342	0.2132584	1	
20011221	MCLEOD LAI	1	actual	TRUE	-10.7	TRUE	96	TRUE	207	TRUE	5.8	TRUE	0		72.09875	1.150007	54.49797	0.9000847	2.184757	0.2860484	1	
20011222	MCLEOD LAI	1	actual	TRUE	-10.6	TRUE	96	TRUE	25	TRUE	5.8	TRUE	0		72.1422	1.150007	53.69797	0.9015439	2.183127	0.2864481	1	
20011223	MCLEOD LAI	1	actual	TRUE	-6.8	TRUE	93	TRUE	145	TRUE	3.1	TRUE	0		72.31181	1.150007	52.89797	0.7919146	2.181451	0.2515576	1	
20011224	MCLEOD LAI	1	actual	TRUE	-3.7	TRUE	90	TRUE	168	TRUE	8.5	TRUE	0		72.83846	1.150007	52.09797	1.061302	2.179725	0.3370506	1	
20011225	MCLEOD LAI	1	actual	TRUE	-2.9	TRUE	85	TRUE	133	TRUE	3.4	TRUE	0.3		73.67331	1.150007	51.29797	0.8507068	2.177949	0.2701033	1	
20011226	MCLEOD LAI	1	actual	TRUE	-10.8	TRUE	97	TRUE	211	TRUE	1.1	TRUE	0		73.1422	1.150007	50.49797	0.7402086	2.176119	0.2349605	1	
20011227	MCLEOD LAI	1	actual	TRUE	-9.4	TRUE	96	TRUE	16	TRUE	5.3	TRUE	0		72.92503	1.150007	49.69797	0.9064496	2.174234	0.2876549	1	
20011228	MCLEOD LAI	1	actual	TRUE	-5	TRUE	95	TRUE	23	TRUE	11.5	TRUE	0		72.96875	1.150007	48.89797	1.241098	2.172291	0.3937478	1	
20011229	MCLEOD LAI	1	actual	TRUE	-11.6	TRUE	88	TRUE	13	TRUE	19.1	TRUE	0		73.38416	1.150007	48.09797	1.85257	2.170286	0.5875798	1	
20011230	MCLEOD LAI	1	actual	TRUE	-11.6	TRUE	92	TRUE	3	TRUE	15.7	TRUE	0		73.42803	1.150007	47.29797	1.563874	2.168217	0.4958728	1	
20011231	MCLEOD LAI	1	actual	TRUE	-13.8	TRUE	95	TRUE	27	TRUE	5.6	TRUE	0		73.18138	1.150007	46.49797	0.930149	2.166082	0.2948446	1	
20020101	MCLEOD LAI	1	actual	TRUE	-10.7	TRUE	96	TRUE	8	TRUE	7.8	TRUE	0		72.95113	1.150007	45.69797	1.029247	2.163876	0.3261581	1	
20020220	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	56	TRUE	224	TRUE	23.7	TRUE	0									
20020222	MCLEOD LAI	1	actual	TRUE	-6	TRUE	71	TRUE	26	TRUE	18.5	TRUE	0									
20020223	MCLEOD LAI	1	actual	TRUE	-9.2	TRUE	54	TRUE	48	TRUE	16.8	TRUE	0									
20020224	MCLEOD LAI	1	actual	TRUE	-9	TRUE	55	TRUE	6	TRUE	9	TRUE	0									
20020225	MCLEOD LAI	1	actual	TRUE	-8.5	TRUE	54	TRUE	186	TRUE	0.6	TRUE	0									
20020226	MCLEOD LAI	1	actual	TRUE	-4.1	TRUE	73	TRUE	203	TRUE	10.7	TRUE	0.8									
20020227	MCLEOD LAI	1	actual	TRUE	-1.5	TRUE	83	TRUE	270	TRUE	17.4	TRUE	0									
20020228	MCLEOD LAI	1	actual	TRUE	-2.5	TRUE	73	TRUE	206	TRUE	8.2	TRUE	0.8									
20020301	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	68	TRUE	140	TRUE	0	TRUE	0.5									
20020302	MCLEOD LAI	1	actual	TRUE	-3	TRUE	93	TRUE	206	TRUE	6.7	TRUE	0									
20020303	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	72	TRUE	212	TRUE	15.2	TRUE	0									
20020304	MCLEOD LAI	1	actual	TRUE	-11.1	TRUE	92	TRUE	37	TRUE	27.8	TRUE	0									
20020305	MCLEOD LAI	1	actual	TRUE	-17.4	TRUE	54	TRUE	35	TRUE	23.7	TRUE	0									
20020306	MCLEOD LAI	1	actual	TRUE	-14.7	TRUE	50	TRUE	47	TRUE	22	TRUE	0									
20020307	MCLEOD LAI	1	actual	TRUE	-13.8	TRUE	50	TRUE	36	TRUE	21.2	TRUE	0									
20020308	MCLEOD LAI	1	actual	TRUE	-12.4	TRUE	44	TRUE	353	TRUE	3.3	TRUE	0									
20020309	MCLEOD LAI	1	actual	TRUE	-10.6	TRUE	48	TRUE	20	TRUE	6.5	TRUE	0									
20020310	MCLEOD LAI	1	actual	TRUE	-13.1	TRUE	89	TRUE	27	TRUE	20.1	TRUE	0									
20020311	MCLEOD LAI	1	actual	TRUE	-7.8	TRUE	95	TRUE	18	TRUE	10	TRUE	0.3									
20020312	MCLEOD LAI	1	actual	TRUE	-7.3	TRUE	91	TRUE	18	TRUE	15.4	TRUE	0									

weather	display	data	status	temp	rh	relative	wdir	wind	wspeed	wind	precip	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger
date	name			valid		humidity	valid	direction	valid	speed	valid									rating
20020313	MCLEOD LAI	1	actual	TRUE	-6.5	TRUE	91	TRUE	51	TRUE	9.5	TRUE	0							
20020314	MCLEOD LAI	1	actual	TRUE	-3.7	TRUE	92	TRUE	127	TRUE	5.8	TRUE	0.3							
20020315	MCLEOD LAI	1	actual	TRUE	-10.8	TRUE	66	TRUE	34	TRUE	21.4	TRUE	0							
20020316	MCLEOD LAI	1	actual	TRUE	-10.3	TRUE	52	TRUE	44	TRUE	22.2	TRUE	0							
20020317	MCLEOD LAI	1	actual	TRUE	-8.6	TRUE	45	TRUE	15	TRUE	4.5	TRUE	0							
20020318	MCLEOD LAI	1	actual	TRUE	-13.8	TRUE	45	TRUE	36	TRUE	15.2	TRUE	0							
20020319	MCLEOD LAI	1	actual	TRUE	-11.5	TRUE	44	TRUE	37	TRUE	14.2	TRUE	0							
20020320	MCLEOD LAI	1	actual	TRUE	-9.6	TRUE	40	TRUE	41	TRUE	15.7	TRUE	0							
20020321	MCLEOD LAI	1	actual	TRUE	-4.5	TRUE	36	TRUE	58	TRUE	1.5	TRUE	0							
20020322	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	42	TRUE	20	TRUE	13.3	TRUE	0							
20020323	MCLEOD LAI	1	actual	TRUE	2.6	TRUE	53	TRUE	60	TRUE	1.4	TRUE	0							
20020324	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	71	TRUE	203	TRUE	7.5	TRUE	0							
20020325	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	51	TRUE	157	TRUE	1.2	TRUE	0							
20020326	MCLEOD LAI	1	actual	TRUE	4	TRUE	59	TRUE	239	TRUE	26.7	TRUE	0							
20020327	MCLEOD LAI	1	actual	TRUE	1.3	TRUE	62	TRUE	221	TRUE	22.8	TRUE	0							
20020328	MCLEOD LAI	1	actual	TRUE	3.5	TRUE	41	TRUE	266	TRUE	21.3	TRUE	0							
20020329	MCLEOD LAI	1	actual	TRUE	-2.5	TRUE	92	TRUE	107	TRUE	7.7	TRUE	0							
20020330	MCLEOD LAI	1	actual	TRUE	-0.5	TRUE	96	TRUE	201	TRUE	7.2	TRUE	1.5							
20020331	MCLEOD LAI	1	actual	TRUE	-3.1	TRUE	93	TRUE	27	TRUE	10.1	TRUE	0							
20020401	MCLEOD LAI	1	actual	TRUE	-7.9	TRUE	57	TRUE	42	TRUE	12.5	TRUE	0							
20020402	MCLEOD LAI	1	actual	TRUE	-4.3	TRUE	51	TRUE	128	TRUE	1.1	TRUE	0.5							
20020403	MCLEOD LAI	1	actual	TRUE	0	TRUE	45	TRUE	70	TRUE	0.8	TRUE	0.3							
20020404	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	46	TRUE	50	TRUE	9.3	TRUE	0							
20020405	MCLEOD LAI	1	actual	TRUE	-6.8	TRUE	90	TRUE	26	TRUE	20.9	TRUE	0							
20020406	MCLEOD LAI	1	actual	TRUE	-6.5	TRUE	89	TRUE	6	TRUE	11.2	TRUE	0							
20020407	MCLEOD LAI	1	actual	TRUE	-1.5	TRUE	81	TRUE	87	TRUE	0.1	TRUE	1.8							
20020408	MCLEOD LAI	1	actual	TRUE	0.7	TRUE	79	TRUE	64	TRUE	5.5	TRUE	4.8							
20020409	MCLEOD LAI	1	actual	TRUE	0.6	TRUE	66	TRUE	11	TRUE	10.3	TRUE	0.5							
20020410	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	95	TRUE	192	TRUE	8.8	TRUE	7.7							
20020411	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	82	TRUE	202	TRUE	1.7	TRUE	5.7							
20020412	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	72	TRUE	226	TRUE	15	TRUE	7.2							
20020413	MCLEOD LAI	1	actual	TRUE	5	TRUE	92	TRUE	171	TRUE	0	TRUE	11							
20020414	MCLEOD LAI	1	actual	TRUE	0.4	TRUE	93	TRUE	18	TRUE	14.1	TRUE	13.7							
20020415	MCLEOD LAI	1	actual	TRUE	1.1	TRUE	89	TRUE	199	TRUE	11.7	TRUE	12.3							
20020416	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	67	TRUE	14	TRUE	6.7	TRUE	0.5							
20020417	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	49	TRUE	70	TRUE	11.9	TRUE	0							
20020418	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	38	TRUE	237	TRUE	5.9	TRUE	0							
20020419	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	34	TRUE	222	TRUE	1.1	TRUE	0							
20020420	MCLEOD LAI	1	actual	TRUE	12	TRUE	39	TRUE	251	TRUE	13.6	TRUE	0							
20020421	MCLEOD LAI	1	actual	TRUE	8.2	TRUE	45	TRUE	261	TRUE	16.6	TRUE	0							
20020422	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	42	TRUE	276	TRUE	14.8	TRUE	0							

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20020423	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	60	TRUE	127	TRUE	0	TRUE	2								
20020424	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	51	TRUE	192	TRUE	6.8	TRUE	0.3								
20020425	MCLEOD LAI	1	actual	TRUE	5.3	TRUE	42	TRUE	14	TRUE	7.9	TRUE	0								
20020426	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	27	TRUE	39	TRUE	8.1	TRUE	0								
20020427	MCLEOD LAI	1	actual	TRUE	9	TRUE	27	TRUE	233	TRUE	11.7	TRUE	0								
20020428	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	34	TRUE	160	TRUE	4.5	TRUE	0								
20020429	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	25	TRUE	111	TRUE	0	TRUE	0								
20020430	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	35	TRUE	233	TRUE	0.3	TRUE	0								
20020501	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	41	TRUE	188	TRUE	8.1	TRUE	0								
20020502	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	88	TRUE	275	TRUE	8	TRUE	0.3								
20020503	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	46	TRUE	227	TRUE	8.1	TRUE	1.9								
20020504	MCLEOD LAI	1	actual	TRUE	-1.6	TRUE	91	TRUE	32	TRUE	13.2	TRUE	5.1								
20020505	MCLEOD LAI	1	actual	TRUE	-5.9	TRUE	66	TRUE	53	TRUE	28.5	TRUE	0.5								
20020506	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	44	TRUE	50	TRUE	19.6	TRUE	1.4								
20020507	MCLEOD LAI	1	actual	TRUE	6.2	TRUE	39	TRUE	156	TRUE	0.1	TRUE	0.8								
20020508	MCLEOD LAI	1	actual	TRUE	6.8	TRUE	44	TRUE	235	TRUE	9.1	TRUE	0								
20020509	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	37	TRUE	221	TRUE	12.4	TRUE	0								
20020510	MCLEOD LAI	5	startup	TRUE	5	TRUE	73	TRUE	267	TRUE	18.4	TRUE	0		60	10	50				
20020511	MCLEOD LAI	1	actual	TRUE	11.8	TRUE	42	TRUE	226	TRUE	11.9	TRUE	0		77.57626	11.95617	54.528	1.657537	15.44559	1.902675	2
20020512	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	49	TRUE	127	TRUE	9.4	TRUE	0		83.48847	13.92029	59.362	2.76211	17.55124	4.10428	2
20020513	MCLEOD LAI	1	actual	TRUE	18	TRUE	32	TRUE	134	TRUE	10.9	TRUE	0		88.81794	17.32954	65.006	6.267015	20.79803	9.84047	3
20020514	MCLEOD LAI	1	actual	TRUE	6.3	TRUE	59	TRUE	247	TRUE	16.7	TRUE	10.8		47.83479	9.141744	51.11113	0.28801	12.63413	0.1979261	1
20020515	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	40	TRUE	192	TRUE	9.8	TRUE	0		69.97559	10.67943	55.08113	1.024233	14.38584	0.759144	1
20020516	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	36	TRUE	134	TRUE	13.9	TRUE	0		82.72048	12.81899	59.55513	3.139482	16.66845	4.551016	2
20020517	MCLEOD LAI	1	actual	TRUE	6.7	TRUE	74	TRUE	251	TRUE	10.5	TRUE	5.8		46.25467	7.760624	55.14961	0.1686304	11.48192	0.1097695	1
20020518	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	29	TRUE	40	TRUE	9.8	TRUE	0		76.15623	10.80311	60.28961	1.345477	14.92176	1.129441	2
20020519	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	42	TRUE	22	TRUE	14.9	TRUE	0		85.22881	13.46749	65.60961	4.607739	17.8004	6.896307	2
20020520	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	86	TRUE	39	TRUE	21.3	TRUE	5.9		43.71193	7.907764	60.98449	0.1959525	11.94372	0.1304191	1
20020521	MCLEOD LAI	1	actual	TRUE	6.9	TRUE	70	TRUE	38	TRUE	17.3	TRUE	2.6		49.60528	6.208985	64.63049	0.3737125	10.0131	0.2256017	1
20020522	MCLEOD LAI	1	actual	TRUE	5.4	TRUE	64	TRUE	39	TRUE	13.4	TRUE	7.4		39.32098	3.453218	56.89006	5.98E-02	5.996474	2.79E-02	1
20020523	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	87	TRUE	202	TRUE	1.1	TRUE	7		18.84062	1.493312	50.14762	8.74E-05	2.779687	3.00E-05	1
20020524	MCLEOD LAI	1	actual	TRUE	7.4	TRUE	74	TRUE	193	TRUE	1.8	TRUE	0.8		32.87684	2.086318	53.88362	8.01E-03	3.804382	3.08E-03	1
20020525	MCLEOD LAI	1	actual	TRUE	15	TRUE	34	TRUE	250	TRUE	0.1	TRUE	0		59.18988	4.883783	58.98762	0.3903386	8.092544	0.2107023	1
20020526	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	41	TRUE	239	TRUE	8.7	TRUE	0		80.12653	7.897257	64.70362	1.786364	12.10185	1.688082	2
20020527	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	50	TRUE	206	TRUE	11	TRUE	0		84.66896	10.07794	69.91562	3.505616	14.81657	4.742096	2
20020528	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	79	TRUE	179	TRUE	10.7	TRUE	1.7		70.31112	9.881407	74.69562	1.0834	14.85119	0.8182944	1
20020529	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	80	TRUE	286	TRUE	23.4	TRUE	4.3		50.6178	6.445114	73.24773	0.5744941	10.56596	0.3571146	1
20020530	MCLEOD LAI	1	actual	TRUE	11.9	TRUE	41	TRUE	229	TRUE	17.4	TRUE	1.6		69.6623	7.839253	77.79373	1.487228	12.52353	1.119134	2
20020531	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	42	TRUE	207	TRUE	7.8	TRUE	0.3		81.75027	10.20193	82.78973	2.049339	15.59848	2.63112	2
20020601	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	42	TRUE	207	TRUE	7.8	TRUE	0		85.94333	12.56461	88.78574	3.559072	18.56213	5.529506	2
20020602	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	35	TRUE	200	TRUE	3.2	TRUE	0		88.49818	15.63714	95.21374	4.060874	22.17122	6.972269	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20020603	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	36	TRUE	174	TRUE	14.1	TRUE	0		89.63383	19.16438	102.1997	8.278378	26.09534	13.86997	3
20020604	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	52	TRUE	217	TRUE	15.2	TRUE	0		88.4137	21.35965	108.5197	7.344534	28.63092	13.25318	3
20020605	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	77	TRUE	226	TRUE	15.2	TRUE	10		44.46315	11.2467	96.13395	0.1626394	17.40336	0.1352047	1
20020606	MCLEOD LAI	1	actual	TRUE	7.4	TRUE	87	TRUE	240	TRUE	19.2	TRUE	14.4		24.39757	5.279788	74.98564	1.66E-03	8.979029	9.47E-04	1
20020607	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	75	TRUE	169	TRUE	16.4	TRUE	1		44.46485	5.839018	79.73964	0.1728241	9.871	0.1035279	1
20020608	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	62	TRUE	26	TRUE	13.1	TRUE	1.1		66.29079	7.588894	86.07764	1.071622	12.43665	0.729827	1
20020609	MCLEOD LAI	1	actual	TRUE	22.8	TRUE	31	TRUE	354	TRUE	0.1	TRUE	0		82.82603	11.93671	93.58564	1.587289	18.1014	2.074498	2
20020610	MCLEOD LAI	1	actual	TRUE	24.1	TRUE	28	TRUE	56	TRUE	8	TRUE	0		90.64473	16.70014	101.3276	7.035572	23.65403	11.58639	3
20020611	MCLEOD LAI	1	actual	TRUE	21.6	TRUE	25	TRUE	239	TRUE	11.1	TRUE	0		92.18655	21.18224	108.6196	10.23888	28.4797	17.0443	3
20020612	MCLEOD LAI	1	actual	TRUE	23.4	TRUE	30	TRUE	203	TRUE	8	TRUE	0		92.23663	25.69725	116.2356	8.820259	33.10014	16.44472	3
20020613	MCLEOD LAI	1	actual	TRUE	25.7	TRUE	34	TRUE	58	TRUE	8.1	TRUE	0		92.28672	30.36096	124.2656	8.927687	37.69656	17.73683	3
20020614	MCLEOD LAI	1	actual	TRUE	26.3	TRUE	33	TRUE	78	TRUE	8.3	TRUE	0		92.33683	35.22285	132.4036	9.082062	42.30806	19.05636	3
20020615	MCLEOD LAI	1	actual	TRUE	23.4	TRUE	51	TRUE	203	TRUE	0.4	TRUE	0		90.41158	38.40916	140.0196	4.639926	45.56836	11.8612	3
20020616	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	61	TRUE	217	TRUE	5.3	TRUE	0		87.94156	40.57215	146.9696	4.167839	48.01025	11.20471	3
20020617	MCLEOD LAI	1	actual	TRUE	7.4	TRUE	94	TRUE	33	TRUE	13	TRUE	45		18.02939	13.40294	60.40652	1.14E-04	17.24186	9.46E-05	1
20020618	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	67	TRUE	222	TRUE	12.3	TRUE	1.2		48.81593	14.83192	66.54652	0.2627988	19.04946	0.2310534	1
20020619	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	62	TRUE	276	TRUE	1.5	TRUE	0.3		65.13502	16.47391	72.66853	0.5718522	21.02942	0.5351217	2
20020620	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	49	TRUE	225	TRUE	13.2	TRUE	1.1		77.81792	18.97831	79.25852	1.804636	23.74336	3.130944	2
20020621	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	34	TRUE	226	TRUE	17	TRUE	0		88.69398	23.02681	86.65852	8.371939	27.67151	14.41826	3
20020622	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	34	TRUE	189	TRUE	12	TRUE	0		90.32254	27.02319	94.00452	8.219329	31.44668	15.18325	3
20020623	MCLEOD LAI	1	actual	TRUE	22.1	TRUE	45	TRUE	180	TRUE	6.8	TRUE	0		90.16949	30.36414	101.3865	6.187679	34.72723	12.83359	3
20020624	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	56	TRUE	227	TRUE	8	TRUE	0.5		88.03953	32.29693	107.6165	4.842778	36.90491	10.89648	3
20020625	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	60	TRUE	178	TRUE	7.1	TRUE	0		87.20343	34.32455	114.3145	4.10656	39.21326	9.840295	3
20020626	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	75	TRUE	148	TRUE	0	TRUE	2.9		56.2072	28.4491	118.045	0.3101534	35.50577	0.410643	2
20020627	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	68	TRUE	241	TRUE	9.1	TRUE	5.8		49.06505	18.51237	115.0299	0.2309455	26.40214	0.2504521	2
20020628	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	50	TRUE	188	TRUE	9.8	TRUE	0.5		74.11703	20.94894	121.5479	1.19913	29.28123	2.172409	2
20020629	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	59	TRUE	231	TRUE	23.9	TRUE	9		59.37331	12.47219	111.5541	1.310957	19.49526	1.611883	2
20020630	MCLEOD LAI	1	actual	TRUE	11.9	TRUE	49	TRUE	250	TRUE	23.9	TRUE	0		77.876	14.21079	117.1001	3.109038	21.8059	5.349078	2
20020701	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	63	TRUE	249	TRUE	22.1	TRUE	0		81.81477	15.29123	122.8381	4.245267	23.32389	7.478273	2
20020702	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	51	TRUE	243	TRUE	15	TRUE	0		84.63744	16.81866	128.7381	4.270083	25.35592	7.892066	2
20020703	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	49	TRUE	186	TRUE	3.3	TRUE	0		85.92867	18.70284	135.0701	2.831165	27.78676	5.700054	2
20020704	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	58	TRUE	229	TRUE	19.7	TRUE	0		85.97668	19.95854	140.8621	6.513132	29.47604	12.23734	3
20020705	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	78	TRUE	228	TRUE	9.8	TRUE	4.8		50.76329	13.26855	138.9656	0.2944979	21.42332	0.2788596	2
20020706	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	50	TRUE	214	TRUE	8.3	TRUE	0.3		73.32274	15.25285	145.5316	1.072182	24.17213	1.406043	2
20020707	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	43	TRUE	72	TRUE	4.2	TRUE	0		84.31947	18.17118	152.9616	2.373464	28.02055	4.803855	2
20020708	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	87	TRUE	347	TRUE	0.3	TRUE	7.2		32.19675	10.38201	145.9762	6.26E-03	17.62945	5.24E-03	1
20020709	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	53	TRUE	216	TRUE	15.2	TRUE	0.3		69.43635	12.63522	153.1722	1.321655	20.95001	1.78175	2
20020710	MCLEOD LAI	1	actual	TRUE	23.4	TRUE	51	TRUE	220	TRUE	10.2	TRUE	0		83.77877	15.48344	161.0882	2.987627	24.96736	5.607407	2
20020711	MCLEOD LAI	1	actual	TRUE	24.6	TRUE	46	TRUE	229	TRUE	14	TRUE	0		88.09161	18.75484	169.2202	6.601478	29.3715	12.34616	3
20020712	MCLEOD LAI	1	actual	TRUE	22.9	TRUE	44	TRUE	228	TRUE	0.1	TRUE	0		88.66677	21.91694	177.0462	3.558672	33.47425	7.917338	2
20020713	MCLEOD LAI	1	actual	TRUE	20	TRUE	60	TRUE	211	TRUE	1.5	TRUE	0		87.70171	23.90408	184.3502	3.325354	36.10434	7.805594	2

weather	display	data	status	temp	rh	relative	wdir	wind	wspeed	wind	precip	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger
date	name			valid		humidity	valid	direction	valid	speed	valid									
20020714	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	49	TRUE	233	TRUE	16.2	TRUE	2.3	76.5871	22.25679	190.8802	1.912316	34.46651	4.435691	2
20020715	MCLEOD LAI	1	actual	TRUE	16	TRUE	54	TRUE	205	TRUE	6.1	TRUE	0	82.7347	24.12023	197.4642	2.122956	36.95526	5.190843	2
20020716	MCLEOD LAI	1	actual	TRUE	20.1	TRUE	57	TRUE	270	TRUE	0.2	TRUE	0	84.6461	26.25122	204.7862	2.027983	39.76038	5.216638	2
20020717	MCLEOD LAI	1	actual	TRUE	20.6	TRUE	61	TRUE	242	TRUE	0.8	TRUE	8.1	49.44075	15.83833	194.6768	0.1594146	26.32279	0.1725366	2
20020718	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	68	TRUE	209	TRUE	0	TRUE	4.1	39.45358	11.87073	194.9193	3.13E-02	20.6044	2.89E-02	2
20020719	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	72	TRUE	238	TRUE	10.8	TRUE	6.5	43.40175	7.544377	188.5343	0.109689	13.71655	7.91E-02	1
20020720	MCLEOD LAI	1	actual	TRUE	15	TRUE	67	TRUE	273	TRUE	2.3	TRUE	0	60.64457	8.780824	194.9383	0.4781075	15.78419	0.37453	1
20020721	MCLEOD LAI	1	actual	TRUE	22.4	TRUE	47	TRUE	259	TRUE	0.7	TRUE	0	77.84872	11.70596	202.6743	0.9636909	20.45792	0.8861624	2
20020722	MCLEOD LAI	1	actual	TRUE	24.1	TRUE	52	TRUE	221	TRUE	6.8	TRUE	0	85.45198	14.56453	210.7163	3.159795	24.83724	5.901509	2
20020723	MCLEOD LAI	1	actual	TRUE	26.8	TRUE	47	TRUE	243	TRUE	4.8	TRUE	0	88.36829	18.05045	219.2443	4.320563	29.93874	8.781775	3
20020724	MCLEOD LAI	1	actual	TRUE	27.8	TRUE	39	TRUE	253	TRUE	14.2	TRUE	0	90.44718	22.19751	227.9523	9.34808	35.70326	17.84954	3
20020725	MCLEOD LAI	1	actual	TRUE	21.8	TRUE	52	TRUE	257	TRUE	15	TRUE	0	89.18291	24.77905	235.5803	8.119707	39.23972	16.87326	3
20020726	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	50	TRUE	258	TRUE	8	TRUE	0	88.82327	27.05448	242.5603	5.419128	42.31087	12.87686	3
20020727	MCLEOD LAI	1	actual	TRUE	19.8	TRUE	46	TRUE	249	TRUE	20.1	TRUE	0	88.87224	29.70015	249.8283	10.04107	45.79097	21.33416	4
20020728	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	47	TRUE	272	TRUE	23.4	TRUE	0	88.86282	31.86167	256.4483	11.84159	48.62132	24.70426	4
20020729	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	49	TRUE	249	TRUE	18.7	TRUE	0	88.20137	33.53854	262.4743	8.498281	50.83731	19.95785	4
20020730	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	82	TRUE	62	TRUE	4.3	TRUE	0.6	82.68164	33.93568	267.6903	1.925949	51.53755	5.935429	3
20020731	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	48	TRUE	49	TRUE	11.7	TRUE	1.1	80.55614	35.54745	273.5903	2.175886	53.66367	6.842528	3
20020801	MCLEOD LAI	1	actual	TRUE	11.4	TRUE	53	TRUE	39	TRUE	8.8	TRUE	0	83.65715	36.76807	278.6463	2.739806	55.29527	8.572764	3
20020802	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	58	TRUE	45	TRUE	15.4	TRUE	0.3	84.21024	37.77771	283.5583	4.112457	56.67783	12.19949	3
20020803	MCLEOD LAI	1	actual	TRUE	13.6	TRUE	46	TRUE	1	TRUE	7.3	TRUE	0	86.12425	39.42255	289.0103	3.559862	58.79516	11.09188	3
20020804	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	49	TRUE	65	TRUE	16.9	TRUE	0	86.48666	41.03029	294.5703	6.077507	60.8658	17.15769	4
20020805	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	90	TRUE	15	TRUE	0.3	TRUE	7.9	28.13229	22.71547	278.1187	2.06E-03	37.72743	2.84E-03	2
20020806	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	50	TRUE	212	TRUE	8.3	TRUE	0	64.18678	24.72601	284.4167	0.7746561	40.62302	1.490094	2
20020807	MCLEOD LAI	1	actual	TRUE	20.3	TRUE	40	TRUE	207	TRUE	12.2	TRUE	0	83.50748	27.37677	291.0747	3.188571	44.33	8.530383	3
20020808	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	56	TRUE	210	TRUE	12.6	TRUE	0	85.43282	29.16798	297.4627	4.22115	46.85093	11.16255	3
20020809	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	38	TRUE	261	TRUE	19.9	TRUE	0	89.02033	31.9711	304.2107	10.15399	50.63774	22.62794	4
20020810	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	45	TRUE	269	TRUE	4	TRUE	0	89.06937	34.10212	310.3827	4.589196	53.50704	12.87981	3
20020811	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	73	TRUE	203	TRUE	9.4	TRUE	3.6	60.0832	25.70892	308.4997	0.6607916	42.55252	0.9920414	2
20020812	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	42	TRUE	263	TRUE	13.6	TRUE	0	83.91975	28.68014	315.7877	3.612857	46.74639	9.80074	3
20020813	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	51	TRUE	267	TRUE	17.3	TRUE	0	86.71915	30.91017	322.5536	6.408875	49.87225	16.03476	3
20020814	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	49	TRUE	323	TRUE	0.7	TRUE	0	87.05121	32.89448	328.7256	2.91073	52.62416	8.760227	3
20020815	MCLEOD LAI	1	actual	TRUE	18	TRUE	33	TRUE	160	TRUE	2.6	TRUE	0.3	89.26422	35.53637	334.9696	4.397912	56.17418	12.80263	3
20020816	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	36	TRUE	236	TRUE	15.5	TRUE	3.9	74.39795	27.61929	332.1682	1.620427	45.73218	4.583734	3
20020817	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	55	TRUE	63	TRUE	8.1	TRUE	1.3	76.00629	29.1683	337.9622	1.223096	47.98341	3.488889	3
20020818	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	50	TRUE	229	TRUE	6.2	TRUE	0	83.72064	31.19322	344.2782	2.423568	50.86494	7.291351	3
20020819	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	54	TRUE	103	TRUE	1.1	TRUE	0	85.12292	32.85639	350.2162	2.265365	53.2284	7.062598	3
20020820	MCLEOD LAI	1	actual	TRUE	18	TRUE	41	TRUE	258	TRUE	9.5	TRUE	0	87.74787	35.171	356.4602	5.009327	56.42398	14.21098	3
20020821	MCLEOD LAI	1	actual	TRUE	21	TRUE	36	TRUE	223	TRUE	16.2	TRUE	0	89.73993	38.09554	363.2442	9.343499	60.36421	23.33003	4
20020822	MCLEOD LAI	1	actual	TRUE	20.6	TRUE	52	TRUE	219	TRUE	10.7	TRUE	0	88.87829	40.22796	369.9562	6.258163	63.25933	17.90382	4
20020823	MCLEOD LAI	1	actual	TRUE	24	TRUE	50	TRUE	237	TRUE	18.4	TRUE	0	88.92728	42.80331	377.2802	9.289846	66.691	24.45046	4

weather	display	data	status	temp	rh	relative	wdir	wind	wspeed	wind	precip	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger
date	name			valid		humidity	valid	direction	valid	speed	valid									
20020824	MCLEOD LAI	1	actual	TRUE	25.4	TRUE	39	TRUE	171	TRUE	6.6	TRUE	0	90.07806	46.15145	384.8562	6.045959	71.01334	18.57654	4
20020825	MCLEOD LAI	1	actual	TRUE	21.6	TRUE	66	TRUE	164	TRUE	6.7	TRUE	3	69.87329	38.11171	385.5115	0.873247	61.11808	2.858109	3
20020826	MCLEOD LAI	1	actual	TRUE	23.1	TRUE	39	TRUE	227	TRUE	8.9	TRUE	0	85.71501	41.14428	392.6735	3.643592	65.20748	12.01187	3
20020827	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	46	TRUE	187	TRUE	10.1	TRUE	0	87.95451	43.78148	399.7455	5.318146	68.74107	16.59279	3
20020828	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	100	TRUE	202	TRUE	10.1	TRUE	10.6	19.22011	21.75087	367.1465	1.60E-04	37.88996	2.22E-04	2
20020829	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	81	TRUE	48	TRUE	0	TRUE	2.8	22.36522	17.73655	367.9948	3.14E-04	31.65843	3.84E-04	2
20020830	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	49	TRUE	208	TRUE	6.1	TRUE	0	59.99687	19.82355	374.3828	0.5565468	35.01235	0.7298255	2
20020831	MCLEOD LAI	1	actual	TRUE	10	TRUE	100	TRUE	193	TRUE	9	TRUE	10	13.29076	9.760625	345.3736	1.12E-05	18.23304	9.61E-06	1
20020901	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	48	TRUE	267	TRUE	16.2	TRUE	0	58.5224	11.40853	350.0836	0.8390678	21.09818	0.7868063	2
20020902	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	100	TRUE	163	TRUE	7.3	TRUE	12.8	10.82291	5.173019	311.3029	2.96E-06	9.933372	1.78E-06	1
20020903	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	70	TRUE	355	TRUE	17.3	TRUE	3.2	37.49746	3.617896	309.0532	5.03E-02	7.030051	2.53E-02	1
20020904	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	67	TRUE	24	TRUE	16.1	TRUE	1.3	54.70401	4.146663	312.1792	0.611295	8.026777	0.3286064	1
20020905	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	58	TRUE	45	TRUE	1.7	TRUE	0	68.09389	5.077346	315.8992	0.6413763	9.762422	0.3819279	1
20020906	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	57	TRUE	197	TRUE	4	TRUE	0	76.92843	6.052699	319.7092	1.059582	11.55834	0.6923036	1
20020907	MCLEOD LAI	1	actual	TRUE	13	TRUE	64	TRUE	205	TRUE	3.7	TRUE	0	80.52921	6.946368	323.7532	1.44973	13.18548	1.138548	2
20020908	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	71	TRUE	174	TRUE	0.3	TRUE	0	81.18913	7.565934	327.4192	1.315096	14.30545	0.9715074	1
20020909	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	100	TRUE	169	TRUE	0	TRUE	2.6	46.19211	5.298017	330.6892	9.84E-02	10.18798	6.00E-02	1
20020910	MCLEOD LAI	1	actual	TRUE	11	TRUE	82	TRUE	179	TRUE	5.8	TRUE	1.6	49.13177	5.085363	334.3732	0.1972374	9.798183	0.1176823	1
20020911	MCLEOD LAI	1	actual	TRUE	11.8	TRUE	80	TRUE	160	TRUE	0.4	TRUE	0.8	53.91222	5.540102	338.2012	0.2570112	10.64429	0.1604116	1
20020912	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	95	TRUE	150	TRUE	0	TRUE	2.6	33.71717	3.711908	341.6152	8.98E-03	7.227485	4.58E-03	1
20020913	MCLEOD LAI	1	actual	TRUE	9.6	TRUE	94	TRUE	244	TRUE	0	TRUE	0.3	36.08222	3.830017	345.0472	1.55E-02	7.453207	8.03E-03	1
20020914	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	76	TRUE	192	TRUE	8.1	TRUE	0	56.50254	4.532297	349.4872	0.4780689	8.77994	0.2691338	1
20020915	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	53	TRUE	156	TRUE	9.5	TRUE	0.3	77.00231	6.182833	354.5212	1.40556	11.84905	0.9312924	1
20020916	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	59	TRUE	212	TRUE	8.5	TRUE	4.9	56.63743	4.201269	345.4073	0.4932151	8.154573	0.2672728	1
20020917	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	51	TRUE	224	TRUE	10.7	TRUE	0	75.15272	5.479123	349.5233	1.324553	10.54499	0.8224657	1
20020918	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	100	TRUE	198	TRUE	14.8	TRUE	5.4	26.10726	2.62839	337.2035	2.31E-03	5.1563	1.01E-03	1
20020919	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	72	TRUE	258	TRUE	27.4	TRUE	19.3	35.4166	1.152083	278.2824	5.32E-02	2.280563	1.71E-02	1
20020920	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	66	TRUE	253	TRUE	8.7	TRUE	0.3	57.06974	1.856145	281.8944	0.515781	3.65217	0.1952315	1
20020921	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	100	TRUE	198	TRUE	0	TRUE	5.7	19.2155	0.3660092	270.7298	9.60E-05	0.7295526	2.39E-05	1
20020922	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	72	TRUE	0	TRUE	0	TRUE	5.2	19.51213	0.5682909	262.6245	1.08E-04	1.130466	2.91E-05	1
20020923	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	94	TRUE	223	TRUE	0	TRUE	1.7	17.8165	0.2033501	266.2365	5.45E-05	0.405925	1.25E-05	1
20020924	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	82	TRUE	30	TRUE	0.1	TRUE	4.5	17.25257	0.4007413	260.6252	4.32E-05	0.7984135	1.09E-05	1
20020925	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	100	TRUE	213	TRUE	2.7	TRUE	0.3	17.2779	0.4007413	263.3372	4.98E-05	0.7984449	1.26E-05	1
20020926	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	82	TRUE	5	TRUE	5.6	TRUE	1.2	32.18521	0.8174879	267.2372	8.15E-03	1.622567	2.38E-03	1
20020927	MCLEOD LAI	1	actual	TRUE	6.7	TRUE	100	TRUE	206	TRUE	3.4	TRUE	0	32.21548	0.8174879	270.1472	7.35E-03	1.6227	2.15E-03	1
20020928	MCLEOD LAI	1	actual	TRUE	11	TRUE	100	TRUE	236	TRUE	6.8	TRUE	9.6	6.362494	0	248.7302	2.26E-07	0	4.51E-08	1
20020929	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	76	TRUE	357	TRUE	4	TRUE	0.3	22.86123	0.3191296	251.5862	4.57E-04	0.6362415	1.11E-04	1
20020930	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	57	TRUE	12	TRUE	4.9	TRUE	0	47.88001	1.142083	255.0362	0.1598967	2.258878	5.13E-02	1
20021001	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	64	TRUE	190	TRUE	8.4	TRUE	0	64.08466	1.637099	257.1622	0.7751383	3.222905	0.2800898	1
20021002	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	100	TRUE	197	TRUE	4.4	TRUE	11.4	13.07842	0.1448532	229.8258	8.04E-06	0.2892507	1.79E-06	1
20021003	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	63	TRUE	164	TRUE	0.1	TRUE	0	29.0995	0.6827796	232.0778	2.69E-03	1.355589	7.55E-04	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20021004	MCLEOD LAI	1	actual	TRUE	3.6	TRUE	88	TRUE	194	TRUE	5.4	TRUE	0		37.51884	0.7682368	233.4298	2.77E-02	1.523935	7.99E-03	1
20021005	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	73	TRUE	151	TRUE	1.9	TRUE	0.3		50.2618	1.116975	235.4478	0.18637	2.207766	5.94E-02	1
20021006	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	90	TRUE	242	TRUE	11.9	TRUE	4.2		33.76323	0.1730964	230.3135	1.65E-02	0.3455436	3.75E-03	1
20021007	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	56	TRUE	243	TRUE	5.4	TRUE	0.3		57.93481	1.018699	233.1235	0.4666348	2.015381	0.1448233	1
20021008	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	56	TRUE	248	TRUE	16.6	TRUE	0		74.93375	1.871166	235.9155	1.761607	3.669569	0.6680084	1
20021009	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	94	TRUE	249	TRUE	10.4	TRUE	0.8		70.02508	1.926531	237.4655	1.057349	3.776468	0.4054041	1
20021010	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	94	TRUE	16	TRUE	2.1	TRUE	0.6		68.7046	1.929259	238.0255	0.6673646	3.781884	0.2560202	1
20021011	MCLEOD LAI	1	actual	TRUE	3.7	TRUE	43	TRUE	212	TRUE	9.5	TRUE	1.6		68.29505	1.858822	239.3955	0.9563655	3.646852	0.3617989	1
20021012	MCLEOD LAI	1	actual	TRUE	4.3	TRUE	52	TRUE	160	TRUE	7.1	TRUE	0		76.29582	2.253198	240.8735	1.185208	4.403419	0.4831888	1
20021013	MCLEOD LAI	1	actual	TRUE	6.3	TRUE	74	TRUE	264	TRUE	15	TRUE	0		78.65005	2.544722	242.7115	2.123117	4.959451	0.9100842	1
20021014	MCLEOD LAI	1	actual	TRUE	8.7	TRUE	69	TRUE	166	TRUE	0	TRUE	0		79.76442	3.000585	244.9815	1.10993	5.822871	0.5109645	1
20021015	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	70	TRUE	193	TRUE	0.6	TRUE	0		80.79434	3.519375	247.5215	1.276835	6.797137	0.6321234	1
20021016	MCLEOD LAI	1	actual	TRUE	5.5	TRUE	100	TRUE	200	TRUE	0	TRUE	0.3		76.23634	3.519375	249.2155	0.8254696	6.798723	0.4087118	1
20021017	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	63	TRUE	194	TRUE	2.6	TRUE	0		80.02249	4.255398	252.0975	1.2994	8.166183	0.7046555	1
20021018	MCLEOD LAI	1	actual	TRUE	11.8	TRUE	55	TRUE	154	TRUE	0	TRUE	0		82.20195	5.131063	254.9255	1.460996	9.770482	0.8703824	1
20021019	MCLEOD LAI	1	actual	TRUE	6.2	TRUE	78	TRUE	186	TRUE	0	TRUE	0		81.96432	5.374403	256.7455	1.419325	10.21427	0.8661092	1
20021020	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	74	TRUE	186	TRUE	0	TRUE	0		82.01102	5.77778	259.0875	1.427374	10.94534	0.9046998	1
20021021	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	96	TRUE	26	TRUE	0	TRUE	0		78.32346	5.818554	260.8355	0.9685009	11.02241	0.6162481	1
20021022	MCLEOD LAI	1	actual	TRUE	2.3	TRUE	100	TRUE	28	TRUE	0	TRUE	0.3		75.12237	5.818554	261.9535	0.7712011	11.02489	0.4907694	1
20021023	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	100	TRUE	69	TRUE	0	TRUE	0.3		73.44818	5.818554	262.9815	0.7095874	11.02716	0.4516118	1
20021024	MCLEOD LAI	1	actual	TRUE	0.3	TRUE	100	TRUE	56	TRUE	0	TRUE	0.8		67.69363	5.818554	263.7395	0.5810896	11.02882	0.3698613	1
20021025	MCLEOD LAI	1	actual	TRUE	-0.4	TRUE	100	TRUE	39	TRUE	0.2	TRUE	0		67.73563	5.818554	264.3715	0.587786	11.0302	0.3741494	1
20021026	MCLEOD LAI	1	actual	TRUE	-1.2	TRUE	100	TRUE	212	TRUE	0	TRUE	0		67.77763	5.818554	264.8595	0.5826941	11.03126	0.370928	1
20021027	MCLEOD LAI	1	actual	TRUE	-1.1	TRUE	100	TRUE	216	TRUE	0.4	TRUE	0		67.81966	5.818554	265.3655	0.5953763	11.03235	0.379022	1
20021028	MCLEOD LAI	1	actual	TRUE	-1.4	TRUE	83	TRUE	43	TRUE	6.9	TRUE	0.8		66.44183	5.818554	265.8175	0.7883224	11.03333	0.5018779	1
20021029	MCLEOD LAI	1	actual	TRUE	-1	TRUE	72	TRUE	350	TRUE	0	TRUE	3.4		39.45745	3.381214	260.4472	3.13E-02	6.549847	0.0152122	1
20021030	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	76	TRUE	205	TRUE	0	TRUE	1.3		38.43551	3.381214	260.8272	2.55E-02	6.550147	1.24E-02	1
20021031	MCLEOD LAI	1	actual	TRUE	-5.7	TRUE	100	TRUE	235	TRUE	0	TRUE	0.6		37.56353	3.381214	261.0272	2.13E-02	6.550304	1.04E-02	1
20021101	MCLEOD LAI	1	actual	TRUE	-6.5	TRUE	100	TRUE	228	TRUE	0	TRUE	0		37.59558	3.381214	261.8272	2.15E-02	6.550932	0.0104473	1
20021102	MCLEOD LAI	1	actual	TRUE	-7.3	TRUE	100	TRUE	320	TRUE	0	TRUE	0		37.62763	3.381214	262.6272	2.16E-02	6.551557	0.010518	1
20021103	MCLEOD LAI	1	actual	TRUE	-8.5	TRUE	100	TRUE	230	TRUE	0	TRUE	0		37.6597	3.381214	263.4272	2.18E-02	6.552177	1.06E-02	1
20021104	MCLEOD LAI	1	actual	TRUE	-5.7	TRUE	100	TRUE	170	TRUE	0	TRUE	0		37.69178	3.381214	264.2272	2.19E-02	6.552794	1.07E-02	1
20021105	MCLEOD LAI	1	actual	TRUE	-0.9	TRUE	100	TRUE	218	TRUE	0.7	TRUE	0		37.72387	3.381214	265.3692	2.29E-02	6.553668	1.11E-02	1
20021106	MCLEOD LAI	1	actual	TRUE	4.8	TRUE	95	TRUE	217	TRUE	2.3	TRUE	10		11.03551	1.152112	241.5344	2.57E-06	2.277071	8.28E-07	1
20021107	MCLEOD LAI	1	actual	TRUE	0.7	TRUE	100	TRUE	11	TRUE	3.6	TRUE	0.3		11.0588	1.152112	242.9644	2.78E-06	2.277229	8.95E-07	1
20021108	MCLEOD LAI	1	actual	TRUE	-4	TRUE	96	TRUE	13	TRUE	21.2	TRUE	9.6		6.430024	0	220.265	4.86E-07	0	9.72E-08	1
20021109	MCLEOD LAI	1	actual	TRUE	-7.6	TRUE	88	TRUE	5	TRUE	4.4	TRUE	0		12.41626	0	221.065	5.80E-06	0	1.16E-06	1
20021110	MCLEOD LAI	1	actual	TRUE	-5	TRUE	96	TRUE	174	TRUE	0	TRUE	0		13.51951	0	221.8651	7.97E-06	0	1.59E-06	1
20021111	MCLEOD LAI	1	actual	TRUE	-1.1	TRUE	100	TRUE	209	TRUE	0	TRUE	0		13.54362	0	222.9711	8.07E-06	0	1.61E-06	1
20021112	MCLEOD LAI	1	actual	TRUE	2.3	TRUE	100	TRUE	61	TRUE	0	TRUE	6.8		3.874295	0	209.9298	3.20E-08	0	6.40E-09	1
20021113	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	77	TRUE	193	TRUE	0	TRUE	1.1		12.0717	0.2671752	212.6198	3.91E-06	0.5326771	9.28E-07	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20021114	MCLEOD LAI	1	actual	TRUE	1.2	TRUE	100	TRUE	211	TRUE	0	TRUE	1.1		10.58157	0.2671752	214.1398	1.80E-06	0.5326889	4.28E-07	1
20021115	MCLEOD LAI	1	actual	TRUE	1.2	TRUE	100	TRUE	175	TRUE	0	TRUE	1.1		9.216164	0.2671752	215.6598	8.57E-07	0.5327006	2.04E-07	1
20021116	MCLEOD LAI	1	actual	TRUE	2.7	TRUE	100	TRUE	183	TRUE	0.9	TRUE	13.4		0.826816	0	185.5084	3.77E-09	0	7.54E-10	1
20021117	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	86	TRUE	207	TRUE	0.3	TRUE	1.3		5.848861	0.046403	187.0644	1.18E-07	9.27E-02	2.47E-08	1
20021118	MCLEOD LAI	1	actual	TRUE	1	TRUE	100	TRUE	180	TRUE	1	TRUE	0		5.870436	0.046403	188.5484	1.24E-07	9.27E-02	2.59E-08	1
20021119	MCLEOD LAI	1	actual	TRUE	4.1	TRUE	100	TRUE	220	TRUE	0	TRUE	16.2		0	0	153.9217	1.91E-09	0	3.81E-10	1
20021120	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	93	TRUE	227	TRUE	0	TRUE	0.3		3.071713	8.44E-02	156.5757	1.84E-08	0.1685208	3.96E-09	1
20021121	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	93	TRUE	202	TRUE	0	TRUE	0		5.857918	0.1493249	158.9237	1.17E-07	0.2979498	2.61E-08	1
20030605	MCLEOD LAI	5	startup	TRUE	21.4	TRUE	28	TRUE	51	TRUE	11.6	TRUE	0		88	15	100				
20030606	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	23	TRUE	140	TRUE	4.4	TRUE	0		92.08427	19.80434	107.472	7.200382	27.11649	12.68065	3
20030607	MCLEOD LAI	1	actual	TRUE	25.9	TRUE	28	TRUE	245	TRUE	9.7	TRUE	0		92.4978	24.92223	115.538	9.969419	32.38199	17.81857	3
20030608	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	43	TRUE	28	TRUE	10.8	TRUE	0		90.84199	28.20858	122.686	8.333003	35.82468	16.41127	3
20030609	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	66	TRUE	14	TRUE	15.8	TRUE	2.79		71.05398	24.0759	129.096	1.435714	32.84032	3.081242	2
20030610	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	43	TRUE	351	TRUE	9.3	TRUE	1.01		80.39484	26.86704	135.65	1.894582	35.93884	4.527482	2
20030611	MCLEOD LAI	1	actual	TRUE	16	TRUE	59	TRUE	304	TRUE	9.7	TRUE	11.15		52.44104	14.46737	120.4581	0.3534272	22.25308	0.342901	2
20030612	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	71	TRUE	144	TRUE	4.8	TRUE	0.25		66.84036	15.68892	126.5441	0.7191352	23.95347	0.7317141	2
20030613	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	82	TRUE	273	TRUE	17	TRUE	6.86		41.6263	9.157621	120.1722	0.1104173	15.38436	8.52E-02	1
20030614	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	63	TRUE	175	TRUE	12.3	TRUE	6.86		46.4925	6.137624	114.5238	0.1911426	10.82491	0.1204113	1
20030615	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	50	TRUE	258	TRUE	14.9	TRUE	3.55		59.48589	5.510636	116.0416	0.8391683	9.85167	0.5021618	2
20030616	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	44	TRUE	233	TRUE	10.1	TRUE	1.78		73.32671	7.334096	122.6676	1.174179	12.76082	0.8115551	2
20030617	MCLEOD LAI	1	actual	TRUE	21.3	TRUE	43	TRUE	130	TRUE	10.9	TRUE	0		85.45979	10.69548	129.9056	3.889153	17.73958	5.866078	2
20030618	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	51	TRUE	221	TRUE	13.2	TRUE	0		86.17368	12.79818	136.0456	4.825817	20.72275	7.837144	3
20030619	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	44	TRUE	294	TRUE	7.1	TRUE	0		86.86063	14.78847	141.6816	3.911003	23.45616	6.964109	2
20030620	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	27	TRUE	18	TRUE	7	TRUE	0		90.08611	18.17092	148.0556	6.176167	27.80924	11.36343	3
20030621	MCLEOD LAI	1	actual	TRUE	14	TRUE	56	TRUE	76	TRUE	11.2	TRUE	5.32		61.39057	12.73918	145.1128	0.781498	20.89297	0.7282817	2
20030622	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	84	TRUE	201	TRUE	3.3	TRUE	0		67.09079	13.2952	150.6948	0.6725299	21.78532	0.6436733	2
20030623	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	46	TRUE	33	TRUE	6.4	TRUE	2.03		72.32008	14.02926	157.3568	0.9354766	22.94444	0.9256717	2
20030624	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	45	TRUE	247	TRUE	14.6	TRUE	0		84.69093	17.04102	164.3068	4.215481	27.06456	8.105017	3
20030625	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	48	TRUE	252	TRUE	20.1	TRUE	0		87.00092	19.77899	171.1128	7.68148	30.68946	14.23234	3
20030626	MCLEOD LAI	1	actual	TRUE	20	TRUE	44	TRUE	259	TRUE	18.5	TRUE	0		88.19564	22.88974	178.1168	8.406156	34.64798	16.23706	3
20030627	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	41	TRUE	271	TRUE	13.7	TRUE	0		88.49169	25.76329	184.6528	6.886501	38.20159	14.68324	3
20030628	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	57	TRUE	189	TRUE	11.1	TRUE	0		87.61343	27.85757	191.1888	5.326491	40.83886	12.45492	3
20030629	MCLEOD LAI	1	actual	TRUE	24.6	TRUE	30	TRUE	169	TRUE	9.3	TRUE	0		91.26726	32.59372	199.0208	8.208853	46.25105	18.52821	4
20030630	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	97	TRUE	195	TRUE	11.7	TRUE	2.28		57.48182	28.11483	204.3328	0.6194879	41.83807	0.919065	2
20030701	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	91	TRUE	220	TRUE	17.4	TRUE	5.59		32.04721	17.3385	198.6433	1.43E-02	28.4655	1.62E-02	2
20030702	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	96	TRUE	197	TRUE	10.4	TRUE	5.32		17.08843	10.55116	194.2621	6.77E-05	18.57951	5.86E-05	1
20030703	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	59	TRUE	239	TRUE	20.1	TRUE	0		55.3208	11.9859	200.4501	0.7909463	20.85434	0.7362204	2
20030704	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	63	TRUE	220	TRUE	14.1	TRUE	2.53		62.51855	10.58475	206.8901	0.9600871	18.7689	0.8363307	2
20030705	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	54	TRUE	133	TRUE	3.9	TRUE	1.53		68.62237	11.85144	213.3841	0.7288163	20.81297	0.6775343	2
20030706	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	72	TRUE	133	TRUE	3.8	TRUE	3.79		52.94736	8.875345	213.9203	0.2768616	16.08257	0.2193477	1
20030707	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	72	TRUE	133	TRUE	3.8	TRUE	3.54		48.89137	6.801406	215.1354	0.1729184	12.60645	0.1186835	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20030708	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	81	TRUE	142	TRUE	7.7	TRUE	1.52		54.88603	7.100053	221.6114	0.4071132	13.14708	0.2862662	1
20030709	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	67	TRUE	199	TRUE	10.5	TRUE	0.76		70.86749	8.526099	228.4294	1.092342	15.59682	0.8495696	2
20030710	MCLEOD LAI	1	actual	TRUE	23.5	TRUE	45	TRUE	264	TRUE	6.6	TRUE	0		84.66252	11.7037	236.3634	2.806037	20.82899	4.67833	2
20030711	MCLEOD LAI	1	actual	TRUE	26.3	TRUE	41	TRUE	187	TRUE	9.5	TRUE	0		89.23018	15.50038	244.8014	6.196188	26.76413	11.16034	3
20030712	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	76	TRUE	255	TRUE	5.2	TRUE	0.75		83.00272	16.62769	251.9074	2.099131	28.54496	4.276544	2
20030713	MCLEOD LAI	1	actual	TRUE	20.2	TRUE	52	TRUE	255	TRUE	14.8	TRUE	0.76		84.82284	19.02886	259.2474	4.335588	32.15689	9.180525	3
20030714	MCLEOD LAI	1	actual	TRUE	20.4	TRUE	47	TRUE	221	TRUE	11.9	TRUE	0		87.30171	21.70504	266.6234	5.304077	36.06933	11.58459	3
20030715	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	46	TRUE	200	TRUE	13.2	TRUE	0		87.77283	24.2288	273.7114	6.057615	39.67711	13.56769	3
20030716	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	43	TRUE	271	TRUE	11.3	TRUE	0		88.27858	26.87939	280.7814	5.918312	43.37741	13.98719	3
20030717	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	63	TRUE	243	TRUE	23.9	TRUE	1.01		81.79607	28.17415	286.9694	4.637925	45.24348	11.80897	3
20030718	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	50	TRUE	2	TRUE	3.2	TRUE	0		85.34953	30.48748	294.0214	2.59837	48.42248	7.522616	3
20030719	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	46	TRUE	134	TRUE	7.4	TRUE	0		87.76456	33.44244	301.7214	4.517108	52.37259	12.56542	3
20030720	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	61	TRUE	193	TRUE	7.2	TRUE	0		87.22137	35.36591	309.0074	4.137878	54.99607	12.04876	3
20030721	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	42	TRUE	205	TRUE	14.1	TRUE	0		88.3881	38.1311	316.1674	6.923031	58.59516	18.51323	4
20030722	MCLEOD LAI	1	actual	TRUE	20	TRUE	41	TRUE	253	TRUE	10.4	TRUE	0		88.87564	41.05482	323.4714	6.161923	62.33184	17.55905	4
20030723	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	38	TRUE	250	TRUE	11.5	TRUE	0		89.30362	43.99616	330.6134	6.925811	66.02631	19.73088	4
20030724	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	76	TRUE	220	TRUE	7.8	TRUE	0		84.9333	44.8811	336.9454	3.093379	67.33849	10.7186	3
20030725	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	49	TRUE	159	TRUE	6.5	TRUE	2.03		78.73605	43.10307	344.6994	1.394313	65.67519	5.131452	3
20030726	MCLEOD LAI	1	actual	TRUE	26.7	TRUE	37	TRUE	210	TRUE	12.9	TRUE	0		89.29654	47.21634	353.2094	7.4245	70.77876	21.51983	4
20030727	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	41	TRUE	238	TRUE	15.9	TRUE	0		89.40254	50.48647	360.9634	8.768516	74.81335	24.90906	4
20030728	MCLEOD LAI	1	actual	TRUE	23.3	TRUE	34	TRUE	297	TRUE	11.4	TRUE	0		90.65755	54.26859	368.8614	8.365664	79.35098	24.84782	4
20030729	MCLEOD LAI	1	actual	TRUE	27.1	TRUE	26	TRUE	232	TRUE	6.3	TRUE	0		92.84229	59.16957	377.4434	8.816338	85.01923	26.69119	4
20030730	MCLEOD LAI	1	actual	TRUE	27.6	TRUE	20	TRUE	348	TRUE	8	TRUE	0		94.41332	64.56186	386.1154	11.95148	91.05905	33.92561	5
20030731	MCLEOD LAI	1	actual	TRUE	29.3	TRUE	23	TRUE	136	TRUE	7.5	TRUE	0		94.46413	70.05937	395.0934	11.73606	97.0816	34.55939	5
20030801	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	97	TRUE	255	TRUE	14.9	TRUE	4.32		41.34362	48.08733	387.9134	9.44E-02	73.42081	0.2098887	2
20030802	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	52	TRUE	218	TRUE	13.6	TRUE	0.25		70.40452	49.77193	393.7794	1.257682	75.64188	5.134407	3
20030803	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	54	TRUE	260	TRUE	8.8	TRUE	0		80.53797	51.33886	399.5554	1.876338	77.71404	7.643114	4
20030804	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	45	TRUE	201	TRUE	5.6	TRUE	0		85.95994	53.63247	405.9973	3.193037	80.63509	12.23955	4
20030805	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	59	TRUE	221	TRUE	1.9	TRUE	0		86.00797	55.06294	411.8453	2.667843	82.53796	10.73143	4
20030806	MCLEOD LAI	1	actual	TRUE	22.8	TRUE	38	TRUE	12	TRUE	8.6	TRUE	0		89.26745	58.12206	418.9533	5.953227	86.30949	20.39658	4
20030807	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	62	TRUE	61	TRUE	9.4	TRUE	2.03		75.83888	53.57683	425.4493	1.292153	81.49651	5.568181	3
20030808	MCLEOD LAI	1	actual	TRUE	23.6	TRUE	36	TRUE	136	TRUE	7.5	TRUE	0		87.6546	56.84033	432.7014	4.469053	85.57687	16.43634	4
20030809	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	66	TRUE	6	TRUE	16.5	TRUE	0		85.93455	57.99147	438.4594	5.510536	87.16231	19.38704	4
20030810	MCLEOD LAI	1	actual	TRUE	12.5	TRUE	72	TRUE	272	TRUE	3.8	TRUE	11.17		39.56403	29.5128	399.1556	3.87E-02	49.81714	6.49E-02	2
20030811	MCLEOD LAI	1	actual	TRUE	20.4	TRUE	39	TRUE	261	TRUE	10.3	TRUE	1.77		71.05001	30.15295	405.8316	1.088045	50.85895	3.188572	3
20030812	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	67	TRUE	177	TRUE	8.6	TRUE	0		79.04352	31.39968	411.9316	1.594934	52.74758	5.007586	3
20030813	MCLEOD LAI	1	actual	TRUE	17	TRUE	71	TRUE	183	TRUE	13.2	TRUE	0.25		81.76463	32.48331	417.9956	2.694836	54.39814	8.363868	3
20030814	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	40	TRUE	217	TRUE	12.5	TRUE	0		88.20347	35.40659	425.0496	6.219851	58.60806	17.10365	4
20030815	MCLEOD LAI	1	actual	TRUE	25.5	TRUE	40	TRUE	187	TRUE	11.7	TRUE	0		89.83464	38.70147	432.6436	7.54967	63.25662	20.5322	4
20030816	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	49	TRUE	244	TRUE	14.9	TRUE	0		89.38071	41.01779	439.4096	8.311549	66.51343	22.57672	4
20030817	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	42	TRUE	205	TRUE	13.9	TRUE	0		89.42987	43.62809	446.1396	7.959044	70.11482	22.50117	4

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20030818	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	61	TRUE	246	TRUE	22	TRUE	20.84		55.27782	18.81887	365.7267	0.8670835	33.34787	1.41335	2
20030819	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	49	TRUE	227	TRUE	12.5	TRUE	0.25		77.04317	20.68246	371.7187	1.639883	36.31368	3.902537	2
20030820	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	52	TRUE	238	TRUE	11.6	TRUE	0		83.24459	22.22833	377.3327	2.98959	38.74986	7.413083	2
20030821	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	67	TRUE	192	TRUE	15.2	TRUE	1.01		79.63486	23.35243	383.1087	2.356359	40.52877	6.119878	2
20030822	MCLEOD LAI	1	actual	TRUE	12	TRUE	71	TRUE	279	TRUE	14	TRUE	0.25		81.31339	24.13671	388.2727	2.660671	41.78032	6.993277	2
20030823	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	49	TRUE	218	TRUE	17.5	TRUE	0		85.36337	25.8529	394.0127	5.351522	44.41942	13.0983	3
20030824	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	52	TRUE	226	TRUE	12.2	TRUE	0		85.74039	27.24022	399.3387	4.31804	46.54326	11.32759	3
20030825	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	52	TRUE	122	TRUE	12.5	TRUE	0		86.17709	28.89509	405.1507	4.660799	49.04545	12.41112	3
20030826	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	93	TRUE	18	TRUE	7	TRUE	8.88		29.7978	14.88075	378.6705	4.64E-03	27.09919	0.0051176	2
20030827	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	76	TRUE	73	TRUE	4.5	TRUE	2.03		42.36783	13.58712	384.4465	6.70E-02	24.96817	7.01E-02	2
20030828	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	61	TRUE	222	TRUE	8	TRUE	0.25		68.88353	15.25375	390.9785	0.9035395	27.79637	1.10395	2
20030829	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	45	TRUE	137	TRUE	5.5	TRUE	0		83.53307	17.93342	398.0325	2.282586	32.23587	5.08212	2
20030830	MCLEOD LAI	1	actual	TRUE	23.7	TRUE	43	TRUE	132	TRUE	7.8	TRUE	0		88.11478	20.85175	405.3025	4.846206	36.95092	10.91049	3
20030831	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	46	TRUE	267	TRUE	10.2	TRUE	0.25		88.16351	22.78036	411.2225	5.507549	40.0185	12.64717	3
20030901	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	46	TRUE	208	TRUE	12.7	TRUE	0		88.21227	24.44358	415.8425	6.290783	42.62354	14.5245	3
20030902	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	39	TRUE	168	TRUE	14.5	TRUE	0		89.27818	26.82196	421.2905	8.026706	46.27805	18.23027	4
20030903	MCLEOD LAI	1	actual	TRUE	23.6	TRUE	49	TRUE	232	TRUE	10.5	TRUE	0		89.3273	29.06468	427.2425	6.607889	49.68019	16.37478	3
20030904	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	60	TRUE	166	TRUE	10	TRUE	1.51		79.13528	29.6641	432.1505	1.726513	50.6383	5.26687	3
20030905	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	100	TRUE	218	TRUE	8.7	TRUE	10.41		17.47987	14.15982	395.5164	7.33E-05	25.99319	7.87E-05	2
20030906	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	97	TRUE	73	TRUE	5.5	TRUE	6.84		9.491991	7.765388	377.543	1.32E-06	14.77123	9.92E-07	1
20030907	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	97	TRUE	242	TRUE	13.9	TRUE	18.78		5.26886	3.242453	314.694	1.62E-07	6.322058	7.74E-08	1
20030908	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	59	TRUE	234	TRUE	7.9	TRUE	0.25		40.17923	4.381172	319.008	5.35E-02	8.47148	2.96E-02	1
20030909	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	42	TRUE	245	TRUE	9	TRUE	0		71.93241	6.291498	323.844	1.051111	12.00016	0.7014529	2
20030910	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	84	TRUE	183	TRUE	5.6	TRUE	0		74.61495	6.641872	327.564	0.9949563	12.64286	0.6840242	2
20030911	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	58	TRUE	248	TRUE	16.9	TRUE	3.8		64.00803	4.921884	323.4099	1.185612	9.48297	0.6951218	2
20030912	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	55	TRUE	274	TRUE	8.5	TRUE	0		77.43786	6.171696	327.7238	1.381402	11.78839	0.9126383	2
20030913	MCLEOD LAI	1	actual	TRUE	6.6	TRUE	100	TRUE	203	TRUE	12.2	TRUE	5.32		27.12727	3.083994	316.8075	2.78E-03	6.021448	1.30E-03	1
20030914	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	63	TRUE	264	TRUE	11.7	TRUE	1.27		51.68281	3.920586	320.5995	0.3599333	7.60856	0.1883377	1
20030915	MCLEOD LAI	1	actual	TRUE	2.7	TRUE	91	TRUE	35	TRUE	14.8	TRUE	1.26		49.55547	3.981474	322.7895	0.327442	7.724744	0.1726421	1
20030916	MCLEOD LAI	1	actual	TRUE	4	TRUE	64	TRUE	38	TRUE	15.5	TRUE	0		64.94209	4.308348	325.2135	1.149004	8.340465	0.6298732	2
20030917	MCLEOD LAI	1	actual	TRUE	3.7	TRUE	65	TRUE	153	TRUE	6.3	TRUE	0		72.18904	4.607449	327.5835	0.9261709	8.901886	0.5251696	2
20030918	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	92	TRUE	190	TRUE	10.3	TRUE	9.65		26.38593	1.934206	301.7868	2.01E-03	3.807406	7.74E-04	1
20030919	MCLEOD LAI	1	actual	TRUE	13.6	TRUE	59	TRUE	258	TRUE	13.4	TRUE	1.5		54.67492	3.007229	305.9388	0.5320963	5.870205	0.245865	1
20030920	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	50	TRUE	269	TRUE	14	TRUE	0		74.16718	4.137758	309.7308	1.485377	8.008062	0.79753	2
20030921	MCLEOD LAI	1	actual	TRUE	6.8	TRUE	93	TRUE	212	TRUE	11.5	TRUE	0		74.39735	4.236212	312.6588	1.324585	8.194843	0.7195998	2
20030922	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	85	TRUE	235	TRUE	9.3	TRUE	13.7		28.71384	1.730216	274.4309	3.84E-03	3.406736	1.41E-03	1
20030923	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	47	TRUE	168	TRUE	6	TRUE	0.5		56.07044	2.768166	277.9169	0.4148335	5.401822	0.1846087	1
20030924	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	87	TRUE	168	TRUE	12.2	TRUE	3.55		39.27296	1.296438	274.1077	0.0557915	2.562575	1.86E-02	1
20030925	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	65	TRUE	230	TRUE	21	TRUE	5.32		50.5627	0.9483974	266.1216	0.5057533	1.880045	0.1539119	1
20030926	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	58	TRUE	262	TRUE	16	TRUE	0		72.22638	2.055069	270.2916	1.512088	4.033471	0.5949311	2
20030927	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	54	TRUE	185	TRUE	5.2	TRUE	0		81.22989	3.561966	275.1096	1.691313	6.90057	0.8434544	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20030928	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	70	TRUE	352	TRUE	10.5	TRUE	0		82.61222	4.518019	279.8376	2.609377	8.685468	2.33023	2
20030929	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	42	TRUE	46	TRUE	8.3	TRUE	0		86.35123	6.170193	284.2236	3.865547	11.70512	4.554251	2
20030930	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	46	TRUE	154	TRUE	4.3	TRUE	0		87.11034	7.833405	288.8436	3.519181	14.67205	4.732481	2
20031001	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	54	TRUE	146	TRUE	5.8	TRUE	0		87.15874	9.060111	292.5176	3.821753	16.81797	5.586339	2
20031002	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	63	TRUE	30	TRUE	6.5	TRUE	0		86.40903	10.02999	296.1376	3.559298	18.49403	5.517429	2
20031003	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	55	TRUE	130	TRUE	5.5	TRUE	0		86.4572	11.32549	300.0636	3.407512	20.69794	5.666107	2
20031004	MCLEOD LAI	1	actual	TRUE	20.1	TRUE	42	TRUE	120	TRUE	4.5	TRUE	0		88.20168	13.18858	304.3856	4.155236	23.79919	7.422153	2
20031005	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	44	TRUE	167	TRUE	8.3	TRUE	0		88.25044	14.86863	308.4556	5.067484	26.53907	9.397628	3
20031006	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	59	TRUE	195	TRUE	9.3	TRUE	1.26		80.24343	15.94957	312.0936	1.864117	28.28533	3.725881	2
20031007	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	100	TRUE	209	TRUE	13.2	TRUE	9.65		18.61248	7.888966	286.7034	1.47E-04	14.76242	1.10E-04	1
20031008	MCLEOD LAI	1	actual	TRUE	6.6	TRUE	100	TRUE	126	TRUE	9.2	TRUE	0.25		18.63827	7.888966	288.5954	1.21E-04	14.76865	9.12E-05	1
20031009	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	100	TRUE	236	TRUE	15	TRUE	5.83		6.056831	4.078218	275.9818	2.82E-07	7.865849	1.50E-07	1
20031010	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	98	TRUE	220	TRUE	11.4	TRUE	1.01		8.187879	4.112461	278.5218	8.48E-07	7.932121	4.53E-07	1
20031011	MCLEOD LAI	1	actual	TRUE	8.2	TRUE	97	TRUE	131	TRUE	11.4	TRUE	0		12.49475	4.154735	280.7018	8.58E-06	8.012966	4.61E-06	1
20031012	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	100	TRUE	30	TRUE	4.7	TRUE	2.53		7.981931	2.530275	282.5577	5.37E-07	4.949739	2.30E-07	1
20031013	MCLEOD LAI	1	actual	TRUE	7.1	TRUE	100	TRUE	224	TRUE	10.6	TRUE	0.25		8.00421	2.530275	284.5397	7.32E-07	4.950494	3.14E-07	1
20031014	MCLEOD LAI	1	actual	TRUE	0.6	TRUE	100	TRUE	195	TRUE	3.7	TRUE	0.25		8.026497	2.530275	285.3517	5.24E-07	4.950801	2.24E-07	1
20031015	MCLEOD LAI	1	actual	TRUE	6	TRUE	100	TRUE	52	TRUE	7.5	TRUE	0.25		8.048791	2.530275	287.1357	6.43E-07	4.951468	2.75E-07	1
20031016	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	100	TRUE	154	TRUE	9.9	TRUE	0		8.071093	2.530275	288.0917	7.35E-07	4.951822	3.15E-07	1
20031017	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	100	TRUE	159	TRUE	7.5	TRUE	10.67		1.093333	0.6384265	260.1655	6.43E-09	1.269068	1.77E-09	1
20031018	MCLEOD LAI	1	actual	TRUE	6.3	TRUE	100	TRUE	213	TRUE	5.2	TRUE	7.85		0	0	242.6898	2.48E-09	0	4.95E-10	1
20031019	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	100	TRUE	212	TRUE	9.6	TRUE	1.52		0	0	244.2758	3.09E-09	0	6.18E-10	1
20031020	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	100	TRUE	32	TRUE	8.9	TRUE	4.57		0	0	236.4936	2.98E-09	0	5.97E-10	1
20031021	MCLEOD LAI	1	actual	TRUE	11	TRUE	100	TRUE	216	TRUE	21.2	TRUE	4.56		0	0	230.3346	5.55E-09	0	1.11E-09	1
20031022	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	100	TRUE	2	TRUE	13.3	TRUE	0.75		0	0	232.3346	3.72E-09	0	7.45E-10	1
20031023	MCLEOD LAI	1	actual	TRUE	4.5	TRUE	100	TRUE	228	TRUE	15.6	TRUE	10.91		0	0	207.3513	4.18E-09	0	8.36E-10	1
20031024	MCLEOD LAI	1	actual	TRUE	-0.2	TRUE	100	TRUE	177	TRUE	4.2	TRUE	0		1.96E-02	0	208.0193	2.39E-09	0	4.78E-10	1
20031025	MCLEOD LAI	1	actual	TRUE	4.5	TRUE	100	TRUE	209	TRUE	11.6	TRUE	16		0	0	171.6203	3.42E-09	0	6.84E-10	1
20031026	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	100	TRUE	213	TRUE	11.4	TRUE	0.76		0	0	173.6203	3.38E-09	0	6.77E-10	1
20031027	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	100	TRUE	203	TRUE	8.5	TRUE	1.77		0	0	175.8363	2.92E-09	0	5.85E-10	1
20031028	MCLEOD LAI	1	actual	TRUE	1.2	TRUE	100	TRUE	283	TRUE	4.4	TRUE	18.79		0	0	135.2208	2.38E-09	0	4.76E-10	1
20031030	MCLEOD LAI	1	actual	TRUE	-4.9	TRUE	100	TRUE	7	TRUE	7.9	TRUE	0.25								
20031031	MCLEOD LAI	1	actual	TRUE	-7.9	TRUE	100	TRUE	180	TRUE	0	TRUE	1.53								
20040406	MCLEOD LAI	1	actual	TRUE	8.1	TRUE	40	TRUE	202	TRUE	4.6	TRUE	0								
20040407	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	51	TRUE	276	TRUE	9.3	TRUE	0								
20040408	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	38	TRUE	190	TRUE	7.4	TRUE	0								
20040409	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	26	TRUE	200	TRUE	5.2	TRUE	0								
20040410	MCLEOD LAI	5	startup	TRUE	12.9	TRUE	29	TRUE	174	TRUE	11	TRUE	0		85	10	80				
20040411	MCLEOD LAI	5	startup	TRUE	16	TRUE	46	TRUE	163	TRUE	10	TRUE	0		86.8	12	134				
20040412	MCLEOD LAI	1	actual	TRUE	11.8	TRUE	52	TRUE	43	TRUE	16.4	TRUE	0		86.8483	13.50114	137.078	6.23806	21.66715	10.01894	3
20040413	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	80	TRUE	13	TRUE	19.2	TRUE	0		82.78259	13.51569	137.888	4.132872	21.7111	6.998787	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20040414	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	52	TRUE	24	TRUE	14.9	TRUE	0		83.98178	14.31862	139.886	3.889428	22.8022	6.813063	2
20040415	MCLEOD LAI	1	actual	TRUE	-0.4	TRUE	40	TRUE	56	TRUE	15.7	TRUE	0		85.03278	14.42044	140.768	4.669323	22.9606	8.067239	3
20040416	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	35	TRUE	200	TRUE	5.5	TRUE	0		86.37748	15.19259	142.406	3.369341	23.98743	6.140983	2
20040417	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	68	TRUE	192	TRUE	10.6	TRUE	0		84.58652	15.65806	144.242	3.397341	24.63149	6.291622	2
20040418	MCLEOD LAI	1	actual	TRUE	6.8	TRUE	60	TRUE	194	TRUE	15.4	TRUE	0		84.63409	16.42414	146.42	4.355045	25.65413	8.085527	3
20040419	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	43	TRUE	228	TRUE	9.9	TRUE	0		86.04814	17.83364	149.012	4.014989	27.45331	7.828048	3
20040420	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	46	TRUE	348	TRUE	4.8	TRUE	0		86.2912	19.2606	151.73	3.213197	29.24143	6.641751	2
20040421	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	25	TRUE	267	TRUE	14.7	TRUE	0		90.27758	22.22433	155.42	9.356856	32.74331	17.09377	3
20040422	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	34	TRUE	160	TRUE	12.2	TRUE	0		90.32703	24.4484	158.678	8.307915	35.29974	16.24954	3
20040423	MCLEOD LAI	1	actual	TRUE	4	TRUE	91	TRUE	232	TRUE	21.7	TRUE	1.5		70.05669	24.55968	160.352	1.870463	35.51903	4.428604	2
20040424	MCLEOD LAI	1	actual	TRUE	4.2	TRUE	72	TRUE	233	TRUE	19	TRUE	0.25		75.52205	24.91945	162.062	2.055923	36.00004	4.933874	2
20040425	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	91	TRUE	244	TRUE	13.5	TRUE	1.26		65.07137	25.07218	164.078	1.044233	36.28348	2.196624	2
20040426	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	67	TRUE	215	TRUE	14.8	TRUE	0		75.26119	26.00821	166.94	1.638598	37.43577	3.991012	2
20040427	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	35	TRUE	15	TRUE	11.8	TRUE	1.26		78.80258	27.86766	169.82	1.83231	39.52151	4.683184	2
20040428	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	34	TRUE	268	TRUE	11.3	TRUE	0		86.13415	30.13973	173.132	4.360881	42.00036	10.76395	3
20040429	MCLEOD LAI	1	actual	TRUE	17	TRUE	28	TRUE	128	TRUE	6.1	TRUE	0		89.77944	33.29911	177.146	5.648597	45.3068	13.81429	3
20040430	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	21	TRUE	358	TRUE	4	TRUE	0		92.30889	37.2636	181.628	7.284034	49.2608	17.53233	4
20040501	MCLEOD LAI	1	actual	TRUE	21.3	TRUE	29	TRUE	149	TRUE	7.4	TRUE	0		92.35901	41.45058	187.866	8.706557	53.42955	20.8385	4
20040502	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	45	TRUE	254	TRUE	16.6	TRUE	3.81		70.09616	32.06722	186.678	1.448409	44.86665	4.004523	3
20040503	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	91	TRUE	13	TRUE	5.7	TRUE	0.25		71.58056	32.30179	190.666	0.8789034	45.38238	2.14305	3
20040504	MCLEOD LAI	1	actual	TRUE	3.6	TRUE	100	TRUE	80	TRUE	13.2	TRUE	6.35		22.18732	18.70282	181.2308	5.73E-04	29.73428	6.72E-04	2
20040505	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	30	TRUE	1	TRUE	8	TRUE	1.5	80	50.03597	20.08497	184.7868	0.2466123	31.5868	0.30149	2
20040506	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	27	TRUE	237	TRUE	14.9	TRUE	0	80	78.14934	22.85242	189.5848	2.021361	35.12115	4.764782	2
20040507	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	26	TRUE	254	TRUE	13.7	TRUE	0	80	88.54395	26.35913	195.0308	6.938334	39.4042	15.01371	3
20040508	MCLEOD LAI	2	estimate	TRUE	14	TRUE	45	TRUE	315	TRUE	15	TRUE	1	80	84.23327	28.54555	199.9548	4.042888	42.07465	10.12015	3
20040509	MCLEOD LAI	1	actual	TRUE	0.9	TRUE	96	TRUE	89	TRUE	2.8	TRUE	1.52	80	63.90118	27.77689	202.5208	0.5798771	41.36885	0.8535383	2
20040510	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	72	TRUE	38	TRUE	9.3	TRUE	8.12	80	39.10826	15.3219	188.9423	4.67E-02	25.47849	4.94E-02	2
20040511	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	30	TRUE	2	TRUE	12.3	TRUE	0	80	68.63145	17.22005	193.0023	1.113192	28.15908	1.848191	2
20040512	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	36	TRUE	26	TRUE	5.4	TRUE	0	80	80.10745	19.00605	197.1163	1.509667	30.62895	3.092802	2
20040513	MCLEOD LAI	1	actual	TRUE	10.9	TRUE	43	TRUE	20	TRUE	7.8	TRUE	0	80	84.56144	20.80679	201.4823	2.940245	33.07465	6.607204	2
20040514	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	49	TRUE	146	TRUE	4.6	TRUE	0	80	85.91487	22.90133	206.4963	3.016994	35.86007	7.120235	2
20040515	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	74	TRUE	226	TRUE	11.1	TRUE	1.02	80	78.13117	23.76379	210.9703	1.666522	37.08454	4.036941	2
20040516	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	44	TRUE	255	TRUE	3.6	TRUE	0	80	84.4989	26.35854	216.3443	2.359313	40.40892	6.115139	2
20040517	MCLEOD LAI	1	actual	TRUE	22.3	TRUE	23	TRUE	231	TRUE	15.2	TRUE	0	80	91.83024	31.10207	222.7623	11.97013	46.10959	24.24541	4
20040518	MCLEOD LAI	1	actual	TRUE	21.1	TRUE	24	TRUE	98	TRUE	8.5	TRUE	0	80	92.48747	35.54389	228.9643	9.370819	51.21251	21.49403	4
20040519	MCLEOD LAI	1	actual	TRUE	21.6	TRUE	29	TRUE	5	TRUE	9.9	TRUE	0	80	92.53765	39.78695	235.2563	10.12704	55.92751	23.75025	4
20040520	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	40	TRUE	18	TRUE	11.8	TRUE	0	80	90.99846	42.81977	240.9183	8.961356	59.29324	22.44407	4
20040521	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	50	TRUE	35	TRUE	16.5	TRUE	0	80	88.49012	44.25457	245.0863	7.928224	60.98114	20.86458	4
20040522	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	31	TRUE	57	TRUE	16.7	TRUE	0	80	89.27328	46.56157	249.5783	8.961421	63.50449	23.24945	4
20040523	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	20	TRUE	31	TRUE	7.7	TRUE	0	80	91.91469	50.18411	254.8803	8.301555	67.26046	22.6884	4
20040524	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	30	TRUE	280	TRUE	6.2	TRUE	0	80	91.96468	53.74084	260.5603	7.751839	70.91562	22.21465	4

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20040525	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	73	TRUE	236	TRUE	14.9	TRUE	4.32	80	59.72203	38.34358	256.7267	0.8521212	55.8379	2.53734	3
20040526	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	40	TRUE	258	TRUE	18.6	TRUE	0	70	81.66347	41.21845	262.2087	3.495249	59.1797	10.96922	3
20040527	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	45	TRUE	174	TRUE	7	TRUE	0.5	70	85.25777	43.28904	266.9887	3.10701	61.60627	10.19544	3
20040528	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	79	TRUE	230	TRUE	6.8	TRUE	0.25	70	83.15302	43.96905	271.4087	2.319712	62.58905	8.014815	3
20040529	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	44	TRUE	269	TRUE	8.7	TRUE	16.75	70	52.70417	21.03268	230.1166	0.3455373	34.24123	0.4462623	2
20040530	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	48	TRUE	272	TRUE	10.6	TRUE	0.25	70	72.93056	22.78498	234.6266	1.184208	36.66779	2.651143	2
20040531	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	45	TRUE	225	TRUE	14.7	TRUE	0	70	82.49144	24.69629	239.2086	3.176074	39.25953	7.889391	3
20040601	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	44	TRUE	165	TRUE	16	TRUE	0	70	85.92882	26.7603	244.9346	5.369114	42.03836	12.73705	3
20040602	MCLEOD LAI	1	actual	TRUE	14.3	TRUE	37	TRUE	236	TRUE	13.9	TRUE	2.78	70	75.08237	23.85293	250.9126	1.550188	38.54515	3.837502	2
20040603	MCLEOD LAI	2	estimate	TRUE	18	TRUE	30	TRUE	190	TRUE	11	TRUE	0	70	87.16916	27.3728	257.5566	4.973989	43.25332	12.17737	3
20040604	MCLEOD LAI	1	actual	TRUE	23.6	TRUE	29	TRUE	132	TRUE	12.9	TRUE	0	70	91.27337	31.98969	265.2086	9.850143	49.15622	21.81363	4
20040605	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	46	TRUE	212	TRUE	10.3	TRUE	0	70	89.8943	34.7761	271.9427	7.09584	52.70301	17.82142	4
20040606	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	100	TRUE	153	TRUE	12.9	TRUE	33.75	70	11.38081	11.16227	184.6232	5.25E-06	19.39326	4.67E-06	1
20040607	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	42	TRUE	41	TRUE	10.1	TRUE	4.57	70	53.89579	9.705243	183.5899	0.4183419	17.14466	0.3445936	1
20040608	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	60	TRUE	56	TRUE	6.9	TRUE	0	70	73.26474	11.74819	190.2879	0.9966576	20.35468	0.9135477	2
20040609	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	70	TRUE	232	TRUE	4.6	TRUE	16.5	70	41.32826	6.625946	159.4277	5.60E-02	12.00459	3.74E-02	1
20040610	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	55	TRUE	65	TRUE	5.1	TRUE	0	70	68.00588	8.983493	166.2157	0.7590683	15.8283	0.595624	2
20040611	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	59	TRUE	180	TRUE	3.8	TRUE	0	70	78.28461	10.96957	172.7337	1.168937	18.93323	1.150407	2
20040612	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	39	TRUE	168	TRUE	11.3	TRUE	0.25	70	86.41582	14.02082	179.3598	4.537586	23.4574	7.962566	3
20040613	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	99	TRUE	216	TRUE	8.2	TRUE	2.77	70	47.72598	10.56933	184.4018	0.1849087	18.48928	0.159576	1
20040614	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	55	TRUE	292	TRUE	13	TRUE	8.1	50	49.39904	6.981941	173.549	0.2932516	12.68779	0.2020189	1
20040615	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	53	TRUE	217	TRUE	13.3	TRUE	0	50	73.28111	9.023568	179.725	1.376923	16.0345	1.379991	2
20040616	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	60	TRUE	66	TRUE	9.2	TRUE	0	50	81.0763	10.90855	186.153	2.032946	19.02931	3.047448	2
20040617	MCLEOD LAI	1	actual	TRUE	23.4	TRUE	38	TRUE	231	TRUE	4.1	TRUE	0	50	88.05347	14.90756	193.769	3.986706	25.00563	7.360934	2
20040618	MCLEOD LAI	1	actual	TRUE	24.5	TRUE	31	TRUE	49	TRUE	9.9	TRUE	0	50	91.15002	19.55789	201.583	8.320865	31.48016	15.33457	3
20040619	MCLEOD LAI	1	actual	TRUE	26.6	TRUE	33	TRUE	186	TRUE	7	TRUE	0	50	91.57783	24.44385	209.775	7.640298	37.85899	15.81912	3
20040620	MCLEOD LAI	1	actual	TRUE	27	TRUE	43	TRUE	237	TRUE	7.1	TRUE	0	50	91.40191	28.66058	218.039	7.489463	43.14346	16.69058	4
20040621	MCLEOD LAI	1	actual	TRUE	27.7	TRUE	44	TRUE	230	TRUE	11.1	TRUE	0	50	91.31264	32.90653	226.429	9.046415	48.27409	20.33188	4
20040622	MCLEOD LAI	1	actual	TRUE	26.1	TRUE	45	TRUE	182	TRUE	7.4	TRUE	0	50	90.94118	36.84499	234.531	7.120958	52.90963	17.90518	4
20040623	MCLEOD LAI	1	actual	TRUE	26.9	TRUE	48	TRUE	68	TRUE	7.6	TRUE	0	50	90.54247	40.67814	242.777	6.795188	57.33823	18.05118	4
20040624	MCLEOD LAI	1	actual	TRUE	25.9	TRUE	45	TRUE	81	TRUE	3.2	TRUE	0	50	90.592	44.58764	250.843	5.482581	61.73958	16.00468	3
20040625	MCLEOD LAI	1	actual	TRUE	24.3	TRUE	51	TRUE	79	TRUE	9.3	TRUE	0	50	89.70151	47.86425	258.621	6.563219	65.44701	18.88325	4
20040626	MCLEOD LAI	1	actual	TRUE	25.3	TRUE	28	TRUE	63	TRUE	13.2	TRUE	0	50	92.11973	52.86841	266.579	11.27486	70.68894	28.77938	4
20040627	MCLEOD LAI	1	actual	TRUE	20.4	TRUE	63	TRUE	226	TRUE	7.6	TRUE	0	50	87.93222	54.96269	273.655	4.673725	73.18033	15.58227	4
20040628	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	69	TRUE	184	TRUE	6.7	TRUE	16.75	50	46.33784	25.67358	233.8731	0.1409454	40.29	0.20367	2
20040629	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	61	TRUE	33	TRUE	8	TRUE	3.8	50	57.12007	20.2517	234.205	0.4998833	33.30392	0.6334856	2
20040630	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	79	TRUE	11	TRUE	4.6	TRUE	0.5	50	68.62399	21.374	241.065	0.7550214	34.99167	0.9896933	2
20040701	MCLEOD LAI	1	actual	TRUE	23.5	TRUE	49	TRUE	229	TRUE	4.8	TRUE	0	50	82.90072	24.3205	248.999	2.030638	39.09475	5.162272	2
20040702	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	84	TRUE	233	TRUE	2.9	TRUE	8.9	50	35.97734	13.08736	233.8579	1.75E-02	22.96215	1.74E-02	2
20040703	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	82	TRUE	22	TRUE	9.7	TRUE	20.57	50	25.80827	6.136421	187.793	1.63E-03	11.34597	1.05E-03	1
20040704	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	68	TRUE	216	TRUE	3.5	TRUE	0	50	49.73412	7.406522	194.341	0.1894397	13.52447	0.1354142	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20040705	MCLEOD LAI	1	actual	TRUE	20	TRUE	60	TRUE	177	TRUE	11.6	TRUE	0	50	74.05361	9.388707	201.645	1.308976	16.81959	1.305547	2
20040706	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	76	TRUE	230	TRUE	15.5	TRUE	9.15	50	43.6104	5.160684	187.2857	0.1438755	9.656175	8.52E-02	1
20040707	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	54	TRUE	264	TRUE	7.4	TRUE	0.25	50	66.95593	6.737977	193.4197	0.8230699	12.39635	0.5595129	2
20040708	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	99	TRUE	256	TRUE	5	TRUE	5.57	50	24.03958	3.427775	188.4855	7.21E-04	6.557418	3.51E-04	1
20040709	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	83	TRUE	47	TRUE	3.2	TRUE	3.3	50	29.43905	2.3279	190.4097	3.47E-03	4.517718	1.43E-03	1
20040710	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	69	TRUE	163	TRUE	7.2	TRUE	0	50	56.55315	3.69664	197.2997	0.4587733	7.062472	0.2313846	1
20040711	MCLEOD LAI	1	actual	TRUE	20	TRUE	55	TRUE	232	TRUE	12.4	TRUE	1.27	50	74.32542	5.926598	204.6037	1.381051	11.0528	0.8800938	2
20040712	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	78	TRUE	162	TRUE	11.2	TRUE	0.5	50	78.7093	6.908296	211.5297	1.762601	12.77366	1.743432	2
20040713	MCLEOD LAI	1	actual	TRUE	20.6	TRUE	61	TRUE	113	TRUE	5.2	TRUE	0	50	83.3075	8.895883	218.9417	2.183196	16.15116	2.936453	2
20040714	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	62	TRUE	162	TRUE	9.3	TRUE	3.04	50	71.43274	8.094366	222.4538	1.048264	14.83889	0.7913654	2
20040715	MCLEOD LAI	1	actual	TRUE	26.4	TRUE	38	TRUE	41	TRUE	5.5	TRUE	0	50	86.98456	12.09866	230.9098	3.672195	21.39483	6.2138	2
20040716	MCLEOD LAI	1	actual	TRUE	23	TRUE	59	TRUE	168	TRUE	12.6	TRUE	0	50	87.03292	14.41927	238.7538	5.288005	25.05554	9.435805	3
20040717	MCLEOD LAI	1	actual	TRUE	23.2	TRUE	47	TRUE	213	TRUE	17.7	TRUE	0	50	88.23294	17.44398	246.6338	8.117329	29.64595	14.58742	3
20040718	MCLEOD LAI	1	actual	TRUE	24.3	TRUE	54	TRUE	217	TRUE	16.1	TRUE	0	50	88.28172	20.18804	254.7118	7.541133	33.6988	14.7349	3
20040719	MCLEOD LAI	1	actual	TRUE	22.4	TRUE	67	TRUE	110	TRUE	6.9	TRUE	0	50	86.76421	22.00935	262.4478	3.819131	36.38948	8.853369	3
20040720	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	64	TRUE	229	TRUE	14	TRUE	10.15	50	57.04419	12.4177	243.1837	0.6723177	22.02388	0.6479747	2
20040721	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	88	TRUE	145	TRUE	6.2	TRUE	3.55	50	41.90337	8.83691	244.0218	6.73E-02	16.20657	5.36E-02	1
20040722	MCLEOD LAI	1	actual	TRUE	23.9	TRUE	59	TRUE	132	TRUE	4.9	TRUE	0	50	70.71312	11.24418	252.0278	0.8195547	20.23177	0.7483427	2
20040723	MCLEOD LAI	1	actual	TRUE	27.3	TRUE	41	TRUE	108	TRUE	7.3	TRUE	0	50	86.87612	15.17943	260.6458	3.959323	26.50053	7.571231	3
20040724	MCLEOD LAI	1	actual	TRUE	25.3	TRUE	51	TRUE	166	TRUE	8.4	TRUE	0	50	87.8659	18.21753	268.9038	4.819978	31.15789	9.861667	3
20040725	MCLEOD LAI	1	actual	TRUE	17.8	TRUE	54	TRUE	245	TRUE	17.1	TRUE	8.38	50	63.41916	11.49251	254.4706	1.166316	20.65315	1.348724	2
20040726	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	51	TRUE	254	TRUE	9.6	TRUE	0	50	80.17526	13.82862	261.6306	1.878878	24.4292	3.361276	2
20040727	MCLEOD LAI	1	actual	TRUE	22.7	TRUE	41	TRUE	240	TRUE	5.5	TRUE	0	50	87.3093	17.12647	269.4206	3.846108	29.55593	7.871714	3
20040728	MCLEOD LAI	1	actual	TRUE	26.3	TRUE	39	TRUE	251	TRUE	11.4	TRUE	0	50	90.00401	21.05185	277.8586	7.619084	35.39877	15.23947	3
20040729	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	51	TRUE	246	TRUE	14.9	TRUE	0	50	89.50433	23.91733	285.8466	8.46028	39.55959	17.47151	3
20040730	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	45	TRUE	225	TRUE	8.3	TRUE	0	50	89.55352	26.73325	293.2766	6.109626	43.5436	14.36597	3
20040731	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	44	TRUE	214	TRUE	8.1	TRUE	0	50	89.60273	29.79766	300.9766	6.091209	47.77148	15.07216	3
20040801	MCLEOD LAI	1	actual	TRUE	21.6	TRUE	47	TRUE	124	TRUE	5.7	TRUE	0	50	89.65195	32.28141	307.8686	5.435605	51.1536	14.33567	3
20040802	MCLEOD LAI	1	actual	TRUE	25.6	TRUE	40	TRUE	186	TRUE	8.1	TRUE	0	50	90.05161	35.58867	315.4806	6.496001	55.51971	17.15965	4
20040803	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	78	TRUE	209	TRUE	7.5	TRUE	0.5	50	84.85303	36.4062	321.5266	3.013622	56.74845	9.453261	3
20040804	MCLEOD LAI	1	actual	TRUE	24.1	TRUE	45	TRUE	330	TRUE	3.6	TRUE	0	50	87.97112	39.26754	328.8686	3.84191	60.48117	11.9952	3
20040805	MCLEOD LAI	1	actual	TRUE	20	TRUE	70	TRUE	153	TRUE	5.1	TRUE	2.28	50	70.3984	35.25065	335.4726	0.8193501	55.83404	2.402245	3
20040806	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	91	TRUE	0	TRUE	12	TRUE	55.37	50	20.93127	10.53323	176.3978	3.40E-04	18.33009	2.92E-04	1
20040807	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	98	TRUE	6	TRUE	5.2	TRUE	2.54	50	15.4426	7.945459	181.3098	2.54E-05	14.32187	1.87E-05	1
20040808	MCLEOD LAI	1	actual	TRUE	16	TRUE	71	TRUE	188	TRUE	6.1	TRUE	0.25	50	42.93965	8.969225	187.1938	8.01E-02	16.01954	6.33E-02	1
20040809	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	48	TRUE	344	TRUE	5.5	TRUE	0	50	73.8409	11.50273	194.2478	0.9529696	20.03887	0.8649181	2
20040810	MCLEOD LAI	1	actual	TRUE	23.9	TRUE	44	TRUE	135	TRUE	4.5	TRUE	0	50	85.38051	14.39297	201.5538	2.786225	24.4254	5.158151	2
20040811	MCLEOD LAI	1	actual	TRUE	26.7	TRUE	39	TRUE	136	TRUE	3.1	TRUE	0	50	89.47684	17.89388	209.3638	4.64986	29.48724	9.271287	3
20040812	MCLEOD LAI	1	actual	TRUE	26.8	TRUE	47	TRUE	99	TRUE	6	TRUE	0	50	89.52603	20.9466	217.1918	5.419616	33.7547	11.36233	3
20040813	MCLEOD LAI	1	actual	TRUE	27.6	TRUE	43	TRUE	358	TRUE	5.2	TRUE	0	50	89.8463	24.32385	225.1638	5.450131	38.30322	12.24186	3
20040814	MCLEOD LAI	1	actual	TRUE	26.4	TRUE	53	TRUE	17	TRUE	9.4	TRUE	0	50	89.55575	26.99217	232.9198	6.459905	41.85756	14.67987	3

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20040815	MCLEOD LAI	1	actual	TRUE	26.7	TRUE	49	TRUE	52	TRUE	10.2	TRUE	0	50	89.60496	29.91916	240.7298	6.773278	45.65325	15.94509	3
20040816	MCLEOD LAI	1	actual	TRUE	25.5	TRUE	45	TRUE	59	TRUE	6.6	TRUE	0	50	89.65418	32.93946	248.3238	5.689609	49.47284	14.57924	3
20040817	MCLEOD LAI	1	actual	TRUE	28	TRUE	33	TRUE	112	TRUE	4.2	TRUE	0	50	91.54017	36.96454	256.3678	6.599543	54.34108	17.16456	4
20040818	MCLEOD LAI	1	actual	TRUE	28.1	TRUE	43	TRUE	240	TRUE	7.7	TRUE	0	50	91.54419	40.40063	264.4298	7.876908	58.46859	20.31593	4
20040819	MCLEOD LAI	1	actual	TRUE	26.8	TRUE	36	TRUE	188	TRUE	3.4	TRUE	0	50	91.59406	44.08693	272.2578	6.38745	62.76492	18.09986	4
20040820	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	60	TRUE	249	TRUE	12.1	TRUE	0	50	87.9771	45.6972	278.5738	5.901112	64.81415	17.36681	4
20040821	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	59	TRUE	28	TRUE	15.7	TRUE	0	50	87.13197	47.21231	284.6018	6.269876	66.74427	18.45325	4
20040822	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	59	TRUE	24	TRUE	21.7	TRUE	0	50	86.33306	48.28727	289.6938	7.574321	68.16821	21.40351	4
20040823	MCLEOD LAI	1	actual	TRUE	9.6	TRUE	63	TRUE	333	TRUE	6.9	TRUE	0	50	85.52888	49.10459	294.4258	3.209898	69.31016	11.24074	3
20040824	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	45	TRUE	209	TRUE	12.8	TRUE	0	50	87.13844	51.09163	300.3818	5.422444	71.69637	17.22888	4
20040825	MCLEOD LAI	1	actual	TRUE	20.7	TRUE	35	TRUE	57	TRUE	5	TRUE	0	50	89.51813	54.01697	307.1118	5.147449	75.03829	16.99263	4
20040826	MCLEOD LAI	1	actual	TRUE	18	TRUE	56	TRUE	254	TRUE	4.1	TRUE	0	50	88.1813	55.75195	313.3558	4.060443	77.17614	14.41752	4
20040827	MCLEOD LAI	1	actual	TRUE	12	TRUE	94	TRUE	203	TRUE	8.6	TRUE	0.51	50	79.78409	55.91421	318.5198	1.715415	77.72017	7.04778	3
20040828	MCLEOD LAI	1	actual	TRUE	16	TRUE	54	TRUE	261	TRUE	11.8	TRUE	2.54	50	71.55378	48.2331	324.4038	1.194054	70.32572	4.607152	3
20040829	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	98	TRUE	163	TRUE	5	TRUE	1.8	70	51.72657	44.8843	329.3158	0.2580535	66.95456	0.5361625	3
20040830	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	73	TRUE	249	TRUE	6	TRUE	0.76	70	64.30614	45.77057	334.9838	0.6934178	68.23342	2.330431	3
20040831	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	96	TRUE	213	TRUE	4.5	TRUE	10.41	70	18.72353	23.12279	307.993	9.90E-05	38.93744	1.40E-04	2
20040901	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	100	TRUE	358	TRUE	10.1	TRUE	6.35	70	5.583705	13.33407	294.8228	1.64E-07	23.95912	1.66E-07	2
20040902	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	57	TRUE	342	TRUE	11.8	TRUE	21.58	70	42.15517	6.917948	236.3039	0.093288	12.89232	6.49E-02	1
20040903	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	52	TRUE	293	TRUE	12.4	TRUE	0	70	72.19435	8.575819	241.3019	1.25971	15.75208	0.9855961	2
20040904	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	54	TRUE	273	TRUE	21.8	TRUE	14.22	70	57.5942	5.082475	209.6377	1.039404	9.584059	0.6128594	2
20040905	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	52	TRUE	204	TRUE	12.2	TRUE	0.25	70	77.0582	6.569432	214.2757	1.617082	12.2035	1.381782	2
20040906	MCLEOD LAI	1	actual	TRUE	12.5	TRUE	65	TRUE	204	TRUE	7.4	TRUE	0	70	80.7703	7.416883	218.2297	1.793844	13.6721	1.924483	2
20040907	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	64	TRUE	168	TRUE	7.9	TRUE	0	70	82.65253	8.339822	222.3277	2.300578	15.24956	3.003021	2
20040908	MCLEOD LAI	1	actual	TRUE	1	TRUE	100	TRUE	32	TRUE	12.2	TRUE	12.96	70	16.0054	3.635057	192.9119	4.64E-05	6.943043	2.32E-05	1
20040909	MCLEOD LAI	1	actual	TRUE	3	TRUE	100	TRUE	15	TRUE	7.8	TRUE	3.28	70	8.592896	1.812496	190.5515	8.93E-07	3.540793	3.34E-07	1
20040910	MCLEOD LAI	1	actual	TRUE	6.1	TRUE	89	TRUE	106	TRUE	6.7	TRUE	0.76	70	18.41676	1.9535	193.3535	9.77E-05	3.810748	3.76E-05	1
20040911	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	100	TRUE	202	TRUE	21.7	TRUE	6.85	70	5.088608	0.38619	182.8438	2.14E-07	0.7683229	5.35E-08	1
20040912	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	56	TRUE	210	TRUE	9.2	TRUE	4.58	70	38.43579	1.167204	179.2375	0.0405928	2.297012	1.31E-02	1
20040913	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	54	TRUE	172	TRUE	13.7	TRUE	0.25	70	67.10493	2.412032	183.4795	1.136358	4.670565	0.474791	1
20040914	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	85	TRUE	222	TRUE	8.1	TRUE	3.3	70	46.27073	1.21871	182.3447	0.1497733	2.397363	4.90E-02	1
20040915	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	58	TRUE	201	TRUE	6.2	TRUE	0	70	66.96181	2.325382	186.5147	0.7749316	4.510187	0.3190759	1
20040916	MCLEOD LAI	1	actual	TRUE	6.5	TRUE	100	TRUE	152	TRUE	9.1	TRUE	4.57	70	26.45177	0.7189177	181.5487	1.93E-03	1.423741	5.48E-04	1
20040917	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	77	TRUE	26	TRUE	14.4	TRUE	3.27	70	37.3263	0.4176725	180.44	4.19E-02	0.8305387	1.06E-02	1
20040918	MCLEOD LAI	1	actual	TRUE	5.4	TRUE	89	TRUE	30	TRUE	14.2	TRUE	3.05	70	32.20831	0.1272957	179.2361	1.26E-02	0.2541403	2.79E-03	1
20040919	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	65	TRUE	246	TRUE	5.9	TRUE	0	70	50.60723	0.563484	182.0021	0.2375598	1.118312	6.38E-02	1
20040920	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	50	TRUE	247	TRUE	17	TRUE	0	70	72.31503	1.596093	185.5961	1.595587	3.125	0.570207	2
20040921	MCLEOD LAI	1	actual	TRUE	7	TRUE	100	TRUE	211	TRUE	12.9	TRUE	3.04	70	37.70103	0.4111956	184.6558	4.21E-02	0.8178383	1.06E-02	1
20040922	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	50	TRUE	196	TRUE	11.9	TRUE	2.02	70	61.18653	1.406484	189.0058	0.8003338	2.761593	0.2740245	1
20040923	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	86	TRUE	202	TRUE	13.9	TRUE	0.76	70	64.68576	1.64078	192.2038	1.04901	3.212989	0.3786296	1
20040924	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	68	TRUE	209	TRUE	13.6	TRUE	2.28	70	63.46888	1.462814	196.3018	0.9799812	2.872122	0.3400346	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20040925	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	45	TRUE	252	TRUE	10.4	TRUE	0	70	80.13828	3.147035	200.9038	1.948547	6.056876	0.9134597	2
20040926	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	59	TRUE	171	TRUE	7.8	TRUE	0	70	83.38062	4.373347	205.4338	2.512561	8.304709	2.128044	2
20040927	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	54	TRUE	173	TRUE	12.3	TRUE	0	70	85.39203	5.831106	210.1438	4.134341	10.90568	4.688221	2
20040928	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	42	TRUE	54	TRUE	6.9	TRUE	0	70	86.93588	7.307736	214.2238	3.913424	13.46699	5.011464	2
20040929	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	50	TRUE	173	TRUE	8.4	TRUE	0	70	86.98423	8.349247	217.8358	4.249808	15.23835	5.84549	2
20040930	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	49	TRUE	45	TRUE	9.2	TRUE	0	70	87.03259	9.393428	221.4118	4.455184	16.98534	6.507788	2
20041001	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	51	TRUE	202	TRUE	14.6	TRUE	0	70	87.08097	10.39573	224.3478	5.888859	18.63295	8.799672	2
20041002	MCLEOD LAI	1	actual	TRUE	16	TRUE	48	TRUE	186	TRUE	7.6	TRUE	0	70	87.12936	11.74305	227.9318	4.167121	20.80625	6.878408	2
20041003	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	45	TRUE	193	TRUE	10.4	TRUE	0	70	87.6842	13.2931	231.7858	5.194195	23.25235	8.914777	3
20041004	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	48	TRUE	242	TRUE	13.2	TRUE	0	70	87.73279	14.57738	235.2258	6.023005	25.24376	10.56468	3
20041005	MCLEOD LAI	1	actual	TRUE	9	TRUE	82	TRUE	201	TRUE	5	TRUE	1.02	70	76.99442	14.85285	237.5498	1.119744	25.69001	1.674343	2
20041006	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	50	TRUE	200	TRUE	20.2	TRUE	2.28	70	72.08488	13.10119	240.2878	1.858619	23.05923	3.171573	2
20041007	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	46	TRUE	222	TRUE	16.1	TRUE	0	70	82.25367	14.20577	243.2238	3.309344	24.79158	6.161631	2
20041008	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	78	TRUE	162	TRUE	8.9	TRUE	0.25	70	82.24765	14.57244	245.7098	2.300671	25.38159	4.341043	2
20041009	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	81	TRUE	171	TRUE	9.7	TRUE	2.28	70	61.35075	12.18891	247.9618	0.722999	21.70988	0.6904429	2
20041010	MCLEOD LAI	1	actual	TRUE	11	TRUE	71	TRUE	185	TRUE	11.8	TRUE	0	70	72.26892	12.7206	250.6458	1.225639	22.5767	1.694393	2
20041011	MCLEOD LAI	1	actual	TRUE	6.7	TRUE	100	TRUE	174	TRUE	12	TRUE	30.49	70	8.837302	5.09783	172.5721	1.27E-06	9.494486	7.44E-07	1
20041012	MCLEOD LAI	1	actual	TRUE	6.9	TRUE	100	TRUE	159	TRUE	5.7	TRUE	10.91	70	1.238071	2.023446	151.5949	6.55E-09	3.91621	2.55E-09	1
20041013	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	100	TRUE	205	TRUE	8.3	TRUE	2.27	70	0	0.9510925	154.6029	2.89E-09	1.873373	8.80E-10	1
20041014	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	64	TRUE	254	TRUE	10.3	TRUE	1.26	70	35.46777	1.818393	157.9709	2.27E-02	3.535056	8.49E-03	1
20041015	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	85	TRUE	244	TRUE	7.6	TRUE	0	70	47.63815	2.050219	160.3129	0.177259	3.973399	6.93E-02	1
20041016	MCLEOD LAI	1	actual	TRUE	2.6	TRUE	57	TRUE	30	TRUE	12.7	TRUE	1.01	70	60.19906	2.291287	161.4849	0.7859644	4.425589	0.3210886	1
20041017	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	45	TRUE	56	TRUE	14.3	TRUE	0	70	73.97259	2.699633	162.8729	1.493972	5.184435	0.6528815	2
20041018	MCLEOD LAI	1	actual	TRUE	-6.2	TRUE	98	TRUE	15	TRUE	17.2	TRUE	0	70	72.89903	2.699633	163.0729	1.649309	5.184689	0.7207811	2
20041019	MCLEOD LAI	1	actual	TRUE	-2.8	TRUE	50	TRUE	14	TRUE	14.7	TRUE	0	70	78.03408	2.699633	163.2729	1.981619	5.184941	0.8660255	2
20041020	MCLEOD LAI	1	actual	TRUE	-5.1	TRUE	88	TRUE	253	TRUE	4.8	TRUE	0	70	77.65401	2.699633	163.4729	1.166232	5.185193	0.5096887	2
20041021	MCLEOD LAI	1	actual	TRUE	0.2	TRUE	63	TRUE	193	TRUE	9.4	TRUE	0.76	70	76.47058	2.772515	164.2129	1.346656	5.320457	0.5952607	2
20041022	MCLEOD LAI	1	actual	TRUE	-0.2	TRUE	100	TRUE	207	TRUE	10.1	TRUE	0	70	73.39507	2.772515	164.8809	1.177673	5.321331	0.5206031	2
20041023	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	100	TRUE	26	TRUE	5.6	TRUE	4.05	70	31.39148	1.062693	159.0913	6.64E-03	2.090475	2.08E-03	1
20041024	MCLEOD LAI	1	actual	TRUE	0.9	TRUE	84	TRUE	165	TRUE	10	TRUE	1.01	70	39.19201	1.111179	159.9573	4.91E-02	2.184422	0.015619	1
20041025	MCLEOD LAI	1	actual	TRUE	0.7	TRUE	100	TRUE	84	TRUE	4.4	TRUE	1.77	70	28.67758	0.4934087	160.7873	2.97E-03	0.9793044	7.76E-04	1
20041026	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	100	TRUE	15	TRUE	7.9	TRUE	5.81	70	9.148007	0	151.4971	1.23E-06	0	2.46E-07	1
20041027	MCLEOD LAI	1	actual	TRUE	1.3	TRUE	97	TRUE	179	TRUE	9.6	TRUE	3.03	70	8.335472	1.09E-02	148.8721	8.43E-07	2.18E-02	1.71E-07	1
20041028	MCLEOD LAI	1	actual	TRUE	-0.1	TRUE	100	TRUE	203	TRUE	9.4	TRUE	2.77	70	4.9708	0	149.5581	1.06E-07	0	2.13E-08	1
20050308	MCLEOD LAI	1	actual	TRUE	3.5	TRUE	98	TRUE	183	TRUE	7.3	TRUE	0.51								
20050309	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	66	TRUE	234	TRUE	10.8	TRUE	7.61								
20050310	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	53	TRUE	184	TRUE	15.4	TRUE	0								
20050311	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	36	TRUE	264	TRUE	21	TRUE	0.51								
20050312	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	36	TRUE	301	TRUE	10.8	TRUE	0								
20050313	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	39	TRUE	159	TRUE	6.3	TRUE	0								
20050314	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	41	TRUE	177	TRUE	2.2	TRUE	0								

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20050315	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	50	TRUE	151	TRUE	2.7	TRUE	0								
20050316	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	65	TRUE	359	TRUE	10.9	TRUE	1.27								
20050317	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	50	TRUE	163	TRUE	13.1	TRUE	0.25								
20050318	MCLEOD LAI	1	actual	TRUE	-7.2	TRUE	48	TRUE	32	TRUE	27.2	TRUE	0								
20050319	MCLEOD LAI	1	actual	TRUE	-7.8	TRUE	45	TRUE	45	TRUE	28.1	TRUE	0								
20050320	MCLEOD LAI	1	actual	TRUE	-7.6	TRUE	99	TRUE	28	TRUE	16.2	TRUE	0								
20050321	MCLEOD LAI	1	actual	TRUE	-6.4	TRUE	95	TRUE	9	TRUE	11.3	TRUE	0								
20050322	MCLEOD LAI	1	actual	TRUE	-4.3	TRUE	70	TRUE	12	TRUE	10.3	TRUE	0.76								
20050323	MCLEOD LAI	1	actual	TRUE	-1.8	TRUE	48	TRUE	13	TRUE	12.1	TRUE	1.26								
20050324	MCLEOD LAI	1	actual	TRUE	3.9	TRUE	37	TRUE	258	TRUE	4.5	TRUE	0								
20050325	MCLEOD LAI	1	actual	TRUE	5.8	TRUE	39	TRUE	200	TRUE	10.5	TRUE	0								
20050326	MCLEOD LAI	1	actual	TRUE	1.1	TRUE	100	TRUE	201	TRUE	15.3	TRUE	0								
20050327	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	37	TRUE	237	TRUE	16.5	TRUE	6.33								
20050328	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	73	TRUE	140	TRUE	10.1	TRUE	0								
20050329	MCLEOD LAI	1	actual	TRUE	5.1	TRUE	49	TRUE	211	TRUE	9.4	TRUE	0								
20050330	MCLEOD LAI	1	actual	TRUE	4.5	TRUE	40	TRUE	296	TRUE	8.1	TRUE	0								
20050331	MCLEOD LAI	1	actual	TRUE	2.4	TRUE	79	TRUE	150	TRUE	13.2	TRUE	0								
20050401	MCLEOD LAI	1	actual	TRUE	4.5	TRUE	49	TRUE	218	TRUE	23.4	TRUE	0.76								
20050402	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	42	TRUE	211	TRUE	19.5	TRUE	0								
20050403	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	48	TRUE	177	TRUE	15.4	TRUE	0								
20050404	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	32	TRUE	242	TRUE	15.2	TRUE	1.27								
20050405	MCLEOD LAI	1	actual	TRUE	-0.1	TRUE	98	TRUE	196	TRUE	9.1	TRUE	0								
20050406	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	88	TRUE	111	TRUE	9.9	TRUE	1.01								
20050407	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	86	TRUE	221	TRUE	4.9	TRUE	0								
20050408	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	61	TRUE	224	TRUE	8.7	TRUE	4.57								
20050409	MCLEOD LAI	1	actual	TRUE	4.4	TRUE	74	TRUE	220	TRUE	8.2	TRUE	3.3								
20050410	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	45	TRUE	152	TRUE	16.9	TRUE	0								
20050411	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	100	TRUE	231	TRUE	15.3	TRUE	2.8								
20050412	MCLEOD LAI	1	actual	TRUE	4.6	TRUE	65	TRUE	163	TRUE	4.5	TRUE	1.02								
20050413	MCLEOD LAI	5	startup	TRUE	6.8	TRUE	41	TRUE	129	TRUE	8	TRUE	0		85	6	30				
20050414	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	48	TRUE	227	TRUE	15.9	TRUE	0.25		85.43919	7.046337	32.25	4.989223	9.114229	5.1457	2
20050415	MCLEOD LAI	1	actual	TRUE	2.4	TRUE	87	TRUE	161	TRUE	11.8	TRUE	1.27		71.11066	7.156643	33.636	1.175889	9.343374	0.6840041	2
20050416	MCLEOD LAI	1	actual	TRUE	6.2	TRUE	86	TRUE	99	TRUE	8.9	TRUE	2.03		55.7709	5.89167	35.706	0.4679556	8.342113	0.256555	1
20050417	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	59	TRUE	245	TRUE	14.5	TRUE	5.84		46.34484	3.569202	30.18596	0.2090212	5.509723	9.38E-02	1
20050418	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	40	TRUE	235	TRUE	16.1	TRUE	0		71.65602	5.140161	32.88596	1.488325	7.391892	0.7676623	2
20050419	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	48	TRUE	189	TRUE	10	TRUE	0		80.95531	6.741182	35.92796	2.087758	9.177443	1.701601	2
20050420	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	41	TRUE	217	TRUE	4.1	TRUE	0		86.35057	9.501755	40.15796	3.12793	11.94045	3.656605	2
20050421	MCLEOD LAI	1	actual	TRUE	20.3	TRUE	28	TRUE	61	TRUE	4.4	TRUE	0		90.3704	13.23715	44.76596	5.642743	15.22174	7.603996	2
20050422	MCLEOD LAI	1	actual	TRUE	12.5	TRUE	44	TRUE	32	TRUE	14.3	TRUE	0		89.27259	15.08351	47.96996	7.939843	16.88996	10.75472	2
20050423	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	40	TRUE	48	TRUE	14	TRUE	0		89.32171	17.89087	52.19995	7.876049	19.2702	11.42002	2
20050424	MCLEOD LAI	1	actual	TRUE	20.4	TRUE	32	TRUE	82	TRUE	8.8	TRUE	0		90.5076	21.43523	56.82595	7.182878	22.06382	11.36166	3

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20050425	MCLEOD LAI	1	actual	TRUE	21.5	TRUE	30	TRUE	72	TRUE	13.5	TRUE	0		91.25729	25.2705	61.64996	10.12932	25.25778	15.92779	3
20050426	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	49	TRUE	48	TRUE	23.6	TRUE	0		88.65848	26.77891	64.60196	11.61575	26.76014	18.15151	3
20050427	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	25	TRUE	51	TRUE	11.6	TRUE	0		90.04987	28.85171	67.40996	7.746983	28.81549	13.86397	3
20050428	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	25	TRUE	48	TRUE	17.4	TRUE	0		90.11949	30.36085	69.65996	10.4807	30.31433	17.89012	3
20050429	MCLEOD LAI	1	actual	TRUE	6.6	TRUE	20	TRUE	37	TRUE	17	TRUE	0		90.92205	31.85423	71.80196	11.5197	31.79739	19.63295	3
20050430	MCLEOD LAI	2	estimate	TRUE	7	TRUE	22	TRUE	45	TRUE	12	TRUE	0		90.97171	33.38591	74.01595	9.017685	33.3191	16.77658	3
20050501	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	24	TRUE	23	TRUE	14.7	TRUE	0		91.04609	35.90695	78.48995	10.44202	35.8306	19.39542	3
20050502	MCLEOD LAI	1	actual	TRUE	13.6	TRUE	26	TRUE	353	TRUE	6.2	TRUE	0		91.09579	38.77076	83.34195	6.85242	38.68262	14.72523	3
20050503	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	54	TRUE	251	TRUE	7.7	TRUE	0.5	85	88.35093	40.26031	87.76195	4.98795	40.17918	11.70947	3
20050504	MCLEOD LAI	1	actual	TRUE	16	TRUE	32	TRUE	139	TRUE	10.4	TRUE	0.76	85	87.99707	43.32157	93.04594	5.432178	43.22902	13.05557	3
20050505	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	29	TRUE	213	TRUE	15.4	TRUE	0	85	89.97029	46.34966	98.16795	9.275583	46.24559	20.25247	4
20050506	MCLEOD LAI	1	actual	TRUE	3.6	TRUE	100	TRUE	26	TRUE	11.2	TRUE	20.57	85	13.82965	18.86569	63.3128	1.63E-05	21.62331	1.55E-05	2
20050507	MCLEOD LAI	1	actual	TRUE	11.4	TRUE	49	TRUE	56	TRUE	13.2	TRUE	4.56	85	44.24227	13.79796	62.01108	0.141964	17.73209	0.119384	1
20050508	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	37	TRUE	33	TRUE	8.6	TRUE	0	85	73.4548	16.58437	67.24108	1.094802	20.51757	1.075477	2
20050509	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	38	TRUE	37	TRUE	22.1	TRUE	0	85	85.03512	19.13067	72.25508	6.448397	23.02245	10.63742	3
20050510	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	36	TRUE	81	TRUE	8.5	TRUE	0	85	88.41746	22.28144	77.82708	5.242941	25.97305	9.556824	3
20050511	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	67	TRUE	74	TRUE	2.1	TRUE	1.78	85	72.05278	21.98528	83.05708	0.7457123	26.46036	0.8098749	2
20050512	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	42	TRUE	186	TRUE	2.6	TRUE	0	85	83.03764	25.0239	88.84509	1.84962	29.36829	3.799483	2
20050513	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	53	TRUE	196	TRUE	6	TRUE	0.25	85	85.38303	27.33774	94.41708	3.006036	31.71697	6.568327	2
20050514	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	65	TRUE	174	TRUE	8.6	TRUE	0	85	85.43086	28.78439	99.44908	3.449658	33.40039	7.69077	3
20050515	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	75	TRUE	156	TRUE	6.3	TRUE	0.5	85	84.18008	29.85719	104.5891	2.589392	34.84573	6.06081	2
20050516	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	98	TRUE	231	TRUE	11.8	TRUE	10.9	85	20.89532	14.04608	89.00951	3.32E-04	20.14481	3.03E-04	2
20050517	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	55	TRUE	40	TRUE	5.8	TRUE	0.25	85	52.15674	15.88236	94.00552	0.2816391	22.33211	0.273874	2
20050518	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	44	TRUE	156	TRUE	16.2	TRUE	0	85	76.47643	18.18225	99.01952	1.897764	24.92328	3.454047	2
20050519	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	41	TRUE	171	TRUE	16.1	TRUE	0	85	85.52415	20.90047	104.3755	5.099629	27.85601	9.707957	3
20050520	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	74	TRUE	164	TRUE	10.2	TRUE	3.29	85	59.00916	16.1483	104.9721	0.6414551	23.32582	0.6415312	2
20050521	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	52	TRUE	191	TRUE	13.6	TRUE	1.53	85	69.47162	17.20038	109.5541	1.220644	24.70416	1.866635	2
20050522	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	59	TRUE	156	TRUE	4.4	TRUE	4.56	85	52.2485	12.36806	107.6785	0.2650686	19.2177	0.2343343	1
20050523	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	49	TRUE	269	TRUE	12.3	TRUE	0.76	85	73.28676	14.48945	112.7285	1.309577	21.93153	1.845344	2
20050524	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	57	TRUE	214	TRUE	9.5	TRUE	0	85	80.61441	16.09695	117.4905	1.96003	23.98028	3.483006	2
20050525	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	48	TRUE	217	TRUE	4.6	TRUE	0.76	85	83.41923	18.78016	123.2245	2.149175	27.19762	4.237141	2
20050526	MCLEOD LAI	1	actual	TRUE	21.8	TRUE	30	TRUE	160	TRUE	9.1	TRUE	0	60	89.94214	23.00031	129.5525	6.725422	31.85989	13.08549	3
20050527	MCLEOD LAI	1	actual	TRUE	25	TRUE	23	TRUE	175	TRUE	9.4	TRUE	0	60	93.01392	28.29117	136.4565	10.55788	37.26645	19.94021	3
20050528	MCLEOD LAI	1	actual	TRUE	26.4	TRUE	26	TRUE	154	TRUE	9.2	TRUE	0	60	93.06496	33.64864	143.6125	10.52699	42.43866	21.23877	3
20050529	MCLEOD LAI	1	actual	TRUE	27.6	TRUE	30	TRUE	183	TRUE	7.3	TRUE	0	60	93.11533	38.93765	150.9845	9.633531	47.3484	21.06422	4
20050530	MCLEOD LAI	1	actual	TRUE	20.3	TRUE	41	TRUE	271	TRUE	8.1	TRUE	0	60	91.29497	42.26165	157.0425	7.757699	50.52882	18.61446	4
20050531	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	74	TRUE	201	TRUE	4.5	TRUE	0	60	86.0022	43.37737	162.1825	3.038839	51.99096	9.023522	3
20050601	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	100	TRUE	182	TRUE	4.7	TRUE	10.93	0	18.45007	21.28911	145.5106	8.95E-05	31.17535	1.08E-04	2
20050602	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	70	TRUE	224	TRUE	6.6	TRUE	0	0	44.84629	22.5133	151.5066	0.1119902	32.83041	0.1405448	2
20050603	MCLEOD LAI	1	actual	TRUE	15	TRUE	71	TRUE	192	TRUE	8.7	TRUE	0	0	64.15483	23.74249	157.6106	0.7893407	34.49438	1.153742	2
20050604	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	41	TRUE	234	TRUE	3.6	TRUE	0	0	79.43906	26.41411	163.9126	1.288011	37.65728	3.025595	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20050605	MCLEOD LAI	1	actual	TRUE	19.5	TRUE	59	TRUE	32	TRUE	14.6	TRUE	0	0	84.16479	28.63766	170.8266	3.925952	40.36019	9.636102	3
20050606	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	56	TRUE	160	TRUE	9.4	TRUE	0	0	85.39357	30.75747	177.3266	3.57302	42.9086	9.225204	3
20050607	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	51	TRUE	91	TRUE	13.2	TRUE	0	0	86.60146	33.28588	184.0606	5.126393	45.84501	12.88629	3
20050608	MCLEOD LAI	1	actual	TRUE	22.8	TRUE	34	TRUE	100	TRUE	5.4	TRUE	0	0	89.93608	37.43864	191.5686	5.576628	50.30114	14.48714	3
20050609	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	49	TRUE	220	TRUE	7.6	TRUE	0	0	89.49626	40.45962	198.8246	5.849632	53.63383	15.56425	3
20050610	MCLEOD LAI	1	actual	TRUE	16	TRUE	61	TRUE	210	TRUE	11.7	TRUE	3.55	0	67.13443	31.81209	199.7199	1.028446	45.50407	2.685539	3
20050611	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	100	TRUE	228	TRUE	12.5	TRUE	4.57	0	26.51573	21.0791	196.8595	2.34E-03	33.25587	2.96E-03	2
20050612	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	67	TRUE	153	TRUE	3.8	TRUE	9.39	0	34.49857	12.14982	182.8314	1.31E-02	20.83777	1.22E-02	2
20050613	MCLEOD LAI	1	actual	TRUE	12	TRUE	75	TRUE	155	TRUE	10.7	TRUE	14.97	0	30.79735	6.235545	155.1345	7.33E-03	11.33235	4.74E-03	1
20050614	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	66	TRUE	248	TRUE	10.5	TRUE	1.77	0	49.82813	6.364039	160.6085	0.2727035	11.58086	0.1783723	1
20050615	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	38	TRUE	236	TRUE	13.9	TRUE	0	0	77.87067	9.285765	167.0365	1.87756	16.30543	2.420103	2
20050616	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	49	TRUE	11	TRUE	11	TRUE	0	0	84.77769	11.87709	173.7165	3.558017	20.28666	5.836621	2
20050617	MCLEOD LAI	1	actual	TRUE	16	TRUE	50	TRUE	54	TRUE	20.5	TRUE	0	0	86.28916	14.12802	180.0005	7.08586	23.62106	11.64476	3
20050618	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	37	TRUE	5	TRUE	10	TRUE	0	0	89.26804	17.85981	187.2565	6.388907	28.84242	11.91033	3
20050619	MCLEOD LAI	1	actual	TRUE	23	TRUE	52	TRUE	108	TRUE	4.4	TRUE	0	0	89.1468	20.90527	194.8005	4.734974	32.96605	10.03203	3
20050620	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	53	TRUE	233	TRUE	12.9	TRUE	0	0	88.57198	23.50371	201.7865	6.69107	36.40612	13.99589	3
20050621	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	78	TRUE	213	TRUE	14	TRUE	5.83	0	54.1496	15.0295	196.7097	0.5218628	25.23822	0.5494097	2
20050622	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	59	TRUE	206	TRUE	9.7	TRUE	0.76	0	71.78334	16.88605	203.0117	1.082976	27.95833	1.745805	2
20050623	MCLEOD LAI	1	actual	TRUE	18	TRUE	49	TRUE	216	TRUE	7.3	TRUE	9.15	0	56.83881	11.06601	189.4913	0.4718946	19.31247	0.4184664	1
20050624	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	93	TRUE	268	TRUE	8.9	TRUE	3.3	0	36.58896	7.69783	190.15	2.71E-02	13.98071	0.0197809	1
20050625	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	60	TRUE	60	TRUE	10.1	TRUE	0.76	0	65.61269	9.793427	196.938	0.8985026	17.42105	0.7474056	2
20050626	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	61	TRUE	39	TRUE	13.6	TRUE	0	0	79.30109	11.80583	203.672	2.103262	20.62312	3.376842	2
20050627	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	57	TRUE	47	TRUE	12.5	TRUE	0	0	83.95316	13.92276	210.244	3.433277	23.89035	6.236023	2
20050628	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	45	TRUE	65	TRUE	6.5	TRUE	0	0	87.49792	17.25307	217.59	4.155308	28.79762	8.298925	3
20050629	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	61	TRUE	212	TRUE	13.3	TRUE	0.76	0	84.35938	19.40922	224.576	3.774553	31.92135	8.105766	3
20050630	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	56	TRUE	214	TRUE	8.1	TRUE	0.51	0	85.45224	21.61012	231.202	3.373836	35.03384	7.762599	3
20050701	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	57	TRUE	218	TRUE	8.9	TRUE	0	0	85.5001	23.28653	237.696	3.536064	37.4105	8.419752	3
20050702	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	100	TRUE	177	TRUE	8.9	TRUE	2.78	0	46.36059	18.37453	243.326	0.1579921	30.91312	0.1903563	2
20050703	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	68	TRUE	212	TRUE	11	TRUE	2.29	0	55.95632	16.41707	249.496	0.5285422	28.19586	0.5987164	2
20050704	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	78	TRUE	201	TRUE	14.2	TRUE	1.27	0	64.53568	17.31093	256.116	1.058389	29.61727	1.79506	2
20050705	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	98	TRUE	206	TRUE	9.6	TRUE	9.37	0	18.43585	8.735069	238.732	1.14E-04	16.00601	9.00E-05	1
20050706	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	62	TRUE	212	TRUE	19.3	TRUE	23.61	0	43.76757	5.022206	184.5451	0.1787865	9.404572	0.1043598	1
20050707	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	54	TRUE	246	TRUE	8.3	TRUE	0	0	70.3041	7.042437	191.4171	0.9597726	12.8985	0.6674746	2
20050708	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	84	TRUE	162	TRUE	16.9	TRUE	4.82	0	48.24666	4.365474	189.2217	0.3074943	8.254837	0.1676754	1
20050709	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	79	TRUE	249	TRUE	11.5	TRUE	7.36	0	38.75496	2.540202	180.5518	4.86E-02	4.907784	2.07E-02	1
20050710	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	61	TRUE	230	TRUE	10.9	TRUE	0	0	65.74754	4.115616	187.1538	0.9402341	7.80229	0.4982298	1
20050711	MCLEOD LAI	1	actual	TRUE	20	TRUE	48	TRUE	205	TRUE	9.6	TRUE	0	0	81.84026	6.692456	194.4578	2.268196	12.32451	2.503409	2
20050712	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	87	TRUE	231	TRUE	8.6	TRUE	0.25	0	80.69454	7.150425	200.6638	1.889728	13.13107	2.016311	2
20050713	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	50	TRUE	233	TRUE	16.3	TRUE	0	0	85.92269	9.592928	207.9138	5.446213	17.20168	7.870368	2
20050714	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	71	TRUE	239	TRUE	9.7	TRUE	0	0	84.72482	10.60093	214.0838	3.308436	18.86632	5.194442	2
20050715	MCLEOD LAI	1	actual	TRUE	15	TRUE	76	TRUE	219	TRUE	7.5	TRUE	4.31	0	54.59832	7.330869	212.8053	0.392441	13.49917	0.2802166	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20050716	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	71	TRUE	304	TRUE	0.3	TRUE	0.25	0	65.42126	8.590872	219.6413	0.5443467	15.65131	0.4242546	1
20050717	MCLEOD LAI	1	actual	TRUE	21	TRUE	55	TRUE	186	TRUE	14.7	TRUE	0	0	81.55205	10.92651	227.1253	2.834082	19.50694	4.526786	2
20050718	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	52	TRUE	232	TRUE	10.2	TRUE	2.03	0	76.41805	11.36242	234.2313	1.39704	20.26699	1.891256	2
20050719	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	61	TRUE	59	TRUE	8.4	TRUE	1.51	0	74.0098	12.42814	240.7613	1.111716	22.01521	1.323708	2
20050720	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	78	TRUE	50	TRUE	3.3	TRUE	1.78	0	63.1783	11.88378	246.9493	0.5753428	21.21524	0.5414116	2
20050721	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	51	TRUE	183	TRUE	5.4	TRUE	4.57	0	61.22425	9.569324	245.0771	0.578031	17.43657	0.4810894	1
20050722	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	59	TRUE	2	TRUE	8.5	TRUE	0	0	78.24937	11.68773	252.5431	1.476794	20.95137	2.138379	2
20050723	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	97	TRUE	83	TRUE	7.7	TRUE	7.61	0	25.29116	6.088816	240.0812	1.25E-03	11.45156	8.11E-04	1
20050724	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	69	TRUE	184	TRUE	7.1	TRUE	9.14	0	36.26788	3.90017	224.66	2.31E-02	7.475882	1.20E-02	1
20050725	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	46	TRUE	237	TRUE	10.5	TRUE	7.11	0	59.14749	4.286284	216.4324	0.6573529	8.168159	0.3565218	1
20050726	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	56	TRUE	227	TRUE	10	TRUE	0	0	77.44302	6.322016	223.4845	1.490465	11.8089	0.9856572	2
20050727	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	80	TRUE	218	TRUE	7.7	TRUE	0	0	79.36291	7.148709	230.1584	1.571794	13.26722	1.446981	2
20050728	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	55	TRUE	197	TRUE	11.3	TRUE	0.25	0	84.99708	9.526627	237.7144	3.722473	17.31815	5.540535	2
20050729	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	50	TRUE	251	TRUE	13.8	TRUE	0	0	86.66224	11.83996	244.7664	5.329458	21.12522	8.642941	3
20050730	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	63	TRUE	186	TRUE	12.6	TRUE	0.25	0	86.39661	13.45624	251.6205	4.831655	23.73871	8.471343	3
20050731	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	62	TRUE	266	TRUE	7.8	TRUE	12.95	0	53.56798	7.997733	225.2998	0.3607095	14.69165	0.270702	1
20050801	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	81	TRUE	218	TRUE	11.3	TRUE	4.55	0	41.47991	4.976182	221.7464	8.07E-02	9.423676	0.0471602	1
20050802	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	62	TRUE	245	TRUE	8.6	TRUE	4.56	0	49.99257	3.778179	219.0861	0.2528429	7.244046	0.1291192	1
20050803	MCLEOD LAI	1	actual	TRUE	19.8	TRUE	49	TRUE	197	TRUE	9.4	TRUE	0	0	76.14208	5.978687	225.6541	1.317411	11.21455	0.8463489	2
20050804	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	70	TRUE	174	TRUE	8.3	TRUE	0.51	0	80.68332	7.17401	231.9341	1.859071	13.31815	1.990035	2
20050805	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	59	TRUE	259	TRUE	9.7	TRUE	2.54	0	71.33054	6.677706	238.2501	1.065818	12.48087	0.7273488	2
20050806	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	71	TRUE	228	TRUE	9.6	TRUE	0	0	78.18134	7.689498	244.0981	1.551843	14.25626	1.541907	2
20050807	MCLEOD LAI	1	actual	TRUE	21	TRUE	51	TRUE	231	TRUE	5.3	TRUE	1.52	0	78.29703	9.473719	250.8821	1.262076	17.31302	1.236855	2
20050808	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	59	TRUE	359	TRUE	2	TRUE	0	0	82.68438	11.16658	257.2881	1.715777	20.14713	2.561183	2
20050809	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	60	TRUE	46	TRUE	13.4	TRUE	0	0	84.31792	12.57041	263.1541	3.77247	22.45878	6.562702	2
20050810	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	46	TRUE	47	TRUE	9.3	TRUE	0	0	86.94744	14.75543	269.4881	4.423768	25.95768	8.253584	3
20050811	MCLEOD LAI	1	actual	TRUE	22.7	TRUE	50	TRUE	33	TRUE	6.2	TRUE	0	0	87.63395	17.21214	276.5781	4.173338	29.78958	8.497002	3
20050812	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	58	TRUE	25	TRUE	7	TRUE	1.78	0	78.71411	17.73329	283.632	1.427024	30.67233	2.885242	2
20050813	MCLEOD LAI	1	actual	TRUE	27.3	TRUE	38	TRUE	249	TRUE	8.4	TRUE	0	0	88.98183	21.36839	291.55	5.656775	36.11871	12.20921	3
20050814	MCLEOD LAI	1	actual	TRUE	21.7	TRUE	58	TRUE	81	TRUE	7.1	TRUE	0.75	0	85.31725	23.34532	298.4601	3.148524	39.05375	7.803171	3
20050815	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	68	TRUE	18	TRUE	10.8	TRUE	2.28	0	69.41614	20.80527	304.0201	1.058156	35.53163	2.192812	2
20050816	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	60	TRUE	73	TRUE	5.2	TRUE	0	0	78.82561	22.25866	309.994	1.3167	37.74225	3.115279	2
20050817	MCLEOD LAI	1	actual	TRUE	16.3	TRUE	44	TRUE	44	TRUE	8.4	TRUE	0	0	85.18201	24.27027	315.932	3.299381	40.72012	8.343561	3
20050818	MCLEOD LAI	1	actual	TRUE	18	TRUE	54	TRUE	181	TRUE	9.1	TRUE	0	0	86.04856	26.0841	322.176	3.85658	43.38652	9.905488	3
20050819	MCLEOD LAI	1	actual	TRUE	23.2	TRUE	44	TRUE	162	TRUE	12.9	TRUE	0	0	88.4836	28.89342	329.356	6.606729	47.39277	15.96404	3
20050820	MCLEOD LAI	1	actual	TRUE	20.3	TRUE	58	TRUE	220	TRUE	9.6	TRUE	1.78	0	78.55334	28.66684	336.014	1.603303	47.25488	4.644325	3
20050821	MCLEOD LAI	1	actual	TRUE	11	TRUE	100	TRUE	206	TRUE	8	TRUE	14.48	0	14.20732	12.22181	294.764	1.65E-05	22.14783	1.60E-05	2
20050822	MCLEOD LAI	1	actual	TRUE	14	TRUE	69	TRUE	233	TRUE	3.9	TRUE	0.5	0	38.91988	13.18818	300.288	3.42E-02	23.76686	3.47E-02	2
20050823	MCLEOD LAI	1	actual	TRUE	16	TRUE	72	TRUE	52	TRUE	4.9	TRUE	4.3	0	41.88403	9.273638	296.6976	6.28E-02	17.20302	5.19E-02	1
20050824	MCLEOD LAI	1	actual	TRUE	19.8	TRUE	53	TRUE	190	TRUE	8.6	TRUE	0.5	0	71.47974	11.30156	303.2656	1.013597	20.67675	0.9383582	2
20050825	MCLEOD LAI	1	actual	TRUE	21.5	TRUE	49	TRUE	161	TRUE	9.6	TRUE	0	0	83.84448	13.68105	310.1396	2.923982	24.6443	5.44404	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20050826	MCLEOD LAI	1	actual	TRUE	21	TRUE	43	TRUE	237	TRUE	13	TRUE	0	0	87.82858	16.28165	316.9236	6.044932	28.85705	11.39279	3
20050827	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	52	TRUE	160	TRUE	4.6	TRUE	0.5	0	87.87722	18.3329	323.4556	3.986484	32.11522	8.533418	3
20050828	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	85	TRUE	180	TRUE	6.4	TRUE	6.08	0	42.16045	11.00076	312.3424	7.11E-02	20.22105	6.49E-02	2
20050829	MCLEOD LAI	1	actual	TRUE	15	TRUE	63	TRUE	9	TRUE	6.5	TRUE	0.25	0	64.18628	12.23056	318.0464	0.7074704	22.31573	0.6876404	2
20050830	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	97	TRUE	216	TRUE	8.7	TRUE	3.04	0	37.71979	8.782025	318.0899	3.42E-02	16.43003	2.74E-02	1
20050831	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	59	TRUE	215	TRUE	10.2	TRUE	4.31	0	49.86798	6.427919	313.7143	0.2699294	12.2294	0.1820818	1
20050901	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	62	TRUE	171	TRUE	9.6	TRUE	0.5	0	69.82773	7.503613	318.0823	1.009182	14.17146	0.7413943	2
20050902	MCLEOD LAI	1	actual	TRUE	10.5	TRUE	95	TRUE	208	TRUE	7.9	TRUE	6.84	0	26.77155	3.770856	302.9081	2.01E-03	7.314082	1.03E-03	1
20050903	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	59	TRUE	216	TRUE	10.4	TRUE	0.25	0	57.21967	4.858478	307.096	0.5685642	9.347255	0.3308016	1
20050904	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	48	TRUE	213	TRUE	10.4	TRUE	0.5	0	78.08546	6.598958	311.9861	1.602523	12.53508	1.402773	2
20050905	MCLEOD LAI	1	actual	TRUE	14.2	TRUE	44	TRUE	256	TRUE	14.2	TRUE	0	0	84.82787	8.12437	316.2461	4.209366	15.26814	5.798186	2
20050906	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	47	TRUE	216	TRUE	9.4	TRUE	0	0	86.72932	9.841705	321.0281	4.310471	18.28222	6.582981	2
20050907	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	56	TRUE	245	TRUE	11.5	TRUE	0	0	86.7776	11.27525	325.8281	4.824551	20.75495	7.842181	3
20050908	MCLEOD LAI	1	actual	TRUE	15	TRUE	56	TRUE	258	TRUE	11.8	TRUE	5.07	0	62.57214	7.782727	317.3801	0.8573208	14.66634	0.6427367	2
20050909	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	57	TRUE	25	TRUE	14.1	TRUE	0	0	77.55499	8.992304	321.7301	1.848737	16.81001	2.430588	2
20050910	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	55	TRUE	6	TRUE	9.9	TRUE	0.51	0	82.95816	10.2982	326.1701	2.644976	19.0896	4.143783	2
20050911	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	87	TRUE	68	TRUE	3.4	TRUE	0	0	80.85007	10.55048	329.6381	1.479488	19.53763	2.000993	2
20050912	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	65	TRUE	113	TRUE	2.2	TRUE	2.53	0	63.25694	8.904146	333.9701	0.5463393	16.69547	0.4427858	1
20050913	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	91	TRUE	244	TRUE	15.6	TRUE	3.81	0	42.22642	5.717325	329.8081	0.1143896	10.95968	7.26E-02	1
20050914	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	52	TRUE	191	TRUE	7	TRUE	1.77	0	61.02668	6.113364	334.1941	0.6195518	11.69203	0.4074245	1
20050915	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	70	TRUE	12	TRUE	6.1	TRUE	0	0	70.8353	6.722247	337.7521	0.874182	12.80724	0.6054699	2
20050916	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	78	TRUE	216	TRUE	9.3	TRUE	0	0	75.3868	7.172678	341.3281	1.251025	13.62934	0.8982875	2
20050917	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	48	TRUE	222	TRUE	13	TRUE	0	0	83.68435	8.718742	345.8401	3.397729	16.40363	4.890358	2
20050918	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	60	TRUE	203	TRUE	10.6	TRUE	0	0	84.18479	9.673016	349.7581	3.217911	18.09493	4.919438	2
20050919	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	60	TRUE	248	TRUE	15	TRUE	4.3	0	62.62999	6.779377	343.1149	1.010241	12.92053	0.7032646	2
20050920	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	61	TRUE	244	TRUE	9.5	TRUE	0.51	0	73.90524	7.515378	346.5289	1.169284	14.25772	0.8620901	2
20050921	MCLEOD LAI	1	actual	TRUE	10	TRUE	68	TRUE	175	TRUE	7.4	TRUE	0	0	78.39532	8.147762	350.0329	1.415066	15.39939	1.390091	2
20050922	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	57	TRUE	163	TRUE	8.6	TRUE	0.25	0	82.26997	9.112361	353.8069	2.272385	17.12226	3.224298	2
20050923	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	64	TRUE	203	TRUE	11.1	TRUE	0.25	0	82.86173	9.766109	357.1489	2.775551	18.2824	4.240441	2
20050924	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	99	TRUE	203	TRUE	10.9	TRUE	0.5	0	75.99114	9.781421	360.2029	1.407069	18.31918	1.713133	2
20050925	MCLEOD LAI	1	actual	TRUE	13.6	TRUE	56	TRUE	261	TRUE	11.7	TRUE	0	0	82.10442	10.93296	364.3549	2.603235	20.34009	4.252842	2
20050926	MCLEOD LAI	1	actual	TRUE	8	TRUE	84	TRUE	307	TRUE	6	TRUE	8.64	0	34.11102	5.641	339.6094	1.34E-02	10.83219	8.41E-03	1
20050927	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	100	TRUE	192	TRUE	5.3	TRUE	0.75	0	32.19746	5.641	341.8714	8.05E-03	10.83504	5.07E-03	1
20050928	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	100	TRUE	204	TRUE	13.4	TRUE	4.81	0	12.21228	2.835759	332.199	8.24E-06	5.553012	3.71E-06	1
20050929	MCLEOD LAI	1	actual	TRUE	9.6	TRUE	79	TRUE	191	TRUE	5.4	TRUE	0.75	0	29.43262	3.235806	335.631	3.87E-03	6.319302	1.85E-03	1
20050930	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	83	TRUE	160	TRUE	5.6	TRUE	0.25	0	42.215	3.505174	338.739	0.0689733	6.83357	3.42E-02	1
20051001	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	89	TRUE	249	TRUE	5.1	TRUE	0.75	0	46.83022	3.616845	340.451	0.1395891	7.046539	7.03E-02	1
20051002	MCLEOD LAI	1	actual	TRUE	2.8	TRUE	100	TRUE	28	TRUE	2.9	TRUE	0	0	46.86532	3.616845	341.6591	0.1255673	7.047184	6.33E-02	1
20051003	MCLEOD LAI	1	actual	TRUE	8.9	TRUE	56	TRUE	86	TRUE	10.4	TRUE	0	0	66.48835	4.283533	343.9651	0.9419219	8.308396	0.5153323	2
20051004	MCLEOD LAI	1	actual	TRUE	9.1	TRUE	60	TRUE	140	TRUE	8.4	TRUE	0	0	75.78033	4.901734	346.3071	1.22419	9.468421	0.7171531	2
20051005	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	100	TRUE	170	TRUE	10.3	TRUE	0.5	0	73.24392	4.901734	347.9471	1.181856	9.469947	0.6924126	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20051006	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	100	TRUE	197	TRUE	9.1	TRUE	8.63	0	18.28274	2.004896	323.1962	1.04E-04	3.948557	4.07E-05	1
20051007	MCLEOD LAI	1	actual	TRUE	4.6	TRUE	100	TRUE	203	TRUE	9	TRUE	2.54	0	11.49206	0.8292249	324.7282	4.57E-06	1.64793	1.34E-06	1
20051008	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	86	TRUE	220	TRUE	6.2	TRUE	4.82	0	18.10342	0.1994003	315.0008	8.38E-05	0.3981705	1.92E-05	1
20051009	MCLEOD LAI	1	actual	TRUE	6	TRUE	85	TRUE	171	TRUE	8.9	TRUE	0.25	0	31.8289	0.3607691	316.7848	8.78E-03	0.7194898	2.18E-03	1
20051010	MCLEOD LAI	1	actual	TRUE	3.3	TRUE	100	TRUE	228	TRUE	5.2	TRUE	19.81	0	2.769924	0	257.0482	1.94E-08	0	3.88E-09	1
20051011	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	80	TRUE	197	TRUE	11.9	TRUE	0.76	0	22.34645	0.2666752	259.1382	5.68E-04	0.5319818	1.35E-04	1
20051012	MCLEOD LAI	1	actual	TRUE	4.5	TRUE	96	TRUE	181	TRUE	17.6	TRUE	3.56	0	16.60563	3.39E-02	254.3626	7.91E-05	6.79E-02	1.64E-05	1
20051013	MCLEOD LAI	1	actual	TRUE	8.2	TRUE	86	TRUE	181	TRUE	8.2	TRUE	0.5	0	30.55612	0.2312195	256.5426	6.06E-03	0.4613994	1.42E-03	1
20051014	MCLEOD LAI	1	actual	TRUE	2.5	TRUE	100	TRUE	16	TRUE	9.9	TRUE	0.25	0	30.58586	0.2312195	257.6966	6.66E-03	0.461404	1.55E-03	1
20051015	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	100	TRUE	219	TRUE	7.3	TRUE	9.89	0	5.772228	0	233.5757	1.60E-07	0	3.20E-08	1
20051016	MCLEOD LAI	1	actual	TRUE	0.7	TRUE	100	TRUE	195	TRUE	8.1	TRUE	5.07	0	1.884631	0	224.1673	1.19E-08	0	2.38E-09	1
20051017	MCLEOD LAI	1	actual	TRUE	6.7	TRUE	98	TRUE	219	TRUE	13.7	TRUE	6.33	0	2.937192	2.36E-02	212.5728	3.35E-08	0.0472611	6.88E-09	1
20051018	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	75	TRUE	184	TRUE	10.1	TRUE	0.5	0	25.44079	0.3645571	214.6988	1.48E-03	0.7260323	3.67E-04	1
20051019	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	93	TRUE	262	TRUE	7.7	TRUE	7.11	0	13.50273	5.20E-02	200.7895	1.17E-05	0.1038755	2.45E-06	1
20051020	MCLEOD LAI	1	actual	TRUE	4.2	TRUE	79	TRUE	164	TRUE	6.2	TRUE	0.25	0	28.61153	0.2206131	202.2495	3.19E-03	0.4400263	7.40E-04	1
20051021	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	90	TRUE	98	TRUE	5.7	TRUE	0.25	0	35.65686	0.2706147	203.3495	1.88E-02	0.5394348	4.47E-03	1
20051022	MCLEOD LAI	1	actual	TRUE	9	TRUE	84	TRUE	214	TRUE	6.5	TRUE	0	0	47.83036	0.515471	205.6735	0.1721584	1.024523	4.54E-02	1
20051023	MCLEOD LAI	1	actual	TRUE	7.5	TRUE	95	TRUE	163	TRUE	11.7	TRUE	2.03	0	38.09135	0.0651536	207.7275	4.29E-02	0.1302051	9.10E-03	1
20051024	MCLEOD LAI	1	actual	TRUE	8	TRUE	71	TRUE	178	TRUE	15.3	TRUE	0.25	0	57.97697	0.4650149	209.8715	0.7708734	0.9249064	0.1994781	1
20051025	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	63	TRUE	175	TRUE	7.7	TRUE	0	0	72.01724	1.23307	212.8435	0.987534	2.430932	0.3243352	1
20051026	MCLEOD LAI	1	actual	TRUE	7.3	TRUE	48	TRUE	223	TRUE	13.3	TRUE	0	0	80.19112	1.894909	214.8615	2.267765	3.708063	0.8633912	2
20051027	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	49	TRUE	157	TRUE	12	TRUE	0	0	83.38504	2.536293	216.8615	3.106562	4.928484	2.016809	2
20051028	MCLEOD LAI	1	actual	TRUE	0.1	TRUE	85	TRUE	4	TRUE	11.5	TRUE	0	0	80.78593	2.563567	217.5835	2.209349	4.980435	0.9487761	2
20051029	MCLEOD LAI	1	actual	TRUE	6.3	TRUE	53	TRUE	236	TRUE	14.8	TRUE	0	0	83.11825	3.090554	219.4215	3.455915	5.970858	2.665257	2
20051030	MCLEOD LAI	1	actual	TRUE	0.3	TRUE	93	TRUE	204	TRUE	4.3	TRUE	0	0	79.1425	3.105402	220.1795	1.296375	5.999271	0.6050442	2
20051031	MCLEOD LAI	1	actual	TRUE	3.6	TRUE	100	TRUE	210	TRUE	8.8	TRUE	0	0	74.45186	3.105402	221.5315	1.159286	6.000519	0.5411144	2
20060412	MCLEOD LAI	1	actual	TRUE	4	TRUE	65	TRUE	230	TRUE	12.3	TRUE	7.11								
20060413	MCLEOD LAI	1	actual	TRUE	0.1	TRUE	100	TRUE	172	TRUE	12.3	TRUE	1.02								
20060414	MCLEOD LAI	1	actual	TRUE	2	TRUE	81	TRUE	229	TRUE	10.3	TRUE	9.9								
20060415	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	69	TRUE	217	TRUE	4.8	TRUE	2.54								
20060416	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	58	TRUE	173	TRUE	12.9	TRUE	0								
20060417	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	34	TRUE	226	TRUE	14.5	TRUE	1.01								
20060418	MCLEOD LAI	1	actual	TRUE	6	TRUE	48	TRUE	156	TRUE	15.3	TRUE	0								
20060419	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	43	TRUE	177	TRUE	16.7	TRUE	0								
20060420	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	75	TRUE	34	TRUE	5.4	TRUE	3.8								
20060421	MCLEOD LAI	1	actual	TRUE	4.8	TRUE	75	TRUE	263	TRUE	13.9	TRUE	1.27								
20060422	MCLEOD LAI	1	actual	TRUE	6.3	TRUE	68	TRUE	143	TRUE	7.8	TRUE	0								
20060423	MCLEOD LAI	5	startup	TRUE	11.9	TRUE	36	TRUE	141	TRUE	8.9	TRUE	0		70	3	50				
20060424	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	25	TRUE	160	TRUE	10.2	TRUE	0	75	86.39375	6.327379	54.05	4.279551	9.78968	4.57039	2
20060425	MCLEOD LAI	1	actual	TRUE	15.8	TRUE	25	TRUE	253	TRUE	14.2	TRUE	0	75	90.40242	9.400205	57.848	9.288441	13.36922	10.91049	2
20060426	MCLEOD LAI	1	actual	TRUE	4	TRUE	93	TRUE	203	TRUE	9.5	TRUE	0	75	81.29837	9.486753	59.522	2.117179	13.56747	2.456916	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20060427	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	47	TRUE	195	TRUE	12.7	TRUE	0.76	75	82.58854	11.00292	62.402	2.906649	15.27327	3.956347	2
20060428	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	70	TRUE	163	TRUE	10.5	TRUE	3.8	75	57.24805	7.884935	60.95253	0.5727031	11.91614	0.3806728	1
20060429	MCLEOD LAI	1	actual	TRUE	8.2	TRUE	34	TRUE	227	TRUE	5.6	TRUE	1.78	75	65.44151	8.268943	63.38253	0.7115414	12.47058	0.4853499	1
20060430	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	32	TRUE	231	TRUE	9.7	TRUE	0	75	80.12057	9.983422	66.01053	1.877507	14.48868	2.1828	2
20060501	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	54	TRUE	349	TRUE	7.3	TRUE	0	75	82.39841	10.80692	69.44053	2.162349	15.55992	2.818363	2
20060502	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	29	TRUE	235	TRUE	7.1	TRUE	0	75	87.17741	12.9191	73.68053	4.091361	17.9638	6.203702	2
20060503	MCLEOD LAI	1	actual	TRUE	13.4	TRUE	24	TRUE	210	TRUE	8.8	TRUE	0	75	90.20381	15.82029	78.49653	6.877478	21.03968	10.69621	3
20060504	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	28	TRUE	211	TRUE	11.3	TRUE	0	75	90.91171	19.28909	83.99653	8.631016	24.50803	13.87621	3
20060505	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	29	TRUE	239	TRUE	17.1	TRUE	0	75	90.96137	22.57886	89.37053	11.64297	27.67682	18.48422	3
20060506	MCLEOD LAI	1	actual	TRUE	7.6	TRUE	59	TRUE	220	TRUE	12.4	TRUE	0	75	87.37838	23.51793	93.14253	5.499259	28.83451	10.539	3
20060507	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	43	TRUE	265	TRUE	10.7	TRUE	2.29	75	73.64945	21.70409	97.49053	1.227621	27.88708	2.142608	2
20060508	MCLEOD LAI	1	actual	TRUE	6.6	TRUE	43	TRUE	301	TRUE	13.4	TRUE	0	75	81.38865	22.85956	101.0825	2.604085	29.20662	5.425002	2
20060509	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	33	TRUE	244	TRUE	8.8	TRUE	0	75	86.182	24.72927	105.1965	3.8707	31.15122	8.167602	3
20060510	MCLEOD LAI	1	actual	TRUE	10.7	TRUE	48	TRUE	264	TRUE	9.1	TRUE	0	75	86.23009	26.34468	109.5265	3.956374	32.90347	8.599566	3
20060511	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	84	TRUE	214	TRUE	7.7	TRUE	2.8	75	56.31193	21.2701	113.3345	0.4611975	28.9549	0.5317754	2
20060512	MCLEOD LAI	1	actual	TRUE	8.3	TRUE	48	TRUE	280	TRUE	9.5	TRUE	5.58	75	49.59784	14.09363	108.5433	0.252023	21.27969	0.2376187	2
20060513	MCLEOD LAI	1	actual	TRUE	10.6	TRUE	28	TRUE	256	TRUE	9.7	TRUE	0	75	74.54107	16.31138	112.8553	1.218619	23.96382	1.798384	2
20060514	MCLEOD LAI	1	actual	TRUE	11.9	TRUE	40	TRUE	193	TRUE	7.3	TRUE	0	75	83.04875	18.36486	117.4013	2.347234	26.40393	4.557964	2
20060515	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	22	TRUE	8	TRUE	9.6	TRUE	0	75	90.54366	22.32807	123.0813	7.516994	30.72269	14.00345	3
20060516	MCLEOD LAI	1	actual	TRUE	24.2	TRUE	28	TRUE	149	TRUE	10.9	TRUE	0	75	92.02684	27.12372	129.8413	9.910089	35.63641	18.61677	3
20060517	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	29	TRUE	262	TRUE	6.6	TRUE	0	75	92.07687	30.60041	135.3953	8.036122	39.10546	16.71321	3
20060518	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	29	TRUE	202	TRUE	7.9	TRUE	0	75	92.12691	34.69394	141.5433	8.641043	43.02378	18.53278	4
20060519	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	43	TRUE	183	TRUE	8.1	TRUE	0	75	90.56728	37.62014	147.2593	6.993319	45.91541	16.38423	3
20060520	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	65	TRUE	265	TRUE	7.8	TRUE	0	75	86.89208	38.99307	152.1473	4.069564	47.53187	10.92475	3
20060521	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	36	TRUE	217	TRUE	15.7	TRUE	0.25	75	88.24907	41.31823	156.8373	7.356129	49.82254	17.76695	4
20060522	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	55	TRUE	43	TRUE	9.8	TRUE	1.02	75	83.0668	43.54546	162.4273	2.66853	52.14307	8.073984	3
20060523	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	92	TRUE	12	TRUE	8.2	TRUE	25.14	75	22.69675	16.88746	113.1889	5.33E-04	24.59949	5.52E-04	2
20060524	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	49	TRUE	251	TRUE	6.8	TRUE	0.5	75	57.00062	19.07599	118.3289	0.4661334	27.19258	0.5154625	2
20060525	MCLEOD LAI	1	actual	TRUE	9.8	TRUE	90	TRUE	11	TRUE	6	TRUE	7.11	75	26.65533	10.75174	110.4259	1.76E-03	17.29388	1.46E-03	1
20060526	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	46	TRUE	57	TRUE	14.7	TRUE	1.52	75	61.43684	12.58605	115.5839	0.9346266	19.78585	0.8415064	2
20060527	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	34	TRUE	58	TRUE	7.6	TRUE	0	75	81.6795	15.83528	121.1559	2.011777	23.87071	3.577657	2
20060528	MCLEOD LAI	1	actual	TRUE	15	TRUE	46	TRUE	246	TRUE	11.5	TRUE	0	75	85.65874	18.12412	126.2599	4.12113	26.67537	7.877291	3
20060529	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	80	TRUE	95	TRUE	3.4	TRUE	2.28	75	62.20374	15.83139	130.9499	0.5510388	24.31406	0.5661557	2
20060530	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	34	TRUE	229	TRUE	13.7	TRUE	0.25	75	83.40282	19.18487	136.6299	3.392256	28.40021	6.858875	2
20060531	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	34	TRUE	184	TRUE	10.3	TRUE	0	75	89.20119	23.09437	142.8859	6.424287	32.89632	12.83921	3
20060601	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	54	TRUE	146	TRUE	12.2	TRUE	0	75	88.2573	25.43165	149.5659	6.174015	35.69126	13.00268	3
20060602	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	49	TRUE	230	TRUE	12.4	TRUE	4.57	75	69.38209	19.31397	149.1095	1.145766	29.17911	2.016536	2
20060603	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	82	TRUE	260	TRUE	11.5	TRUE	1.52	75	64.25403	19.31632	154.7095	0.9128336	29.44251	1.301168	2
20060604	MCLEOD LAI	1	actual	TRUE	15.3	TRUE	44	TRUE	232	TRUE	13.6	TRUE	0.76	75	79.2978	21.73416	160.8676	2.10259	32.49324	4.697679	2
20060605	MCLEOD LAI	1	actual	TRUE	7.4	TRUE	93	TRUE	293	TRUE	8.5	TRUE	3.81	75	41.58841	15.29949	160.0729	7.15E-02	24.6976	7.42E-02	2
20060606	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	49	TRUE	235	TRUE	8.4	TRUE	0	75	68.31134	17.39404	166.0869	0.9052708	27.56973	1.085049	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20060607	MCLEOD LAI	1	actual	TRUE	20.4	TRUE	22	TRUE	185	TRUE	5.2	TRUE	0	75	86.97845	21.80901	173.1629	3.613959	33.17306	7.982528	3
20060608	MCLEOD LAI	1	actual	TRUE	22.5	TRUE	33	TRUE	41	TRUE	13.4	TRUE	0	75	90.32847	25.97177	180.6169	8.827598	38.20819	17.71132	3
20060609	MCLEOD LAI	5	startup	TRUE	21.8	TRUE	36	TRUE	69	TRUE	7.3	TRUE	0		90.4	30	250				
20060610	MCLEOD LAI	1	actual	TRUE	24.9	TRUE	25	TRUE	27	TRUE	5.5	TRUE	0	75	92.60503	35.13369	257.886	8.190465	52.41513	19.74125	4
20060611	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	35	TRUE	33	TRUE	16.3	TRUE	0	75	92.10221	39.06951	265.232	13.14853	57.1084	28.74845	4
20060612	MCLEOD LAI	1	actual	TRUE	21.2	TRUE	41	TRUE	165	TRUE	6.9	TRUE	0	75	91.12122	42.5333	272.452	7.124182	61.18656	19.34436	4
20060613	MCLEOD LAI	1	actual	TRUE	25.7	TRUE	35	TRUE	186	TRUE	7.5	TRUE	0	75	91.17094	47.1194	280.482	7.395027	66.366	20.74477	4
20060614	MCLEOD LAI	1	actual	TRUE	19	TRUE	72	TRUE	222	TRUE	9.1	TRUE	0	50	86.18306	48.60106	287.306	3.930246	68.31252	13.10633	3
20060615	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	50	TRUE	256	TRUE	9.8	TRUE	0	50	86.86734	51.14157	293.986	4.485278	71.28252	14.8793	4
20060616	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	43	TRUE	149	TRUE	12.6	TRUE	0	50	88.18377	54.21784	300.882	6.233637	74.75792	19.52885	4
20060617	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	46	TRUE	238	TRUE	11.3	TRUE	0	50	88.23253	56.71992	307.256	5.879346	77.61858	19.09518	4
20060618	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	39	TRUE	248	TRUE	11.6	TRUE	0	50	88.96019	59.89964	314.026	6.625961	81.1171	21.30722	4
20060619	MCLEOD LAI	1	actual	TRUE	16.8	TRUE	57	TRUE	216	TRUE	8.2	TRUE	0	50	87.70448	61.926	320.454	4.662652	83.50822	16.7372	4
20060620	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	42	TRUE	228	TRUE	14.2	TRUE	0.25	50	88.40417	64.93408	327.206	6.974064	86.80299	22.90771	4
20060621	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	48	TRUE	213	TRUE	13.7	TRUE	0	50	88.453	67.15183	333.328	6.848366	89.31863	22.9547	4
20060622	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	38	TRUE	238	TRUE	9.2	TRUE	0	50	88.99518	70.20414	339.9	5.900765	92.59568	21.03457	4
20060623	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	33	TRUE	221	TRUE	11.1	TRUE	0	50	90.07378	73.7319	346.706	7.580144	96.27711	25.60279	4
20060624	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	37	TRUE	287	TRUE	9.3	TRUE	0	50	90.12316	77.38077	353.872	6.971991	100.061	24.61627	4
20060625	MCLEOD LAI	1	actual	TRUE	26.4	TRUE	36	TRUE	209	TRUE	5.7	TRUE	0	50	90.87828	82.01425	362.028	6.477997	104.72	23.89945	4
20060626	MCLEOD LAI	1	actual	TRUE	27.8	TRUE	27	TRUE	195	TRUE	9.5	TRUE	0	50	92.8407	87.56837	370.436	10.35668	110.0809	33.67058	5
20060627	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	34	TRUE	203	TRUE	9.9	TRUE	0	50	92.28471	91.47787	377.692	9.772535	113.9552	32.87567	5
20060628	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	33	TRUE	252	TRUE	13.3	TRUE	0	50	91.78838	94.72342	384.21	10.81296	117.2064	35.56279	5
20060629	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	35	TRUE	223	TRUE	14.1	TRUE	0	50	91.52914	98.12876	390.998	10.85141	120.5939	36.05008	5
20060630	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	24	TRUE	206	TRUE	12.5	TRUE	0	50	92.87013	103.1108	398.686	12.09667	125.2434	39.25596	5
20060701	MCLEOD LAI	1	actual	TRUE	27.6	TRUE	21	TRUE	288	TRUE	9.9	TRUE	0	50	94.22402	108.4357	407.358	12.81296	130.2154	41.31013	5
20060702	MCLEOD LAI	1	actual	TRUE	30.6	TRUE	18	TRUE	202	TRUE	4.9	TRUE	0	50	95.42677	114.5405	416.57	11.74704	135.7596	39.60596	5
20060703	MCLEOD LAI	1	actual	TRUE	28.6	TRUE	30	TRUE	91	TRUE	4.6	TRUE	0	50	94.4561	119.4232	425.422	10.12926	140.3499	36.34159	5
20060704	MCLEOD LAI	1	actual	TRUE	28.5	TRUE	40	TRUE	169	TRUE	4.3	TRUE	0.51	50	92.62063	123.5942	434.256	7.726811	144.4256	30.62332	5
20060705	MCLEOD LAI	1	actual	TRUE	26.6	TRUE	35	TRUE	79	TRUE	9.9	TRUE	0	50	92.67085	127.8228	442.748	10.31851	148.4794	37.401	5
20060706	MCLEOD LAI	1	actual	TRUE	17	TRUE	88	TRUE	306	TRUE	1.9	TRUE	3.81	50	49.36681	81.25115	438.4001	0.1669423	111.049	0.4991122	2
20060707	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	45	TRUE	219	TRUE	19.5	TRUE	4.06	50	65.43871	58.51789	432.9114	1.433318	87.47512	6.4696	3
20060708	MCLEOD LAI	1	actual	TRUE	20.2	TRUE	52	TRUE	141	TRUE	7.4	TRUE	0	50	80.61607	60.91906	440.2514	1.763539	90.52315	7.994435	4
20060709	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	43	TRUE	239	TRUE	6.1	TRUE	0	50	86.5029	63.73029	447.5374	3.534883	93.9971	14.48874	4
20060710	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	100	TRUE	55	TRUE	11.3	TRUE	9.4	50	20.38161	33.18882	415.5328	2.67E-04	55.32963	4.83E-04	2
20060711	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	63	TRUE	209	TRUE	8.8	TRUE	2.03	50	47.00842	31.03387	421.9188	0.1725051	52.42716	0.3002658	2
20060712	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	87	TRUE	174	TRUE	6.8	TRUE	6.07	50	30.82609	18.79176	407.4819	6.07E-03	33.69837	7.76E-03	2
20060713	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	56	TRUE	231	TRUE	11.8	TRUE	6.85	50	47.64652	12.10401	390.5273	0.2192903	22.46715	0.2140724	2
20060714	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	65	TRUE	172	TRUE	9.6	TRUE	1.02	50	66.00295	13.56716	397.2373	0.8890067	24.99973	0.9301326	2
20060715	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	57	TRUE	247	TRUE	13.3	TRUE	4.82	50	58.82013	9.777788	389.2796	0.7402449	18.40015	0.6369155	2
20060716	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	41	TRUE	212	TRUE	8.2	TRUE	0	50	80.72821	12.68765	396.5656	1.858932	23.49599	3.219357	2
20060717	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	99	TRUE	210	TRUE	7.4	TRUE	1.26	50	65.55887	12.71748	402.3576	0.7826067	23.57231	0.7880474	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20060718	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	58	TRUE	243	TRUE	4.1	TRUE	0.76	50	75.45274	14.52258	409.1576	0.9663833	26.67791	1.270116	2
20060719	MCLEOD LAI	1	actual	TRUE	23.1	TRUE	39	TRUE	182	TRUE	7.7	TRUE	0	50	86.89144	17.98953	417.0196	4.048741	32.47659	8.70606	3
20060720	MCLEOD LAI	1	actual	TRUE	21.5	TRUE	52	TRUE	198	TRUE	6.8	TRUE	0	50	87.20267	20.53725	424.5936	4.04451	36.64346	9.33694	3
20060721	MCLEOD LAI	1	actual	TRUE	29.3	TRUE	37	TRUE	184	TRUE	8.5	TRUE	0	50	90.82627	25.03521	433.5716	7.404477	43.75429	16.67142	4
20060722	MCLEOD LAI	1	actual	TRUE	31.6	TRUE	30	TRUE	272	TRUE	8.8	TRUE	0	50	92.90942	30.41106	442.9636	10.09457	51.91222	22.81935	4
20060723	MCLEOD LAI	1	actual	TRUE	29.6	TRUE	32	TRUE	264	TRUE	12.2	TRUE	0	50	92.95974	35.31392	451.9956	12.06581	59.08686	27.56908	4
20060724	MCLEOD LAI	1	actual	TRUE	26.1	TRUE	34	TRUE	236	TRUE	11.5	TRUE	0	50	92.88453	39.53005	460.3976	11.52547	65.08871	28.03493	4
20060725	MCLEOD LAI	1	actual	TRUE	21.8	TRUE	48	TRUE	214	TRUE	13.1	TRUE	0	50	90.25391	42.32672	468.0256	8.602898	69.0433	23.58364	4
20060726	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	71	TRUE	229	TRUE	13	TRUE	0.5	50	85.94084	43.57991	474.8436	4.623627	70.89371	15.18254	4
20060727	MCLEOD LAI	1	actual	TRUE	19.9	TRUE	42	TRUE	226	TRUE	9	TRUE	0	50	88.14724	46.44046	482.1296	5.172306	74.85513	17.03094	4
20060728	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	34	TRUE	56	TRUE	8.8	TRUE	0	50	90.18214	50.00557	489.7756	6.856171	79.67445	21.63804	4
20060729	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	100	TRUE	19	TRUE	8.4	TRUE	15	50	16.17858	22.51455	426.9317	4.13E-05	39.784	5.92E-05	2
20060730	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	83	TRUE	188	TRUE	4.3	TRUE	27.7	50	17.1164	9.079498	324.7006	5.04E-05	16.97251	4.13E-05	1
20060731	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	57	TRUE	274	TRUE	11.4	TRUE	0.25	50	54.60071	10.82659	331.3206	0.4777705	20.01787	0.4333394	2
20060801	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	68	TRUE	197	TRUE	9	TRUE	0.25	50	70.72873	11.91663	337.0966	1.008155	21.89798	0.9680891	2
20060802	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	48	TRUE	231	TRUE	13.3	TRUE	0	50	82.25616	13.7094	342.9086	2.874744	24.92734	5.392957	2
20060803	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	47	TRUE	222	TRUE	7.6	TRUE	0	50	85.56274	15.48195	348.6306	3.34085	27.8698	6.68449	2
20060804	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	59	TRUE	289	TRUE	11.6	TRUE	0.76	50	83.01409	16.76852	354.1726	2.902215	29.98759	6.13152	2
20060805	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	72	TRUE	192	TRUE	8.9	TRUE	0.25	50	83.06114	17.72808	359.9666	2.548361	31.56926	5.591715	2
20060806	MCLEOD LAI	1	actual	TRUE	18.9	TRUE	45	TRUE	240	TRUE	11.2	TRUE	1.78	50	79.82599	18.45091	366.3726	1.963936	32.77531	4.399634	2
20060807	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	62	TRUE	358	TRUE	2.9	TRUE	0	50	82.88035	19.94145	372.5986	1.840464	35.17631	4.32214	2
20060808	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	59	TRUE	223	TRUE	9	TRUE	1.01	50	81.05605	21.57505	378.8786	2.007932	37.77273	4.982133	2
20060809	MCLEOD LAI	1	actual	TRUE	17	TRUE	53	TRUE	225	TRUE	11.9	TRUE	0.76	50	83.17316	23.33129	384.9426	3.007252	40.52244	7.663711	3
20060810	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	55	TRUE	145	TRUE	6	TRUE	0	50	85.04588	24.98492	390.9526	2.869201	43.08601	7.635896	3
20060811	MCLEOD LAI	1	actual	TRUE	18	TRUE	46	TRUE	197	TRUE	6.7	TRUE	0	50	87.00002	27.11421	397.1966	3.909689	46.32295	10.41212	3
20060812	MCLEOD LAI	1	actual	TRUE	20	TRUE	47	TRUE	251	TRUE	12.3	TRUE	0.51	80	87.67133	29.42289	403.8006	5.705564	49.7781	14.66004	3
20060813	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	53	TRUE	241	TRUE	12.1	TRUE	0	80	87.71992	31.26646	410.0266	5.687757	52.52056	15.06109	3
20060814	MCLEOD LAI	1	actual	TRUE	20.4	TRUE	41	TRUE	245	TRUE	10.8	TRUE	0	80	88.79251	33.88522	416.7026	6.212794	56.32078	16.72583	4
20060815	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	50	TRUE	202	TRUE	10	TRUE	6.85	80	64.09322	21.04006	399.1489	0.840534	37.18046	1.555004	2
20060816	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	38	TRUE	227	TRUE	10.5	TRUE	0	80	84.46796	24.02238	406.1489	3.326328	41.85569	8.545004	3
20060817	MCLEOD LAI	1	actual	TRUE	23.2	TRUE	41	TRUE	170	TRUE	8.6	TRUE	0	80	88.55678	26.9822	413.3289	5.375837	46.39303	13.46558	3
20060818	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	43	TRUE	248	TRUE	13.6	TRUE	0	80	88.60566	29.42982	419.8788	6.964881	50.0836	17.1069	4
20060819	MCLEOD LAI	1	actual	TRUE	18	TRUE	43	TRUE	294	TRUE	5.5	TRUE	0	80	88.65456	31.6774	426.1228	4.663379	53.4258	13.03262	3
20060820	MCLEOD LAI	1	actual	TRUE	22.8	TRUE	29	TRUE	232	TRUE	6.9	TRUE	0	80	91.24309	35.18058	433.2308	7.248819	58.48746	19.129	4
20060821	MCLEOD LAI	1	actual	TRUE	26.2	TRUE	31	TRUE	190	TRUE	8.6	TRUE	0	80	91.88461	39.06941	440.9508	8.6498	63.96921	22.76037	4
20060822	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	39	TRUE	212	TRUE	9.1	TRUE	0	80	91.02011	41.53768	447.2849	7.845601	67.42223	21.82258	4
20060823	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	38	TRUE	237	TRUE	7	TRUE	0	80	90.95484	44.12321	453.7268	6.992465	70.98811	20.64558	4
20060824	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	56	TRUE	155	TRUE	4.4	TRUE	0	80	88.46857	45.68559	459.6288	4.295718	73.18525	14.60958	4
20060825	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	36	TRUE	199	TRUE	12.8	TRUE	0	80	90.07237	48.81696	466.7008	8.25644	77.39509	24.30514	4
20060826	MCLEOD LAI	1	actual	TRUE	21.5	TRUE	35	TRUE	229	TRUE	11.5	TRUE	0	80	90.33799	51.84966	473.5748	8.03256	81.4149	24.46462	4
20060827	MCLEOD LAI	1	actual	TRUE	24	TRUE	31	TRUE	189	TRUE	10.2	TRUE	0	80	91.42098	55.42509	480.8988	8.779465	86.05494	26.77983	4

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20060828	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	46	TRUE	129	TRUE	3	TRUE	0	90	90.0994	57.59897	487.2148	5.058361	88.91802	18.40626	4
20060829	MCLEOD LAI	1	actual	TRUE	15	TRUE	47	TRUE	273	TRUE	7.1	TRUE	0.51	90	89.04417	59.36058	492.9189	5.345724	91.24909	19.43399	4
20060830	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	51	TRUE	233	TRUE	6.1	TRUE	0	90	88.15849	60.80714	498.2989	4.47632	93.18577	17.24515	4
20060831	MCLEOD LAI	1	actual	TRUE	13.6	TRUE	50	TRUE	255	TRUE	12.7	TRUE	0.25	90	87.97105	62.32452	503.7509	6.07698	95.20264	21.79236	4
20060901	MCLEOD LAI	1	actual	TRUE	20	TRUE	38	TRUE	174	TRUE	14.5	TRUE	0	90	89.26827	64.65359	509.0548	8.015301	98.14454	26.86158	4
20060902	MCLEOD LAI	1	actual	TRUE	24.7	TRUE	30	TRUE	168	TRUE	7.5	TRUE	0	90	91.51111	67.86892	515.2048	7.761393	102.11	26.77725	4
20060903	MCLEOD LAI	1	actual	TRUE	24.1	TRUE	35	TRUE	165	TRUE	7.7	TRUE	0	90	91.56097	70.78515	521.2468	7.895687	105.689	27.53491	4
20060904	MCLEOD LAI	1	actual	TRUE	27.4	TRUE	27	TRUE	160	TRUE	6.7	TRUE	0	90	92.8322	74.48919	527.8828	8.983121	110.1281	30.61974	5
20060905	MCLEOD LAI	1	actual	TRUE	25.3	TRUE	29	TRUE	221	TRUE	15.4	TRUE	0	90	92.88249	77.82629	534.1408	14.02434	114.0931	41.66267	5
20060906	MCLEOD LAI	1	actual	TRUE	24.3	TRUE	22	TRUE	187	TRUE	6.7	TRUE	0	90	93.50191	81.35355	540.2188	9.864984	118.2048	33.58376	5
20060907	MCLEOD LAI	1	actual	TRUE	23.3	TRUE	26	TRUE	169	TRUE	4.4	TRUE	0	90	93.55243	84.56816	546.1168	8.847461	121.9322	31.61802	5
20060908	MCLEOD LAI	1	actual	TRUE	23.6	TRUE	32	TRUE	201	TRUE	10.6	TRUE	0	90	93.01372	87.55846	552.0688	11.21568	125.3969	37.38721	5
20060909	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	39	TRUE	247	TRUE	11.2	TRUE	0	90	91.42172	89.80652	557.3008	9.234173	128.0331	33.14104	5
20060910	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	95	TRUE	172	TRUE	7.8	TRUE	3.3	90	48.38763	65.86889	549.5215	0.1980677	101.3629	0.5570588	3
20060911	MCLEOD LAI	1	actual	TRUE	18	TRUE	44	TRUE	238	TRUE	10.1	TRUE	0	90	75.74821	67.77316	554.4655	1.331037	103.8209	6.767593	3
20060912	MCLEOD LAI	1	actual	TRUE	16	TRUE	44	TRUE	308	TRUE	9	TRUE	1.02	90	80.78597	69.47803	559.0495	1.947853	106.0169	9.590968	4
20060913	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	44	TRUE	11	TRUE	6.7	TRUE	0	90	85.15402	70.9536	563.2195	3.016839	107.9186	13.80195	4
20060914	MCLEOD LAI	1	actual	TRUE	5.5	TRUE	51	TRUE	43	TRUE	22.3	TRUE	4.57	90	60.25921	48.23606	546.1082	1.279671	79.02257	5.395634	3
20060915	MCLEOD LAI	1	actual	TRUE	5.5	TRUE	58	TRUE	58	TRUE	20.3	TRUE	0	90	73.40364	48.72957	548.8021	1.969722	79.755	8.117014	4
20060916	MCLEOD LAI	1	actual	TRUE	12	TRUE	44	TRUE	124	TRUE	6.6	TRUE	0	90	81.93938	50.03564	552.6661	1.973371	81.60175	8.247834	4
20060917	MCLEOD LAI	1	actual	TRUE	14.9	TRUE	40	TRUE	150	TRUE	8.8	TRUE	0	90	86.45055	51.74479	557.0521	4.020194	83.98588	15.00813	4
20060918	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	99	TRUE	29	TRUE	5.5	TRUE	3.54	90	40.753	38.62962	547.4609	5.28E-02	65.67409	0.1081124	2
20060919	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	96	TRUE	103	TRUE	3.8	TRUE	1.52	90	35.20457	37.70261	550.8389	1.54E-02	64.38757	3.11E-02	2
20060920	MCLEOD LAI	1	actual	TRUE	7.1	TRUE	100	TRUE	253	TRUE	8.7	TRUE	6.09	90	10.91229	22.61901	525.332	3.33E-06	40.84175	4.86E-06	2
20060921	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	76	TRUE	9	TRUE	5	TRUE	2.53	90	28.3011	19.00274	529.2141	2.74E-03	34.87481	3.59E-03	2
20060922	MCLEOD LAI	1	actual	TRUE	6.1	TRUE	100	TRUE	212	TRUE	5.9	TRUE	3.8	90	13.03696	13.08764	518.3277	8.50E-06	24.62108	8.80E-06	2
20060923	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	82	TRUE	178	TRUE	9	TRUE	0.76	90	34.20742	13.59076	522.6597	0.0158903	25.52238	1.69E-02	2
20060924	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	56	TRUE	188	TRUE	12.7	TRUE	0	90	67.37315	15.09481	527.6216	1.090326	28.1745	1.783478	2
20060925	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	71	TRUE	254	TRUE	9.3	TRUE	1.25	90	70.47433	15.97253	532.1876	1.014982	29.71544	1.669436	2
20060926	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	53	TRUE	180	TRUE	3.3	TRUE	0	90	80.26257	17.51219	537.0056	1.380553	32.38419	2.898637	2
20060927	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	63	TRUE	194	TRUE	9.1	TRUE	0	90	83.32104	18.76378	541.9316	2.66197	34.53796	6.186704	2
20060928	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	51	TRUE	235	TRUE	13.4	TRUE	0	90	85.85928	20.3515	546.7136	4.664141	37.23757	10.61881	3
20060929	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	100	TRUE	182	TRUE	4.6	TRUE	2.54	90	49.23232	16.43871	549.9296	0.1880513	30.5913	0.22498	2
20060930	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	80	TRUE	251	TRUE	11.6	TRUE	0.25	90	61.44457	16.79122	553.2177	0.7998038	31.21394	0.9699622	2
20061001	MCLEOD LAI	1	actual	TRUE	4.1	TRUE	86	TRUE	194	TRUE	6.3	TRUE	0	90	65.71626	16.90153	554.6597	0.7448331	31.41023	0.9071318	2
20061002	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	100	TRUE	173	TRUE	2	TRUE	3.31	90	32.6429	12.11761	544.1993	7.63E-03	22.95725	7.55E-03	2
20061003	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	56	TRUE	15	TRUE	3.8	TRUE	0	90	54.42385	12.81763	546.5953	0.3203956	24.21562	0.3283165	2
20061004	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	48	TRUE	187	TRUE	9.5	TRUE	0	90	72.69507	13.71584	549.1533	1.109735	25.81949	1.656356	2
20061005	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	93	TRUE	194	TRUE	7.3	TRUE	1.78	90	55.44303	12.42432	551.0093	0.4195094	23.52264	0.4218486	2
20061006	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	58	TRUE	268	TRUE	7.2	TRUE	0	90	69.77576	13.04161	553.2614	0.8927464	24.63166	0.9250337	2
20061007	MCLEOD LAI	1	actual	TRUE	8	TRUE	56	TRUE	144	TRUE	8.1	TRUE	0	90	77.65891	13.64829	555.4053	1.37776	25.71671	2.348068	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20061008	MCLEOD LAI	1	actual	TRUE	9.7	TRUE	48	TRUE	164	TRUE	4.8	TRUE	0	90	82.42493	14.49923	557.8553	1.912688	27.22917	3.727699	2
20061009	MCLEOD LAI	1	actual	TRUE	8.8	TRUE	50	TRUE	203	TRUE	7.8	TRUE	0	90	84.29742	15.24925	560.1434	2.837101	28.55506	5.813356	2
20061010	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	56	TRUE	164	TRUE	3.4	TRUE	0	90	84.78374	16.14261	563.0614	2.427994	30.126	5.16499	2
20061011	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	58	TRUE	180	TRUE	7.6	TRUE	0	90	84.98784	17.10992	566.3034	3.085382	31.81662	6.742754	2
20061012	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	73	TRUE	198	TRUE	4.2	TRUE	0	90	83.99184	17.59675	568.9514	2.271476	32.66761	5.103508	2
20061013	MCLEOD LAI	1	actual	TRUE	13	TRUE	65	TRUE	73	TRUE	5.1	TRUE	0	90	84.03922	18.3445	571.9954	2.391932	33.96571	5.517462	2
20061014	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	100	TRUE	181	TRUE	2.5	TRUE	2.54	90	48.31168	14.68907	573.7074	0.1501269	27.6108	0.1677038	2
20061015	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	100	TRUE	1	TRUE	10	TRUE	7.34	90	13.20415	7.816415	537.0485	1.13E-05	15.08399	8.64E-06	1
20061126	MCLEOD LAI	1	actual	TRUE	-20.9	TRUE	56	TRUE	28	TRUE	18.2	TRUE	0								
20070126	MCLEOD LAI	1	actual	TRUE	-5.5	TRUE	70	TRUE	11	TRUE	5.9	TRUE	0								
20070127	MCLEOD LAI	1	actual	TRUE	-5.1	TRUE	71	TRUE	199	TRUE	9.1	TRUE	0								
20070128	MCLEOD LAI	1	actual	TRUE	-9.4	TRUE	84	TRUE	16	TRUE	10.7	TRUE	0								
20070129	MCLEOD LAI	1	actual	TRUE	-4.6	TRUE	69	TRUE	18	TRUE	5.3	TRUE	0								
20070131	MCLEOD LAI	1	actual	TRUE	-5.4	TRUE	84	TRUE	24	TRUE	6.5	TRUE	0								
20070201	MCLEOD LAI	1	actual	TRUE	-2.4	TRUE	70	TRUE	152	TRUE	4.9	TRUE	0								
20070203	MCLEOD LAI	1	actual	TRUE	-7.8	TRUE	93	TRUE	140	TRUE	0	TRUE	0								
20070309	MCLEOD LAI	1	actual	TRUE	3	TRUE	63	TRUE	209	TRUE	8.8	TRUE	0								
20070312	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	65	TRUE	255	TRUE	14.8	TRUE	1.53								
20070313	MCLEOD LAI	1	actual	TRUE	-2	TRUE	78	TRUE	204	TRUE	11.8	TRUE	2.29								
20070314	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	48	TRUE	251	TRUE	9.6	TRUE	0.5								
20070324	MCLEOD LAI	1	actual	TRUE	2.9	TRUE	66	TRUE	113	TRUE	1.9	TRUE	0								
20070325	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	39	TRUE	234	TRUE	19.3	TRUE	0								
20070326	MCLEOD LAI	1	actual	TRUE	4.3	TRUE	52	TRUE	180	TRUE	17	TRUE	0								
20070327	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	29	TRUE	239	TRUE	13.1	TRUE	0								
20070328	MCLEOD LAI	1	actual	TRUE	1.4	TRUE	39	TRUE	151	TRUE	16.1	TRUE	0								
20070329	MCLEOD LAI	1	actual	TRUE	5.1	TRUE	45	TRUE	158	TRUE	18.4	TRUE	0								
20070531	MCLEOD LAI	5	startup	TRUE	21.3	TRUE	24	TRUE	204	TRUE	13.4	TRUE	0		90	45	165				
20070601	MCLEOD LAI	1	actual	TRUE	24.7	TRUE	17	TRUE	173	TRUE	7.8	TRUE	0		94.17722	50.63758	172.85	11.45203	58.45972	26.45588	4
20070602	MCLEOD LAI	1	actual	TRUE	24.8	TRUE	24	TRUE	106	TRUE	4.9	TRUE	0		94.22795	55.81971	180.718	9.96472	62.99505	24.94274	4
20070603	MCLEOD LAI	1	actual	TRUE	28.9	TRUE	23	TRUE	94	TRUE	12.5	TRUE	0		94.2787	61.90115	189.324	14.71736	68.12067	33.80014	4
20070604	MCLEOD LAI	1	actual	TRUE	23.9	TRUE	34	TRUE	153	TRUE	9.2	TRUE	0		92.95384	66.24504	197.03	10.36442	71.98415	27.41909	4
20070605	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	88	TRUE	5	TRUE	5.2	TRUE	9.13		36.2223	35.58353	183.5104	2.08E-02	47.93164	3.39E-02	2
20070606	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	59	TRUE	52	TRUE	15.8	TRUE	3.54		53.65942	27.84178	184.2184	0.5447227	40.41376	0.7888241	2
20070607	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	50	TRUE	272	TRUE	7.1	TRUE	0.76		73.01783	30.14536	190.5744	0.9963182	43.20509	2.447024	3
20070608	MCLEOD LAI	1	actual	TRUE	18.3	TRUE	37	TRUE	254	TRUE	9.9	TRUE	0		85.34902	33.36299	197.2724	3.641616	46.89754	9.885158	3
20070609	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	46	TRUE	85	TRUE	8.2	TRUE	0		87.01621	35.9788	203.7904	4.226387	49.92305	11.59082	3
20070610	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	45	TRUE	164	TRUE	7.9	TRUE	3.79		68.65028	28.36948	203.9936	0.8923607	42.10133	2.020867	2
20070611	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	41	TRUE	219	TRUE	7.3	TRUE	0		81.06574	30.60619	209.7916	1.845119	44.85339	5.164234	3
20070612	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	43	TRUE	255	TRUE	9.7	TRUE	0		85.95982	33.12722	216.0216	3.925736	47.89321	10.65339	3
20070613	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	72	TRUE	35	TRUE	0.4	TRUE	0.75		80.91087	34.14448	221.7116	1.280618	49.30575	3.760635	3
20070614	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	52	TRUE	128	TRUE	6.8	TRUE	3.81		66.15233	26.76356	221.8695	0.7762461	41.12508	1.524429	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20070615	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	48	TRUE	16	TRUE	5.3	TRUE	1.26		75.72717	29.46046	228.6215	1.043721	44.56436	2.685619	3
20070616	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	42	TRUE	46	TRUE	13.6	TRUE	0		85.91342	32.62123	235.5535	4.747263	48.46349	12.50922	3
20070617	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	29	TRUE	126	TRUE	8.1	TRUE	0		90.48679	36.8269	242.8095	6.913345	53.40425	17.60377	4
20070618	MCLEOD LAI	1	actual	TRUE	12.9	TRUE	61	TRUE	235	TRUE	9	TRUE	3.54		64.13725	28.67022	242.5547	0.8007551	44.26115	1.787132	3
20070619	MCLEOD LAI	1	actual	TRUE	9.4	TRUE	79	TRUE	139	TRUE	2.1	TRUE	2.55		49.21629	24.19543	247.6507	0.1654564	38.89161	0.2332854	2
20070620	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	61	TRUE	91	TRUE	5.6	TRUE	0		68.56187	25.89982	253.8447	0.7924717	41.27213	1.598623	2
20070621	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	44	TRUE	222	TRUE	14.5	TRUE	0		81.53619	28.02279	259.6427	2.800434	44.13662	7.585964	3
20070622	MCLEOD LAI	1	actual	TRUE	15	TRUE	36	TRUE	228	TRUE	2.3	TRUE	0		86.38785	30.73549	265.7467	2.871785	47.68361	8.143242	3
20070623	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	46	TRUE	234	TRUE	12.2	TRUE	0		87.00034	32.98167	271.7967	5.158514	50.60995	13.68369	3
20070624	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	32	TRUE	223	TRUE	11.3	TRUE	0		89.57941	36.31146	278.3507	7.133127	54.76303	18.25785	4
20070625	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	41	TRUE	259	TRUE	13.5	TRUE	0		89.61711	38.76563	284.4007	8.012601	57.82609	20.44978	4
20070626	MCLEOD LAI	1	actual	TRUE	19.8	TRUE	36	TRUE	156	TRUE	6.2	TRUE	0		89.84864	42.28707	291.3687	5.733726	62.05767	16.60034	4
20070627	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	60	TRUE	46	TRUE	3.8	TRUE	3.55		64.40335	33.41984	291.1251	0.6232177	51.93494	1.344021	3
20070628	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	86	TRUE	14	TRUE	9.7	TRUE	6.86		37.66795	19.29515	279.7188	3.56E-02	32.9142	4.47E-02	2
20070629	MCLEOD LAI	1	actual	TRUE	18.6	TRUE	58	TRUE	171	TRUE	4.8	TRUE	13.45		42.71108	10.92552	249.0829	0.07217	19.6917	6.48E-02	2
20070630	MCLEOD LAI	1	actual	TRUE	17	TRUE	56	TRUE	244	TRUE	14	TRUE	9.9		51.76533	7.302935	230.8361	0.4078794	13.53533	0.2916944	1
20070701	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	41	TRUE	232	TRUE	16.2	TRUE	0		78.89901	9.894101	237.7081	2.307648	17.92317	3.396481	2
20070702	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	44	TRUE	222	TRUE	10.7	TRUE	0		85.93361	12.49818	244.7781	4.113475	22.16682	7.054164	2
20070703	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	73	TRUE	239	TRUE	7.4	TRUE	0.25		84.73702	13.62056	251.4701	2.951294	23.99233	5.400177	2
20070704	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	50	TRUE	129	TRUE	9	TRUE	1.27		82.79156	16.32141	259.1161	2.474729	28.20181	5.035627	2
20070705	MCLEOD LAI	1	actual	TRUE	20.6	TRUE	36	TRUE	226	TRUE	12.7	TRUE	0		88.66027	19.58309	266.528	6.708451	33.08829	13.32592	3
20070706	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	40	TRUE	237	TRUE	11.1	TRUE	0		88.8031	22.26044	273.454	6.317023	36.99249	13.49762	3
20070707	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	36	TRUE	202	TRUE	7.2	TRUE	0		89.52374	25.25157	280.5421	5.755548	41.22622	13.31044	3
20070708	MCLEOD LAI	1	actual	TRUE	15	TRUE	60	TRUE	285	TRUE	6.7	TRUE	0		87.36156	26.76404	286.946	4.116439	43.40654	10.4612	3
20070709	MCLEOD LAI	1	actual	TRUE	19.8	TRUE	47	TRUE	218	TRUE	6.2	TRUE	0.76		86.0007	29.36554	294.2141	3.309932	47.00272	9.129477	3
20070710	MCLEOD LAI	1	actual	TRUE	22.4	TRUE	53	TRUE	215	TRUE	13	TRUE	0		87.02107	31.95953	301.95	5.38658	50.5445	14.14162	3
20070711	MCLEOD LAI	1	actual	TRUE	26.2	TRUE	31	TRUE	227	TRUE	10.3	TRUE	0		91.32883	36.38351	310.3701	8.709012	56.27481	21.40809	4
20070712	MCLEOD LAI	1	actual	TRUE	30.8	TRUE	27	TRUE	233	TRUE	5.8	TRUE	0		93.35849	41.8526	319.618	9.240911	63.06121	23.6727	4
20070713	MCLEOD LAI	1	actual	TRUE	31.4	TRUE	23	TRUE	201	TRUE	8.4	TRUE	0		94.46552	47.72987	328.974	12.2829	70.05101	30.36175	4
20070714	MCLEOD LAI	1	actual	TRUE	28.2	TRUE	37	TRUE	229	TRUE	6.6	TRUE	0		93.05549	52.06508	337.754	9.22209	75.16376	25.85943	4
20070715	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	83	TRUE	180	TRUE	6.5	TRUE	2.02		69.10728	47.48804	344.626	0.8437235	70.64098	3.125682	3
20070716	MCLEOD LAI	1	actual	TRUE	20.8	TRUE	58	TRUE	284	TRUE	3.3	TRUE	3.55		62.2785	37.58455	344.3382	0.5503851	59.05457	1.229163	3
20070717	MCLEOD LAI	1	actual	TRUE	24.7	TRUE	44	TRUE	17	TRUE	7.2	TRUE	0		83.26023	40.97775	352.4882	2.399941	63.50029	8.334797	3
20070718	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	60	TRUE	127	TRUE	4.6	TRUE	0		85.24595	43.20419	360.2602	2.748594	66.47758	9.637594	3
20070719	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	74	TRUE	241	TRUE	13.9	TRUE	0.75		81.45229	44.31553	367.0422	2.69043	68.08126	9.605478	3
20070720	MCLEOD LAI	1	actual	TRUE	13.8	TRUE	73	TRUE	179	TRUE	8.5	TRUE	1.27		74.34126	45.26035	373.2302	1.135547	69.46212	4.326903	3
20070721	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	59	TRUE	207	TRUE	11.4	TRUE	1.52		76.52032	46.08864	380.4622	1.494542	70.75069	5.799897	3
20070722	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	55	TRUE	205	TRUE	16.6	TRUE	2.53		76.14048	41.02433	388.1082	1.893396	64.89865	6.832944	3
20070723	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	89	TRUE	36	TRUE	2.6	TRUE	5.31	50	36.25721	26.58189	378.1977	1.84E-02	45.21828	2.88E-02	2
20070724	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	59	TRUE	237	TRUE	13.2	TRUE	1.77	50	59.11176	26.16368	384.5117	0.751345	44.72004	1.608261	3
20070725	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	44	TRUE	190	TRUE	9.5	TRUE	1.52	50	75.33733	28.11457	391.7077	1.260065	47.6746	3.592375	3

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20070726	MCLEOD LAI	1	actual	TRUE	23.6	TRUE	33	TRUE	147	TRUE	7.7	TRUE	0	50	88.13254	32.0012	399.6597	4.834146	53.32743	13.39233	3
20070727	MCLEOD LAI	1	actual	TRUE	23.1	TRUE	38	TRUE	233	TRUE	8.3	TRUE	0.76	50	88.46268	35.52498	407.5217	5.224163	58.33651	14.95254	3
20070728	MCLEOD LAI	1	actual	TRUE	21	TRUE	53	TRUE	206	TRUE	9.4	TRUE	0.75	50	85.8609	37.96443	415.0057	3.813587	61.79618	12.07445	3
20070729	MCLEOD LAI	1	actual	TRUE	18	TRUE	72	TRUE	278	TRUE	8.8	TRUE	7.1	50	53.00868	22.70616	397.0575	0.3584525	39.73203	0.5129671	2
20070730	MCLEOD LAI	1	actual	TRUE	14	TRUE	56	TRUE	200	TRUE	13.3	TRUE	0.25	50	73.32925	24.26655	403.2815	1.379785	42.18685	3.611193	2
20070731	MCLEOD LAI	1	actual	TRUE	13.5	TRUE	59	TRUE	249	TRUE	11	TRUE	0.5	50	80.57948	25.67239	409.4155	2.105842	44.38663	5.840487	3
20070801	MCLEOD LAI	1	actual	TRUE	21.2	TRUE	46	TRUE	188	TRUE	8.1	TRUE	0	50	86.4612	28.15842	416.2355	3.886707	48.17005	10.60169	3
20070802	MCLEOD LAI	1	actual	TRUE	25.2	TRUE	33	TRUE	27	TRUE	5.7	TRUE	0	50	90.5423	31.7962	423.7755	6.174639	53.54803	16.20042	3
20070803	MCLEOD LAI	1	actual	TRUE	22	TRUE	51	TRUE	160	TRUE	6.4	TRUE	0	50	89.45599	34.13297	430.7395	5.474667	56.97817	15.29729	3
20070804	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	56	TRUE	52	TRUE	5.3	TRUE	4.82	50	65.1944	24.18615	422.0303	0.6941609	42.31038	1.207655	2
20070805	MCLEOD LAI	1	actual	TRUE	23	TRUE	54	TRUE	169	TRUE	4.2	TRUE	0	50	80.41377	26.47481	429.1743	1.468221	45.87482	4.13507	3
20070806	MCLEOD LAI	1	actual	TRUE	23.4	TRUE	45	TRUE	184	TRUE	13.9	TRUE	0.51	50	87.34339	29.25667	436.3904	5.901481	50.11393	15.09995	3
20070807	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	43	TRUE	250	TRUE	11.2	TRUE	0	50	87.97374	31.4101	442.4904	5.636761	53.35221	15.08707	3
20070808	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	75	TRUE	91	TRUE	8.4	TRUE	1.52	50	72.7147	31.10083	447.1684	1.05072	52.98824	3.167023	3
20070809	MCLEOD LAI	1	actual	TRUE	17.3	TRUE	38	TRUE	14	TRUE	5.1	TRUE	0	50	84.04703	33.45596	453.2864	2.394427	56.48869	7.717515	3
20070810	MCLEOD LAI	1	actual	TRUE	19.4	TRUE	47	TRUE	225	TRUE	3.2	TRUE	0	50	86.6405	35.699	459.7824	3.11439	59.7919	10.03252	3
20070811	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	62	TRUE	61	TRUE	4.8	TRUE	1.78	50	74.40253	34.67362	465.8644	0.9453004	58.46801	3.033748	3
20070812	MCLEOD LAI	1	actual	TRUE	7.1	TRUE	94	TRUE	38	TRUE	15.3	TRUE	16.01	50	21.04371	14.07491	400.7163	4.19E-04	25.87749	4.49E-04	2
20070813	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	59	TRUE	35	TRUE	5.4	TRUE	1.78	50	45.70708	13.94076	406.1863	0.1202521	25.67825	0.1280438	2
20070814	MCLEOD LAI	1	actual	TRUE	20.1	TRUE	41	TRUE	243	TRUE	12.7	TRUE	0	50	77.73817	16.52298	412.8083	1.748321	30.04003	3.625793	2
20070815	MCLEOD LAI	1	actual	TRUE	22.1	TRUE	37	TRUE	168	TRUE	7.8	TRUE	0	50	87.48168	19.5404	419.7903	4.426338	35.00703	9.812736	3
20070816	MCLEOD LAI	1	actual	TRUE	25.7	TRUE	36	TRUE	60	TRUE	9.3	TRUE	0	50	90.39419	23.08136	427.4203	7.247694	40.67186	15.78382	3
20070817	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	92	TRUE	269	TRUE	7.2	TRUE	10.15	50	30.90561	11.54817	394.0204	6.33E-03	21.51957	6.01E-03	2
20070818	MCLEOD LAI	1	actual	TRUE	19	TRUE	55	TRUE	345	TRUE	7.1	TRUE	6.09	50	50.11334	8.184292	380.9749	0.237901	15.5343	0.1845817	1
20070819	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	89	TRUE	246	TRUE	7.8	TRUE	11.43	70	23.32509	3.936568	346.3039	6.51E-04	7.655578	3.42E-04	1
20070820	MCLEOD LAI	1	actual	TRUE	14.6	TRUE	56	TRUE	241	TRUE	16.4	TRUE	0.25	70	59.64225	5.362698	351.9359	0.9143122	10.33181	0.561425	2
20070821	MCLEOD LAI	1	actual	TRUE	17.9	TRUE	53	TRUE	227	TRUE	6.5	TRUE	0	70	77.00675	7.20626	358.1619	1.208758	13.72229	0.8713908	2
20070822	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	51	TRUE	213	TRUE	8.7	TRUE	0	70	84.26555	9.249662	364.6039	2.956018	17.39602	4.389879	2
20070823	MCLEOD LAI	1	actual	TRUE	22.1	TRUE	43	TRUE	147	TRUE	6.4	TRUE	0	70	87.90589	11.9797	371.5858	4.382928	22.17235	7.473412	2
20070824	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	63	TRUE	190	TRUE	10.8	TRUE	0	70	86.55665	13.30116	377.5059	4.51371	24.44874	8.116119	3
20070825	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	60	TRUE	270	TRUE	11.2	TRUE	2.54	70	70.27776	11.5496	383.0479	1.109843	21.48005	1.261268	2
20070826	MCLEOD LAI	1	actual	TRUE	11	TRUE	64	TRUE	341	TRUE	4.1	TRUE	0.76	70	74.22134	12.44888	388.0319	0.9043463	23.0491	0.8975012	2
20070827	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	66	TRUE	2	TRUE	3.6	TRUE	0	70	78.85769	13.41051	393.3039	1.218322	24.7143	1.861427	2
20070828	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	50	TRUE	141	TRUE	7.9	TRUE	0.25	70	84.56328	15.34078	399.4759	2.955837	27.99397	5.971186	2
20070829	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	99	TRUE	161	TRUE	9.2	TRUE	7.87	70	23.83848	8.049527	377.302	8.32E-04	15.28387	6.39E-04	1
20070830	MCLEOD LAI	1	actual	TRUE	14	TRUE	94	TRUE	162	TRUE	11.5	TRUE	7.6	70	15.82393	4.075137	358.1332	4.13E-05	7.924836	2.21E-05	1
20070831	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	54	TRUE	236	TRUE	7.4	TRUE	10.66	70	42.06235	3.149953	329.1604	7.35E-02	6.152708	3.47E-02	1
20070901	MCLEOD LAI	1	actual	TRUE	14.3	TRUE	57	TRUE	207	TRUE	10.6	TRUE	0	70	67.20913	4.328907	333.4384	0.9754536	8.385645	0.5362223	2
20070902	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	78	TRUE	119	TRUE	3.4	TRUE	5.33	70	42.01609	2.517421	323.6945	5.96E-02	4.938817	2.55E-02	1
20070903	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	65	TRUE	190	TRUE	9.2	TRUE	0	70	64.82649	3.526885	328.1165	0.8325738	6.86918	0.4142873	1
20070904	MCLEOD LAI	1	actual	TRUE	17.1	TRUE	55	TRUE	235	TRUE	14.3	TRUE	0.5	70	79.76002	4.985	332.8985	2.28057	9.610228	2.061783	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20070905	MCLEOD LAI	1	actual	TRUE	10.2	TRUE	89	TRUE	260	TRUE	8.5	TRUE	4.31	70	43.1866	2.722988	326.1329	9.42E-02	5.334625	4.17E-02	1
20070906	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	58	TRUE	253	TRUE	6.6	TRUE	2.78	70	53.86086	2.414845	330.3389	0.3495058	4.743009	0.1469838	1
20070907	MCLEOD LAI	1	actual	TRUE	12.7	TRUE	61	TRUE	181	TRUE	1.6	TRUE	0.75	80	65.26506	3.373034	334.3289	0.577686	6.580103	0.2815786	1
20070908	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	64	TRUE	105	TRUE	3	TRUE	0	80	74.1562	4.238289	338.2649	0.8528636	8.219125	0.464032	1
20070909	MCLEOD LAI	1	actual	TRUE	18.1	TRUE	55	TRUE	181	TRUE	10	TRUE	0	80	82.61716	5.77652	343.2269	2.546031	11.08657	2.700133	2
20070910	MCLEOD LAI	1	actual	TRUE	21.2	TRUE	53	TRUE	197	TRUE	6	TRUE	0	80	85.84632	7.642516	348.7469	3.206573	14.49113	4.256399	2
20070911	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	63	TRUE	124	TRUE	3.2	TRUE	0	80	85.89431	8.933633	353.7809	2.8034	16.80629	4.051864	2
20070912	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	39	TRUE	186	TRUE	2.7	TRUE	0	80	87.8915	10.88847	358.5269	3.629931	20.2402	5.942064	2
20070913	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	43	TRUE	182	TRUE	9.2	TRUE	0	80	88.13267	12.76586	363.3629	5.21379	23.47029	8.990198	3
20070914	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	39	TRUE	158	TRUE	7.6	TRUE	0	80	88.96652	14.95962	368.5049	5.42135	27.16255	10.07662	3
20070915	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	37	TRUE	241	TRUE	5.4	TRUE	0	80	89.08485	16.90003	373.1249	4.935602	30.36207	9.913581	3
20070916	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	87	TRUE	246	TRUE	14.8	TRUE	12.44	80	33.10662	8.040642	333.3147	1.63E-02	15.16661	1.25E-02	1
20070917	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	50	TRUE	236	TRUE	7.8	TRUE	0	80	60.56089	9.162269	337.0887	0.6276553	17.15859	0.5172648	2
20070918	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	67	TRUE	24	TRUE	10.7	TRUE	0	80	71.86996	9.767413	340.4487	1.142519	18.22747	0.9773031	2
20070919	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	39	TRUE	199	TRUE	10.5	TRUE	0	80	82.06645	11.00548	344.0067	2.439183	20.38089	3.966543	2
20070920	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	54	TRUE	277	TRUE	12.5	TRUE	4.32	80	62.54096	7.828483	337.3491	0.8867157	14.79844	0.6683226	2
20070921	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	91	TRUE	208	TRUE	13.5	TRUE	5.33	80	33.63732	4.317755	326.5336	1.74E-02	8.359177	9.55E-03	1
20070922	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	50	TRUE	215	TRUE	9.8	TRUE	2.54	80	54.92259	3.920398	330.5956	0.4540734	7.615036	0.2376982	1
20070923	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	69	TRUE	287	TRUE	3.4	TRUE	0.51	80	65.90456	4.505424	334.0096	0.6481077	8.716895	0.3634914	1
20070924	MCLEOD LAI	1	actual	TRUE	5	TRUE	100	TRUE	200	TRUE	13	TRUE	6.09	80	21.10478	1.941626	319.8003	3.82E-04	3.825191	1.47E-04	1
20070925	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	55	TRUE	244	TRUE	15.5	TRUE	1.77	80	51.497	2.261209	323.6103	0.426934	4.444774	0.1747267	1
20070926	MCLEOD LAI	1	actual	TRUE	13.7	TRUE	37	TRUE	281	TRUE	10.7	TRUE	0.25	80	75.88754	3.921216	327.7803	1.383845	7.614697	0.7243989	2
20070927	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	67	TRUE	213	TRUE	16.9	TRUE	5.58	80	54.16482	2.352678	316.7599	0.6048608	4.619578	0.2515571	1
20070928	MCLEOD LAI	1	actual	TRUE	6.8	TRUE	59	TRUE	243	TRUE	7.6	TRUE	0	80	68.14597	2.929337	319.6879	0.8648877	5.727469	0.3951682	1
20070929	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	66	TRUE	195	TRUE	10.6	TRUE	0	80	75.03544	3.334903	322.3999	1.309283	6.501672	0.6345441	2
20070930	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	99	TRUE	131	TRUE	5.3	TRUE	9.65	80	18.36344	1.108405	296.3337	8.91E-05	2.196273	2.84E-05	1
20071001	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	87	TRUE	217	TRUE	11.9	TRUE	0.5	80	32.41507	1.271895	298.3337	1.19E-02	2.516963	3.94E-03	1
20071002	MCLEOD LAI	1	actual	TRUE	8	TRUE	67	TRUE	198	TRUE	11.5	TRUE	5.58	80	37.26964	0.4771003	286.7657	3.58E-02	0.9502481	0.931E-03	1
20071003	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	82	TRUE	197	TRUE	6.5	TRUE	0.25	80	48.54151	0.6489239	288.4057	0.1893065	1.290588	0.0524282	1
20071004	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	57	TRUE	41	TRUE	10.3	TRUE	0.25	80	65.53451	1.104999	290.1717	0.9049068	2.189157	0.2877545	1
20071005	MCLEOD LAI	1	actual	TRUE	3.5	TRUE	80	TRUE	170	TRUE	10.5	TRUE	0	80	70.52744	1.244398	291.5057	1.080124	2.462515	0.3562008	1
20071006	MCLEOD LAI	1	actual	TRUE	6.4	TRUE	85	TRUE	208	TRUE	12.3	TRUE	1.76	80	59.36256	0.7904511	293.3617	0.7301702	1.570324	0.2118838	1
20071007	MCLEOD LAI	1	actual	TRUE	6.6	TRUE	97	TRUE	210	TRUE	12.4	TRUE	25.68	80	11.29103	3.50E-02	220.532	4.89E-06	7.00E-02	1.01E-06	1
20071008	MCLEOD LAI	1	actual	TRUE	6.1	TRUE	59	TRUE	175	TRUE	8.9	TRUE	0	80	37.39389	0.4822882	222.334	3.22E-02	0.9593736	8.40E-03	1
20071009	MCLEOD LAI	1	actual	TRUE	5.3	TRUE	67	TRUE	23	TRUE	10.9	TRUE	0	80	55.68087	0.8022984	223.992	0.513549	1.590356	0.1495011	1
20071010	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	45	TRUE	160	TRUE	15.1	TRUE	0.25	80	77.77791	2.160675	227.432	1.979466	4.221096	0.7931682	2
20071011	MCLEOD LAI	1	actual	TRUE	9.5	TRUE	50	TRUE	233	TRUE	10.4	TRUE	0	80	82.62756	2.963731	229.846	2.601263	5.742352	1.667079	2
20071012	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	48	TRUE	179	TRUE	6.2	TRUE	0	80	84.75893	3.861942	232.404	2.786447	7.415806	2.281204	2
20071013	MCLEOD LAI	1	actual	TRUE	3.9	TRUE	99	TRUE	181	TRUE	12.8	TRUE	3.3	80	42.02411	1.978955	228.6732	9.59E-02	3.874094	3.71E-02	1
20071014	MCLEOD LAI	1	actual	TRUE	6.2	TRUE	100	TRUE	150	TRUE	4	TRUE	12.43	80	7.112503	0.3222735	200.1314	3.10E-07	0.6419626	7.54E-08	1
20071015	MCLEOD LAI	1	actual	TRUE	8	TRUE	99	TRUE	161	TRUE	0.1	TRUE	4.05	80	3.703607	1.38E-02	195.5422	2.87E-08	2.76E-02	5.83E-09	1

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20071016	MCLEOD LAI	1	actual	TRUE	8.1	TRUE	100	TRUE	21	TRUE	5.9	TRUE	4.05	80	0.7073482	0	191.0471	4.43E-09	0	8.86E-10	1
20071018	MCLEOD LAI	1	actual	TRUE	6	TRUE	64	TRUE	158	TRUE	6	TRUE	0								
20071019	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	88	TRUE	142	TRUE	0.1	TRUE	0								
20071020	MCLEOD LAI	1	actual	TRUE	3.6	TRUE	92	TRUE	279	TRUE	5.8	TRUE	1.27								
20071021	MCLEOD LAI	1	actual	TRUE	2.7	TRUE	94	TRUE	177	TRUE	10.7	TRUE	0.25								
20071022	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	100	TRUE	157	TRUE	6.5	TRUE	10.92								
20071023	MCLEOD LAI	1	actual	TRUE	7.6	TRUE	100	TRUE	231	TRUE	7.5	TRUE	15.51								
20071024	MCLEOD LAI	1	actual	TRUE	7.2	TRUE	39	TRUE	257	TRUE	22.9	TRUE	0.5								
20071025	MCLEOD LAI	1	actual	TRUE	5.6	TRUE	47	TRUE	313	TRUE	14.3	TRUE	0								
20071026	MCLEOD LAI	1	actual	TRUE	4	TRUE	71	TRUE	181	TRUE	7.7	TRUE	0								
20071027	MCLEOD LAI	1	actual	TRUE	0.2	TRUE	100	TRUE	197	TRUE	7.9	TRUE	0								
20071028	MCLEOD LAI	1	actual	TRUE	2.9	TRUE	100	TRUE	178	TRUE	3.8	TRUE	10.41								
20071029	MCLEOD LAI	1	actual	TRUE	3	TRUE	86	TRUE	277	TRUE	8.5	TRUE	5.07								
20071030	MCLEOD LAI	1	actual	TRUE	1.7	TRUE	93	TRUE	218	TRUE	10.5	TRUE	0								
20071031	MCLEOD LAI	1	actual	TRUE	3.2	TRUE	89	TRUE	207	TRUE	14.7	TRUE	2.54								
20071101	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	55	TRUE	247	TRUE	16.6	TRUE	0.25								
20071102	MCLEOD LAI	1	actual	TRUE	-1.7	TRUE	100	TRUE	194	TRUE	13.6	TRUE	0								
20071103	MCLEOD LAI	1	actual	TRUE	-2.1	TRUE	100	TRUE	209	TRUE	4.6	TRUE	0								
20071104	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	84	TRUE	283	TRUE	4.3	TRUE	5.59								
20071105	MCLEOD LAI	1	actual	TRUE	-2.8	TRUE	100	TRUE	181	TRUE	13.9	TRUE	4.58								
20071106	MCLEOD LAI	1	actual	TRUE	0.8	TRUE	100	TRUE	204	TRUE	3.8	TRUE	0								
20071107	MCLEOD LAI	1	actual	TRUE	2.6	TRUE	100	TRUE	202	TRUE	8.4	TRUE	14.76								
20071108	MCLEOD LAI	1	actual	TRUE	0.1	TRUE	100	TRUE	64	TRUE	4.4	TRUE	2.53								
20071109	MCLEOD LAI	1	actual	TRUE	-0.4	TRUE	100	TRUE	18	TRUE	8	TRUE	0								
20071110	MCLEOD LAI	1	actual	TRUE	1.9	TRUE	96	TRUE	201	TRUE	16.4	TRUE	10.67								
20071111	MCLEOD LAI	1	actual	TRUE	-0.3	TRUE	93	TRUE	196	TRUE	5.9	TRUE	3.54								
20071112	MCLEOD LAI	1	actual	TRUE	0.5	TRUE	100	TRUE	148	TRUE	6.7	TRUE	0								
20071113	MCLEOD LAI	1	actual	TRUE	0.3	TRUE	93	TRUE	166	TRUE	2.7	TRUE	0								
20071114	MCLEOD LAI	1	actual	TRUE	-2.7	TRUE	91	TRUE	49	TRUE	2.7	TRUE	3.29								
20071115	MCLEOD LAI	1	actual	TRUE	1	TRUE	100	TRUE	200	TRUE	8.5	TRUE	0								
20071116	MCLEOD LAI	1	actual	TRUE	2.4	TRUE	97	TRUE	201	TRUE	7.2	TRUE	25.9								
20071117	MCLEOD LAI	1	actual	TRUE	4	TRUE	79	TRUE	153	TRUE	7	TRUE	6.1								
20071118	MCLEOD LAI	1	actual	TRUE	-0.8	TRUE	97	TRUE	219	TRUE	6.7	TRUE	1.52								
20071119	MCLEOD LAI	1	actual	TRUE	-1.4	TRUE	84	TRUE	201	TRUE	3.3	TRUE	0								
20080311	MCLEOD LAI	1	actual	TRUE	4.7	TRUE	60	TRUE	187	TRUE	13.6	TRUE	0.76								
20080312	MCLEOD LAI	1	actual	TRUE	4.5	TRUE	39	TRUE	275	TRUE	13.9	TRUE	0.51								
20080314	MCLEOD LAI	1	actual	TRUE	2.4	TRUE	47	TRUE	34	TRUE	7.4	TRUE	0								
20080315	MCLEOD LAI	1	actual	TRUE	-8.8	TRUE	90	TRUE	14	TRUE	14.2	TRUE	0								
20080318	MCLEOD LAI	1	actual	TRUE	2.8	TRUE	50	TRUE	216	TRUE	13.4	TRUE	5.59								
20080319	MCLEOD LAI	1	actual	TRUE	5.7	TRUE	39	TRUE	161	TRUE	7	TRUE	0								
20080320	MCLEOD LAI	1	actual	TRUE	5.2	TRUE	56	TRUE	130	TRUE	9.8	TRUE	0								

weather	display	data	status	temp	rh	relative	wdir	wind	wspeed	wind	precip	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger
date	name			valid		humidity	valid	direction	valid	speed	valid									rating
20080321	MCLEOD LAI	1	actual	TRUE	2.1	TRUE	64	TRUE	223	TRUE	14	TRUE	0							
20080322	MCLEOD LAI	1	actual	TRUE	3.8	TRUE	41	TRUE	159	TRUE	16.4	TRUE	0							
20080323	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	44	TRUE	218	TRUE	11	TRUE	0							
20080324	MCLEOD LAI	1	actual	TRUE	4.4	TRUE	36	TRUE	247	TRUE	8.1	TRUE	0							
20080325	MCLEOD LAI	1	actual	TRUE	3.9	TRUE	42	TRUE	197	TRUE	13.3	TRUE	0							
20080326	MCLEOD LAI	1	actual	TRUE	3.1	TRUE	38	TRUE	144	TRUE	8.7	TRUE	0							
20080331	MCLEOD LAI	1	actual	TRUE	2	TRUE	41	TRUE	179	TRUE	10.2	TRUE	0							
20080401	MCLEOD LAI	1	actual	TRUE	-0.2	TRUE	66	TRUE	70	TRUE	6.8	TRUE	0.25							
20080402	MCLEOD LAI	1	actual	TRUE	6	TRUE	44	TRUE	263	TRUE	10.4	TRUE	0							
20080403	MCLEOD LAI	1	actual	TRUE	5	TRUE	46	TRUE	216	TRUE	11	TRUE	0							
20080404	MCLEOD LAI	1	actual	TRUE	4.9	TRUE	46	TRUE	201	TRUE	5.8	TRUE	0							
20080405	MCLEOD LAI	1	actual	TRUE	4.8	TRUE	52	TRUE	167	TRUE	10.9	TRUE	0							
20080406	MCLEOD LAI	1	actual	TRUE	1.8	TRUE	92	TRUE	203	TRUE	7.8	TRUE	2.28							
20080407	MCLEOD LAI	1	actual	TRUE	6.2	TRUE	56	TRUE	213	TRUE	8	TRUE	0							
20080408	MCLEOD LAI	1	actual	TRUE	0.4	TRUE	81	TRUE	214	TRUE	3.9	TRUE	0							
20080409	MCLEOD LAI	1	actual	TRUE	2.4	TRUE	47	TRUE	220	TRUE	8.7	TRUE	0							
20080410	MCLEOD LAI	1	actual	TRUE	4.6	TRUE	47	TRUE	212	TRUE	12.3	TRUE	0.25							
20080411	MCLEOD LAI	1	actual	TRUE	2	TRUE	91	TRUE	182	TRUE	13.4	TRUE	0							
20080412	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	60	TRUE	187	TRUE	11.5	TRUE	2.79							
20080413	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	30	TRUE	279	TRUE	10.8	TRUE	0.25							
20080414	MCLEOD LAI	1	actual	TRUE	3.3	TRUE	38	TRUE	266	TRUE	13.8	TRUE	0							
20080415	MCLEOD LAI	1	actual	TRUE	9.2	TRUE	29	TRUE	228	TRUE	10.1	TRUE	0							
20080416	MCLEOD LAI	1	actual	TRUE	7.7	TRUE	51	TRUE	225	TRUE	14.3	TRUE	0							
20080417	MCLEOD LAI	1	actual	TRUE	5	TRUE	26	TRUE	247	TRUE	15.5	TRUE	0							
20080419	MCLEOD LAI	1	actual	TRUE	-6.7	TRUE	40	TRUE	30	TRUE	20.4	TRUE	0							
20080420	MCLEOD LAI	1	actual	TRUE	-3.3	TRUE	40	TRUE	59	TRUE	19.5	TRUE	0.25							
20080421	MCLEOD LAI	1	actual	TRUE	-3.1	TRUE	30	TRUE	8	TRUE	7.3	TRUE	0							
20080422	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	36	TRUE	30	TRUE	10.4	TRUE	0							
20080423	MCLEOD LAI	1	actual	TRUE	3.5	TRUE	34	TRUE	60	TRUE	12.6	TRUE	0							
20080424	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	37	TRUE	45	TRUE	9.7	TRUE	0							
20080425	MCLEOD LAI	1	actual	TRUE	6.2	TRUE	30	TRUE	217	TRUE	12.6	TRUE	0							
20080426	MCLEOD LAI	1	actual	TRUE	11	TRUE	30	TRUE	191	TRUE	10.3	TRUE	0							
20080427	MCLEOD LAI	1	actual	TRUE	8.5	TRUE	59	TRUE	150	TRUE	6.9	TRUE	1.01							
20080428	MCLEOD LAI	1	actual	TRUE	11.4	TRUE	44	TRUE	201	TRUE	11.9	TRUE	0.76							
20080429	MCLEOD LAI	1	actual	TRUE	5.9	TRUE	71	TRUE	193	TRUE	9.3	TRUE	6.34							
20080430	MCLEOD LAI	1	actual	TRUE	3.4	TRUE	91	TRUE	211	TRUE	8	TRUE	5.83							
20080501	MCLEOD LAI	1	actual	TRUE	2.2	TRUE	90	TRUE	132	TRUE	5.8	TRUE	8.38							
20080502	MCLEOD LAI	1	actual	TRUE	11.4	TRUE	36	TRUE	150	TRUE	14	TRUE	0							
20080503	MCLEOD LAI	1	actual	TRUE	11.4	TRUE	41	TRUE	198	TRUE	11.1	TRUE	0.5							
20080504	MCLEOD LAI	1	actual	TRUE	10.4	TRUE	33	TRUE	183	TRUE	8.7	TRUE	0							
20080505	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	40	TRUE	178	TRUE	10	TRUE	0							

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20080506	MCLEOD LAI	1	actual	TRUE	8.9	TRUE	49	TRUE	260	TRUE	9.5	TRUE	0								
20080507	MCLEOD LAI	1	actual	TRUE	3.7	TRUE	79	TRUE	234	TRUE	3.7	TRUE	0.25								
20080508	MCLEOD LAI	1	actual	TRUE	9.3	TRUE	49	TRUE	46	TRUE	9.8	TRUE	6.58								
20080509	MCLEOD LAI	1	actual	TRUE	9.9	TRUE	42	TRUE	115	TRUE	9.6	TRUE	0								
20080510	MCLEOD LAI	1	actual	TRUE	8.6	TRUE	61	TRUE	144	TRUE	8.4	TRUE	0								
20080511	MCLEOD LAI	1	actual	TRUE	10.3	TRUE	55	TRUE	85	TRUE	3.6	TRUE	0								
20080512	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	39	TRUE	208	TRUE	11.1	TRUE	0.5								
20080513	MCLEOD LAI	1	actual	TRUE	11.1	TRUE	49	TRUE	212	TRUE	10.1	TRUE	1.02								
20080514	MCLEOD LAI	1	actual	TRUE	7.9	TRUE	85	TRUE	209	TRUE	12.5	TRUE	0								
20080515	MCLEOD LAI	1	actual	TRUE	16.2	TRUE	54	TRUE	267	TRUE	12.2	TRUE	1.26								
20080516	MCLEOD LAI	1	actual	TRUE	19	TRUE	35	TRUE	194	TRUE	11.4	TRUE	0								
20080517	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	39	TRUE	191	TRUE	4.9	TRUE	0								
20080518	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	30	TRUE	228	TRUE	11.1	TRUE	0								
20080519	MCLEOD LAI	1	actual	TRUE	9	TRUE	76	TRUE	73	TRUE	1.9	TRUE	0								
20080520	MCLEOD LAI	5	startup	TRUE	8.3	TRUE	95	TRUE	27	TRUE	4	TRUE	15.5		60	6	40				
20080521	MCLEOD LAI	1	actual	TRUE	10.8	TRUE	80	TRUE	266	TRUE	6.1	TRUE	1.25		60.60872	6.626573	44.348	0.5777748	9.648789	0.3419002	1
20080522	MCLEOD LAI	1	actual	TRUE	10.1	TRUE	74	TRUE	242	TRUE	9.5	TRUE	2.28		56.22456	5.601075	48.57	0.5013116	8.695302	0.2807981	1
20080523	MCLEOD LAI	1	actual	TRUE	12	TRUE	49	TRUE	41	TRUE	17.9	TRUE	3.29		62.59196	5.021609	49.90049	1.166988	8.024425	0.6272299	2
20080524	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	51	TRUE	33	TRUE	21.2	TRUE	2.28		70.28008	5.379653	54.80649	1.837111	8.639285	1.157923	2
20080525	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	45	TRUE	31	TRUE	10.3	TRUE	0		82.71771	7.985986	60.25249	2.617722	11.99678	2.963243	2
20080526	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	19	TRUE	63	TRUE	15.7	TRUE	0		91.77483	12.42149	66.20248	12.17957	16.91067	15.10248	2
20080527	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	38	TRUE	164	TRUE	6.9	TRUE	0		91.25372	15.80025	72.13448	7.259792	20.41907	11.00883	3
20080528	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	45	TRUE	228	TRUE	10.1	TRUE	0		90.13869	18.79753	78.06648	7.27495	23.46799	11.85428	3
20080529	MCLEOD LAI	1	actual	TRUE	11.2	TRUE	92	TRUE	194	TRUE	6.3	TRUE	8.64		31.25225	9.930157	68.60996	6.63E-03	14.58351	4.95E-03	1
20080530	MCLEOD LAI	1	actual	TRUE	15.5	TRUE	56	TRUE	229	TRUE	13.7	TRUE	4.82		51.80914	7.638626	67.47337	0.4037108	11.90722	0.268231	1
20080531	MCLEOD LAI	1	actual	TRUE	18.2	TRUE	40	TRUE	179	TRUE	4.3	TRUE	0		75.89953	10.68725	73.15337	1.003129	15.65628	0.7819715	2
20080601	MCLEOD LAI	1	actual	TRUE	19.6	TRUE	34	TRUE	57	TRUE	6	TRUE	0		86.60216	14.28399	80.08537	3.566887	19.75793	5.757035	2
20080602	MCLEOD LAI	1	actual	TRUE	20	TRUE	38	TRUE	158	TRUE	10.7	TRUE	0		88.94807	17.72803	87.08936	6.321173	23.4979	10.57876	3
20080603	MCLEOD LAI	1	actual	TRUE	17.6	TRUE	36	TRUE	144	TRUE	6.3	TRUE	0		89.39494	20.8788	93.66136	5.399641	26.81419	9.971393	3
20080604	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	39	TRUE	183	TRUE	10.6	TRUE	0		89.44409	23.56069	99.87336	6.753515	29.64049	12.63308	3
20080605	MCLEOD LAI	1	actual	TRUE	11.3	TRUE	58	TRUE	194	TRUE	9.8	TRUE	0.51		87.16322	24.93178	105.3114	4.678169	31.32411	9.646089	3
20080606	MCLEOD LAI	3	forecast	TRUE	14	TRUE	50	TRUE	200	TRUE	8	TRUE	1.2		80.98539	26.91944	111.2354	1.89403	33.54425	4.304546	2
20080607	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	45	TRUE	235	TRUE	11	TRUE	0		85.47034	29.17826	117.2494	3.914533	35.97499	8.982125	3
20080608	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	31	TRUE	228	TRUE	11.5	TRUE	0		88.47568	31.63058	122.8854	6.149719	38.49179	13.50442	3
20080609	MCLEOD LAI	1	actual	TRUE	15.4	TRUE	30	TRUE	58	TRUE	10.1	TRUE	0		89.90666	34.6713	129.0614	7.037142	41.48265	15.597	3
20080610	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	48	TRUE	12	TRUE	9.1	TRUE	0		88.93077	36.88906	135.1834	5.817068	43.85801	13.88421	3
20080611	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	33	TRUE	172	TRUE	9.7	TRUE	0.76		88.76237	40.55793	142.1334	5.852418	47.34265	14.54491	3
20080612	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	37	TRUE	229	TRUE	12.3	TRUE	0		88.90088	43.24483	148.2554	6.80565	50.01632	16.80171	4
20080613	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	44	TRUE	265	TRUE	13.6	TRUE	2.79		72.52974	36.98254	153.8374	1.355537	46.19928	3.806207	3
20080614	MCLEOD LAI	1	actual	TRUE	12.2	TRUE	77	TRUE	60	TRUE	11.5	TRUE	9.38		41.31165	19.42723	141.0267	7.91E-02	28.90119	9.11E-02	2
20080615	MCLEOD LAI	1	actual	TRUE	11.5	TRUE	78	TRUE	208	TRUE	7.6	TRUE	1.78		48.43036	18.53266	146.5007	0.1971912	28.15967	0.2231812	2

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20080616	MCLEOD LAI	1	actual	TRUE	15.6	TRUE	40	TRUE	222	TRUE	10	TRUE	4.06		61.23654	15.0527	146.7949	0.7293218	23.96247	0.7422602	2
20080617	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	50	TRUE	233	TRUE	11.8	TRUE	0		77.63291	17.02719	152.7009	1.656681	26.63064	3.091191	2
20080618	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	59	TRUE	225	TRUE	11.7	TRUE	3.05		64.55343	14.05757	154.6977	0.9338052	22.9104	0.9231327	2
20080619	MCLEOD LAI	1	actual	TRUE	16.4	TRUE	28	TRUE	226	TRUE	9.8	TRUE	0		83.76772	17.37472	161.0537	2.923735	27.36815	5.823681	2
20080620	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	47	TRUE	147	TRUE	17	TRUE	0		86.49633	19.83047	167.4277	6.116569	30.6001	11.87338	3
20080621	MCLEOD LAI	1	actual	TRUE	21.9	TRUE	43	TRUE	149	TRUE	13.8	TRUE	0		88.51384	23.28189	174.7737	6.943321	34.9308	14.08938	3
20080622	MCLEOD LAI	1	actual	TRUE	14.1	TRUE	49	TRUE	253	TRUE	15.6	TRUE	2.28		75.75312	21.77851	180.7157	1.756645	33.47241	3.959095	2
20080623	MCLEOD LAI	1	actual	TRUE	17.4	TRUE	35	TRUE	219	TRUE	9.1	TRUE	0		86.08085	24.94429	187.2517	3.874123	37.4249	9.112911	3
20080624	MCLEOD LAI	1	actual	TRUE	11	TRUE	83	TRUE	160	TRUE	7.6	TRUE	1.01		76.47675	25.48583	192.6357	1.230407	38.30291	2.898709	2
20080625	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	47	TRUE	232	TRUE	13.1	TRUE	5.07		61.78017	18.02414	189.0899	0.8785383	29.11108	1.117788	2
20080626	MCLEOD LAI	1	actual	TRUE	12.8	TRUE	57	TRUE	254	TRUE	9	TRUE	2.52		62.43544	16.02686	194.7979	0.7394032	26.58547	0.8055277	2
20080627	MCLEOD LAI	1	actual	TRUE	18.4	TRUE	41	TRUE	197	TRUE	11.7	TRUE	0		81.85585	19.05573	201.5139	2.526096	30.82437	5.456316	2
20080628	MCLEOD LAI	1	actual	TRUE	21.7	TRUE	41	TRUE	217	TRUE	15.4	TRUE	0		87.98331	22.59719	208.8239	6.97491	35.5713	14.27617	3
20080629	MCLEOD LAI	1	actual	TRUE	22.7	TRUE	39	TRUE	216	TRUE	8.5	TRUE	0		89.47515	26.41928	216.3139	6.102511	40.47894	13.79527	3
20080630	MCLEOD LAI	1	actual	TRUE	26.2	TRUE	29	TRUE	215	TRUE	8.7	TRUE	0		92.00163	31.52217	224.4339	8.838616	46.66046	19.64606	4
20080701	MCLEOD LAI	1	actual	TRUE	23.8	TRUE	45	TRUE	353	TRUE	6.4	TRUE	0		90.82772	34.73852	232.4219	6.662352	50.57813	16.63492	4
20080702	MCLEOD LAI	1	actual	TRUE	27.5	TRUE	38	TRUE	188	TRUE	4.8	TRUE	0		90.87735	38.90299	241.0759	6.189953	55.43983	16.53822	4
20080703	MCLEOD LAI	1	actual	TRUE	20.9	TRUE	69	TRUE	223	TRUE	2.8	TRUE	0		87.03979	40.50471	248.5419	3.23037	57.55867	10.10847	3
20080704	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	71	TRUE	206	TRUE	8.3	TRUE	7.1		54.48737	24.48811	239.1109	0.4043572	38.99278	0.5711532	2
20080705	MCLEOD LAI	1	actual	TRUE	15.2	TRUE	91	TRUE	256	TRUE	4.9	TRUE	2.54		41.96339	20.37948	245.5509	6.37E-02	33.75519	8.15E-02	2
20080706	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	66	TRUE	248	TRUE	13.9	TRUE	2.03		57.64062	19.06547	251.7569	0.7005326	32.06101	0.865107	2
20080707	MCLEOD LAI	1	actual	TRUE	12.1	TRUE	62	TRUE	228	TRUE	10.5	TRUE	0		72.56005	20.24351	257.6389	1.160876	33.83977	2.391074	2
20080708	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	47	TRUE	266	TRUE	9.8	TRUE	0		83.2932	22.58361	264.5289	2.747601	37.2227	6.689224	2
20080709	MCLEOD LAI	1	actual	TRUE	14.4	TRUE	46	TRUE	230	TRUE	15.1	TRUE	0		86.12229	24.54936	270.8249	5.272411	40.02776	12.2169	3
20080710	MCLEOD LAI	1	actual	TRUE	13.9	TRUE	48	TRUE	254	TRUE	7.8	TRUE	0		86.55331	26.38123	277.0309	3.878615	42.61666	9.848555	3
20080711	MCLEOD LAI	1	actual	TRUE	17.5	TRUE	49	TRUE	202	TRUE	7.9	TRUE	0		86.99741	28.60908	283.8849	4.151855	45.7035	10.85555	3
20080712	MCLEOD LAI	1	actual	TRUE	17.2	TRUE	53	TRUE	238	TRUE	9.9	TRUE	0		87.04578	30.62907	290.6849	4.623808	48.48591	12.25248	3
20080713	MCLEOD LAI	1	actual	TRUE	19	TRUE	47	TRUE	226	TRUE	10	TRUE	0.5		87.59042	33.131	297.8089	5.022729	51.8432	13.58285	3
20080714	MCLEOD LAI	1	actual	TRUE	18.8	TRUE	50	TRUE	192	TRUE	10.4	TRUE	0.76		85.65038	35.46782	304.8969	3.89437	54.95401	11.46881	3
20080715	MCLEOD LAI	1	actual	TRUE	20.1	TRUE	53	TRUE	95	TRUE	4.8	TRUE	12.94		55.07189	17.93154	274.139	0.3577732	30.82276	0.4302116	2
20080716	MCLEOD LAI	1	actual	TRUE	20.2	TRUE	47	TRUE	161	TRUE	10.3	TRUE	1.27		75.40761	20.58283	281.479	1.317282	34.80328	2.906841	2
20080717	MCLEOD LAI	1	actual	TRUE	17	TRUE	46	TRUE	206	TRUE	9	TRUE	1.01		80.79671	22.87831	288.243	1.950184	38.1805	4.872615	2
20080718	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	55	TRUE	191	TRUE	6.5	TRUE	0		84.41557	24.86519	295.133	2.699917	41.07821	7.011208	2
20080719	MCLEOD LAI	1	actual	TRUE	16.6	TRUE	54	TRUE	237	TRUE	13.2	TRUE	0		85.68501	26.77739	301.825	4.506209	43.83285	11.33051	3
20080720	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	76	TRUE	208	TRUE	9.7	TRUE	1		78.7767	27.79197	308.571	1.6444	45.36847	4.627335	3
20080721	MCLEOD LAI	1	actual	TRUE	15	TRUE	43	TRUE	255	TRUE	13	TRUE	4.05		67.99566	21.38386	306.168	1.129851	36.41018	2.47012	2
20080722	MCLEOD LAI	1	actual	TRUE	17.7	TRUE	40	TRUE	216	TRUE	7.6	TRUE	0		82.74959	24.03303	313.058	2.293951	40.32653	5.944691	2
20080723	MCLEOD LAI	1	actual	TRUE	19.2	TRUE	38	TRUE	274	TRUE	4.9	TRUE	0		87.62249	26.98893	320.218	3.902315	44.58374	10.16501	3
20080724	MCLEOD LAI	1	actual	TRUE	22.6	TRUE	36	TRUE	231	TRUE	11.8	TRUE	0		89.91869	30.55123	327.99	7.679757	49.56127	18.29038	4
20080725	MCLEOD LAI	1	actual	TRUE	26.2	TRUE	26	TRUE	175	TRUE	12	TRUE	0		92.67292	35.29579	336.41	11.4736	55.9231	25.91049	4
20080726	MCLEOD LAI	1	actual	TRUE	19.3	TRUE	50	TRUE	230	TRUE	8.2	TRUE	0		89.82784	37.69132	343.588	6.322806	59.15853	17.40154	4

weather date	display name	data status	status	temp valid	temperature	rh valid	relative humidity	wdir valid	wind direction	wspeed valid	wind speed	precip valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	danger rating
20080727	MCLEOD LAI	1	actual	TRUE	18.7	TRUE	46	TRUE	242	TRUE	11.1	TRUE	0		89.52718	40.2024	350.658	7.008893	62.49299	19.33073	4
20080728	MCLEOD LAI	1	actual	TRUE	19.1	TRUE	39	TRUE	179	TRUE	11	TRUE	0		89.57639	43.09629	357.8	7.023057	66.24492	19.96646	4
20080729	MCLEOD LAI	1	actual	TRUE	15.9	TRUE	63	TRUE	187	TRUE	14.7	TRUE	3.55		67.49367	33.57133	356.3737	1.210791	54.34423	3.81838	3
20080730	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	55	TRUE	241	TRUE	12	TRUE	6.09		55.30166	21.24773	344.6768	0.5249823	36.82087	0.7126961	2
20080731	MCLEOD LAI	1	actual	TRUE	15.7	TRUE	40	TRUE	224	TRUE	10.1	TRUE	0		77.85307	23.61508	351.2068	1.548118	40.43333	3.97638	2
20080801	MCLEOD LAI	1	actual	TRUE	14.3	TRUE	63	TRUE	195	TRUE	8.9	TRUE	0		81.79498	24.79141	356.7848	2.177737	42.24437	5.833815	2
20080802	MCLEOD LAI	1	actual	TRUE	19.7	TRUE	46	TRUE	208	TRUE	7.1	TRUE	0.76		84.76234	27.11021	363.3347	2.917084	45.69634	8.039874	3
20080803	MCLEOD LAI	1	actual	TRUE	22.2	TRUE	41	TRUE	224	TRUE	8	TRUE	0.25		88.40691	29.94822	370.3347	5.104758	49.82361	13.45418	3
20080804	MCLEOD LAI	1	actual	TRUE	24.8	TRUE	34	TRUE	274	TRUE	8.4	TRUE	0		90.7075	33.47721	377.8027	7.243446	54.81212	18.47403	4
20080805	MCLEOD LAI	1	actual	TRUE	27.1	TRUE	26	TRUE	206	TRUE	6.7	TRUE	0		92.85572	37.78532	385.6847	9.012807	60.70304	22.80897	4
20080806	MCLEOD LAI	1	actual	TRUE	28.3	TRUE	24	TRUE	160	TRUE	9.1	TRUE	0		93.72362	42.39816	393.7827	11.48201	66.81229	28.32958	4
20080807	MCLEOD LAI	1	actual	TRUE	27.8	TRUE	26	TRUE	176	TRUE	5.1	TRUE	0		93.77421	46.81321	401.7907	9.452232	72.50675	25.82617	4
20080808	MCLEOD LAI	1	actual	TRUE	28.2	TRUE	23	TRUE	172	TRUE	15.8	TRUE	0		94.01006	51.47084	409.8707	16.74581	78.34547	39.35559	5
20080809	MCLEOD LAI	1	actual	TRUE	24.3	TRUE	37	TRUE	161	TRUE	9.1	TRUE	0		92.47706	54.77438	417.2487	9.644312	82.47987	27.9498	4
20080810	MCLEOD LAI	1	actual	TRUE	8.5	TRUE	100	TRUE	188	TRUE	11.6	TRUE	17.53		15.35534	23.70311	353.7243	3.36E-05	40.60402	4.89E-05	2
20080811	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	76	TRUE	213	TRUE	6	TRUE	26.17		25.4088	9.766729	272.2122	1.19E-03	17.92558	1.01E-03	1
20080812	MCLEOD LAI	1	actual	TRUE	18.5	TRUE	61	TRUE	158	TRUE	8.7	TRUE	0		59.1066	11.3448	278.5462	0.5987006	20.59281	0.5528319	2
20080813	MCLEOD LAI	1	actual	TRUE	21.4	TRUE	49	TRUE	192	TRUE	13.7	TRUE	0		81.06808	13.71377	285.4022	2.547991	24.4861	4.715744	2
20080814	MCLEOD LAI	1	actual	TRUE	24.9	TRUE	44	TRUE	167	TRUE	7.2	TRUE	0		87.67036	16.71963	292.8882	4.411942	29.26302	8.824445	3
20080815	MCLEOD LAI	1	actual	TRUE	28.7	TRUE	39	TRUE	160	TRUE	7.9	TRUE	0		90.41901	20.4724	301.0582	6.778031	34.99545	13.84174	3
20080816	MCLEOD LAI	1	actual	TRUE	27.4	TRUE	37	TRUE	206	TRUE	6.6	TRUE	0		90.91602	24.17914	308.9942	6.815117	40.44593	15.01659	3
20080817	MCLEOD LAI	1	actual	TRUE	28.1	TRUE	35	TRUE	164	TRUE	10.3	TRUE	0		91.43948	28.09748	317.0562	8.847034	46.00301	19.51663	4
20080818	MCLEOD LAI	1	actual	TRUE	16.9	TRUE	75	TRUE	229	TRUE	3.9	TRUE	0		85.95818	29.02649	323.1022	2.930177	47.40597	8.25843	3
20080819	MCLEOD LAI	1	actual	TRUE	16.1	TRUE	74	TRUE	141	TRUE	12.4	TRUE	0		84.47784	29.94972	329.0042	3.665439	48.79478	10.17581	3
20080820	MCLEOD LAI	1	actual	TRUE	13.2	TRUE	93	TRUE	45	TRUE	8.1	TRUE	12.96		25.97816	13.38127	293.9869	1.59E-03	24.02833	1.62E-03	2
20080821	MCLEOD LAI	1	actual	TRUE	13.3	TRUE	68	TRUE	351	TRUE	6.3	TRUE	4.3		38.2397	9.375631	290.0568	3.37E-02	17.34929	2.80E-02	1
20080822	MCLEOD LAI	1	actual	TRUE	14	TRUE	75	TRUE	195	TRUE	6.6	TRUE	0		56.7675	10.15497	295.5808	0.4529335	18.70349	0.3936925	1
20080823	MCLEOD LAI	1	actual	TRUE	21.1	TRUE	49	TRUE	174	TRUE	10.9	TRUE	0.25		79.65707	12.49235	302.3828	1.901562	22.64578	3.214925	2
20080824	MCLEOD LAI	1	actual	TRUE	16.7	TRUE	69	TRUE	191	TRUE	11.9	TRUE	2.55		67.65656	10.71537	308.3928	1.057143	19.71795	0.9497601	2
20080825	MCLEOD LAI	1	actual	TRUE	14.8	TRUE	55	TRUE	227	TRUE	8.6	TRUE	5.83		55.59214	7.349705	299.154	0.4538227	13.84881	0.3289214	1
20080826	MCLEOD LAI	1	actual	TRUE	11.6	TRUE	56	TRUE	226	TRUE	11.7	TRUE	0.5		72.87354	8.503325	304.246	1.248785	15.89597	0.9824178	2
20080827	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	73	TRUE	198	TRUE	12.3	TRUE	5.32		51.17548	5.386583	296.5741	0.3503484	10.30524	0.2148263	1
20080828	MCLEOD LAI	1	actual	TRUE	12	TRUE	70	TRUE	220	TRUE	8.9	TRUE	2.02		56.33611	4.863925	301.7381	0.4909325	9.351012	0.2856949	1
20080829	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	89	TRUE	150	TRUE	4.9	TRUE	0		61.11965	5.066036	306.1461	0.5603144	9.729566	0.3330534	1
20080830	MCLEOD LAI	1	actual	TRUE	7.8	TRUE	88	TRUE	45	TRUE	6.8	TRUE	2.52		45.75591	3.503409	310.5541	0.1299895	6.814626	6.44E-02	1
20080831	MCLEOD LAI	1	actual	TRUE	11.7	TRUE	70	TRUE	200	TRUE	2.1	TRUE	0.25		59.52925	4.296162	315.6641	0.4415334	8.309591	0.241584	1
20080901	MCLEOD LAI	1	actual	TRUE	12.4	TRUE	62	TRUE	186	TRUE	9.4	TRUE	0		73.36259	5.209486	319.6001	1.135249	10.01102	0.6852474	2
20080902	MCLEOD LAI	1	actual	TRUE	8.4	TRUE	91	TRUE	240	TRUE	7.2	TRUE	0.25		74.11614	5.361707	322.8161	1.051838	10.2959	0.6446466	2
20080903	MCLEOD LAI	1	actual	TRUE	12.3	TRUE	64	TRUE	151	TRUE	5.1	TRUE	1.26		72.06017	6.220553	326.7341	0.8676456	11.87586	0.5756167	2
20080904	MCLEOD LAI	1	actual	TRUE	12.6	TRUE	67	TRUE	231	TRUE	6.5	TRUE	0		78.05834	7.025454	330.7061	1.313589	13.3423	0.931594	2
20080905	MCLEOD LAI	1	actual	TRUE	15.1	TRUE	60	TRUE	65	TRUE	5.4	TRUE	0.25		82.16547	8.179127	335.1281	1.909335	15.41755	2.362404	2

weather	display	data		temp		rh	relative	wdir	wind	wspeed	wind	precip									danger
date	name	status	status	valid	temperature	valid	humidity	valid	direction	valid	speed	valid	precipitation	gc	ffmc	dmc	dc	isi	bui	fwi	rating
20080906	MCLEOD LAI	1	actual	TRUE	14.5	TRUE	63	TRUE	51	TRUE	3.7	TRUE	0		83.36942	9.206751	339.442	2.040608	17.24421	2.834569	2
20080907	MCLEOD LAI	1	actual	TRUE	14.7	TRUE	64	TRUE	164	TRUE	7	TRUE	0.25		83.8599	10.21942	343.7921	2.570182	19.02501	4.006307	2
20080908	MCLEOD LAI	1	actual	TRUE	17	TRUE	72	TRUE	175	TRUE	6.5	TRUE	2.03		69.56771	9.357373	348.5561	0.8561223	17.5377	0.7150806	2
20080909	MCLEOD LAI	1	actual	TRUE	16.5	TRUE	42	TRUE	156	TRUE	4.4	TRUE	0		81.80618	11.17476	353.2301	1.738238	20.71146	2.668591	2
20080910	MCLEOD LAI	1	actual	TRUE	13.1	TRUE	62	TRUE	202	TRUE	10.9	TRUE	0		83.34921	12.13545	357.2921	2.925388	22.37129	5.116044	2