Soil temperature and soil moisture characteristics for several habitat types of Montana and Idaho
by Dean Albert Sirucek

A Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in
Soils

Montana State University

© Copyright by Dean Albert Sirucek (1996)

Abstract:

Soil temperature and soil moisture data from sixty-six monitoring sites located in forest ecosystems of western Montana and northern Idaho were summarized. These data were analyzed in comparison to the criteria for soil temperature and soil moisture regimes (U.S.D.A.- Soil Taxonomy, Soils Staff, 1975). The hypothesis that climax forest communities (habitat types) occupy sites with characteristic soil temperature and moisture conditions was tested.

The soil temperature and soil moisture status throughout the growing season for fifty-two monitoring sites was analyzed in respect to their climax forest series and habitat type class. The results of the analysis demonstrate that some forest habitat types of northern Idaho and western Montana occupy sites with a narrow range of soil temperature and soil moisture conditions; where as other habitat types have variable soil temperature and soil moisture conditions. The monitored soil temperature and soil moisture data were displayed for nineteen forest habitat types.

Several relationships between climax forest vegetation, soil temperature regimes and soil moisture regimes were identified, for western Montana and northern Idaho. The *Abies lasiocarpa* climax forest series monitoring sites classify primarily in the cryic soil temperature regime. The *Thuja plicata*, *Abies grandis*, and *Pseudotsuga menziesii* climax forest series monitoring sites classify primarily in the frigid soil temperature regime. In western Montana all the *Abies lasiocarpa*, *Thuja plicata*, and *Abies grandis* climax forest series monitoring sites classify in the udic soil moisture regime. The *Pseudotsuga menziesii* climax forest series monitoring sites classify in either a udic or a xeric soil moisture regime. It was concluded that a field soil scientist in western Montana or northern Idaho could estimate the soil temperature regime by knowing the climax forest series and elevation of a site.

Discriminant analysis was applied to thirty-four monitoring sites representing six habitat types. The probability of the membership in a habitat type being correctly predicted by the site characteristics alone (i.e. average soil temperature, average soil moisture tension, and elevation) was eighty-six percent.

SOIL TEMPERATURE AND SOIL MOISTURE CHARACTERISTICS
FOR SEVERAL HABITAT TYPES OF MONTANA AND IDAHO

by

Dean Albert Sirucek

A Thesis submitted in partial fulfillment
of the requirements for the degree

of

Master of Science

in

Soils

MONTANA STATE UNIVERSITY
Bozeman, Montana

October 1996

N378
Si 798

APPROVAL

of a thesis submitted by

Dean Albert Sirucek

This thesis has been read by each member of the thesis committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

10-2-96
Date

Gerald A. Nielsen
Chairperson, Graduate Committee

Approved for the Major Department

10/3/96
Date

Jeffery S. Janderson
Head, Major Department

Approved for the College of Graduate Studies

10/23/96
Date

RL Brown
Graduate Dean

STATEMENT OF PERMISSION TO USE

In presenting this thesis in partial fulfillment of the requirements for a master's degree at Montana State University, I agree that the Library shall make it available to borrowers under rules of the Library.

If I have indicated my intention to copyright this thesis by including a copyright notice page, copying is allowable only for scholarly purposes, consistent with "fair use" as prescribed in the U.S. Copyright Law. Requests for permission for extended quotation from or reproduction of this thesis in whole or in parts may be granted only by the copyright holder.

Signature

Date

I dedicate this thesis to Albin H. Martinson former Forest Soil Scientist for the Flathead National Forest. Albin's initiation of a soil temperature and soil moisture monitoring program was the seed from which this project grew.

ACKNOWLEDGEMENTS

There are a number of people who have aided in the completion of this project to whom I am grateful. First and foremost Gerald Nielsen, whose encouragement and patience with the author was extraordinary over the long term of this project. Also to my committee Drs. Joseph Caprio, Hayden Ferguson, Clifford Montagne, Theodore Weaver III, and John Wraith for their wise counsel.

I gratefully acknowledge the U.S. Forest Service employees on the Flathead, Helena, Lolo, Clearwater, and Nez Perce National Forests without whose efforts in original data collection this project would not have happened.

I thank my wife Lois for her patience and gentle encouragement to finish this project.

TABLE OF CONTENTS

	Page
LIST OF TABLES	viii
LIST OF FIGURES	ix
ABSTRACT	xii
INTRODUCTION	1
THESIS OBJECTIVES	2
LITERATURE REVIEW	3
Soil Temperature	3
Soil Moisture	5
Soil Climate-Vegetation Relationships	7
Soil Climate-Soil Taxonomy Relationships	9
METHODS	11
Soil Temperature/Moisture Monitoring Sites	11
Monitoring Time-Frame Comparison to Long-Term Weather Records	14
Soil Temperature	15
Soil Moisture	17
Soil Climate-Vegetation Relationships	20
RESULTS AND DISCUSSION	22
Monitoring Time-Frame Comparison to Long-Term Weather Records	22
Three Inch Soil Temperatures	27
Subsurface Soil Temperatures/Relationship to Climax Vegetation & Soil Taxonomy	29
Soil Moisture - Relationship to Climax Vegetation and Soil Taxonomy	39
Soil Climate-Climax Vegetation Relationships	44
CONCLUSIONS	73
RECOMMENDATIONS FOR FURTHER STUDIES	75
LITERATURE CITED	76
APPENDICES	81
A: FOREST HABITAT TYPES OF MONTANA	82
B: FOREST HABITAT TYPES OF NORTHERN IDAHO	87
C: RANGELAND HABITAT TYPES OF MONTANA	91
D: REPRESENTATIVE SOILS PEDON DESCRIPTIONS	94
E: DISCRIMINANT ANALYSES RESULTS	133
F: SOIL TEMPERATURE AND MOISTURE DATA	136

LIST OF TABLES

Table	Page
1. Summary Table of the Soil Temperatures at 20 Inches (50 cm) Depth	30
2. Statistics of Tested Linear Correlations of Soil Temperature to Elevation	35
3. Summary Table of the Soil Moisture Sites	41
4. The Soil Moisture Regimes for Selected Soil Moisture Sites	43
5. Representative Habitat Type Sites	45
6. Summary Table of Paired Soil Temperature/Moisture Sites	68
7. Soil Temperature and Soil Moisture Monitoring Site Characteristics	137
8. Soil Temperature and Soil Moisture Monitoring Data	140

LIST OF FIGURES

Figure		Page
1.	The locations of the five national forests with soil temperature and soil monitoring sites.	13
2.	(a) The monthly deviation for air temperature at Kalispell, Montana for years 1980-84. and (b) The monthly deviation for precipitation at Kalispell, Montana for years 1980-84.	23
3.	(a) The monthly deviation for air temperature at Helena, Montana for years 1983-86. and (b) The monthly deviation for precipitation at Helena, Montana for years 1983-86.	24
4.	(a) The monthly deviation for air temperature at Missoula, Montana for years 1984-86. and (b) The monthly deviation for precipitation at Missoula, Montana for years 1984-86.	25
5.	(a) The monthly deviation for air temperature at Grangeville, Idaho for years 1980-83. and (b) The monthly deviation for precipitation at Grangeville, Idaho for years 1980-83.	26
6.	(a) The 1983 soil temperature at 3 and 20 inches depth versus calendar day for monitoring site 47. and (b) The 1979 to 1983 January thru June soil temperature at 3 and 20 inches depth versus calendar day for monitoring site 47.	28
7.	The linear regression of elevation versus MSST for the PSME, THPL, ABGR, and ABLA climax forest series.	32
8.	The linear regression of elevation versus mean summer soil temperature for the PSME, THPL, ABLA, and ABGR climax forest series.	36
9.	The linear regression of elevation versus average soil temperature at 20 inches depth during the time the soil temperature is $41 \pm ^\circ\text{F}$ for the PSME, THPL, ABLA, and ABGR climax forest series.	36
10.	The linear regression of elevation versus mean summer soil temperature for the PSME and ABLA climax forest series in relation to the cryic/frigid soil temperature regime criteria.	37
11.	The linear regression of elevation versus mean summer soil temperature for the THPL and ABGR climax forest series in relation to the cryic/frigid soil temperature regime criteria.	37
12.	The linear regression of elevation versus mean summer soil temperature for all monitoring sites on the Helena, Flathead, Lolo, and Nez Perce National Forests.	38
13.	(a) The soil temperature at 20 inches depth versus calendar day for PIPO/AGSP. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PIPO/AGSP.	46
14.	(a) The soil temperature at 20 inches depth versus calendar day for PIPO/FEID. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PIPO/FEID.	47

LIST OF FIGURES (Continued)

Figure		Page
15.	(a) The soil temperature at 20 inches depth versus calendar day for PSME/FESC. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/FESC.	48
16.	(a) The soil temperature at 20 inches depth versus calendar day for PSME/PHMA-PHMA. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/PHMA-PHMA.	49
17.	(a) The soil temperature at 20 inches depth versus calendar day for PSME/PHMA-CARU. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/PHMA-CARU.	50
18.	(a) The soil temperature at 20 inches depth versus calendar day for PSME/SYAL. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/SYAL.	51
19.	(a) The soil temperature at 20 inches depth versus calendar day for PSME/CARU. and the average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/CARU.	52
20.	(a) The soil temperature at 20 inches depth versus calendar day for PSME/CARU-AGSP. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/CARU-AGSP.	53
21.	(a) The soil temperature at 20 inches depth versus calendar day for ABGR/XETE-COOR. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABGR/XETE-COOC.	54
22.	(a) The soil temperature at 20 inches depth versus calendar day for ABGR/SETR. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABGR/SETR.	55
23.	(a) The soil temperature at 20 inches depth versus calendar day for ABGR/CLUN. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day type ABGR/CLUN.	56
24.	(a) The soil temperature at 20 inches depth versus calendar day for THPL/CLUN. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for THPL/CLUN.	57
25.	(a) The soil temperature at 20 inches depth versus calendar day for ABLA/CLUN. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/CLUN.	58
26.	(a) The soil temperature at 20 inches depth versus calendar day ABLA/CLUN-VACA. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/CLUN-VACA.	59

LIST OF FIGURES (Continued)

Figure		Page
27.	(a) The soil temperature at 20 inches depth versus calendar day for ABLA/VACA. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/VACA.	60
28.	(a) The soil temperature at 20 inches depth versus calendar day for ABLA/CACA- LEGL. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/CACA-LEGL.	61
29.	(a) The soil temperature at 20 inches depth versus calendar day for ABLA/LIBO. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/LIBO.	62
30.	(a) The soil temperature at 20 inches depth versus calendar day for ABLA/XETE. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/XETE.	63
31.	(a) The soil temperature at 20 inches depth versus calendar day for ABLA/VASC. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/VASC.	64
32.	The average soil temperature versus the average soil tension when the soil tempera- ture is $41 \pm ^\circ\text{F}$ for nineteen representative habitat type monitoring sites.	66
33.	The average soil temperature versus the average soil tension when the soil tempera- ture is $41 \pm ^\circ\text{F}$ grouped by climax forest series monitoring sites.	67
34.	The average soil temperature at 20 inches depth versus the average soil moisture tension when the soil temperature is $41 \pm ^\circ\text{F}$ for six habitat types.	71
35.	The range of the average soil temperature at 20 inches depth versus the average soil moisture tension when the soil temperature is $41 \pm ^\circ\text{F}$ for four selected habitat types.	71
36.	A graph of the the average soil temperature, versus the average soil tension, versus the elevation for monitoring sites of six habitat types.	72

ABSTRACT

Soil temperature and soil moisture data from sixty-six monitoring sites located in forest ecosystems of western Montana and northern Idaho were summarized. These data were analyzed in comparison to the criteria for soil temperature and soil moisture regimes (U.S.D.A.- Soil Taxonomy, Soils Staff, 1975). The hypothesis that climax forest communities (habitat types) occupy sites with characteristic soil temperature and moisture conditions was tested.

The soil temperature and soil moisture status throughout the growing season for fifty-two monitoring sites was analyzed in respect to their climax forest series and habitat type class. The results of the analysis demonstrate that some forest habitat types of northern Idaho and western Montana occupy sites with a narrow range of soil temperature and soil moisture conditions; where as other habitat types have variable soil temperature and soil moisture conditions. The monitored soil temperature and soil moisture data were displayed for nineteen forest habitat types.

Several relationships between climax forest vegetation, soil temperature regimes and soil moisture regimes were identified, for western Montana and northern Idaho. The *Abies lasiocarpa* climax forest series monitoring sites classify primarily in the cryic soil temperature regime. The *Thuja plicata*, *Abies grandis*, and *Pseudotsuga menziesii* climax forest series monitoring sites classify primarily in the frigid soil temperature regime. In western Montana all the *Abies lasiocarpa*, *Thuja plicata*, and *Abies grandis* climax forest series monitoring sites classify in the udic soil moisture regime. The *Pseudotsuga menziesii* climax forest series monitoring sites classify in either a udic or a xeric soil moisture regime. It was concluded that a field soil scientist in western Montana or northern Idaho could estimate the soil temperature regime by knowing the climax forest series and elevation of a site.

Discriminant analysis was applied to thirty-four monitoring sites representing six habitat types. The probability of the membership in a habitat type being correctly predicted by the site characteristics alone (i.e. average soil temperature, average soil moisture tension, and elevation) was eighty-six percent.

INTRODUCTION

Both Daubermire (1943) in northern Idaho and Pfister (1977) in western Montana described changes in climax vegetation associated with changes in temperature or soil moisture. During the soil survey of forested lands in Montana and Idaho many of the field soil scientists recognized relationships between climax forest vegetation communities (habitat types), and the soil temperature and soil moisture conditions occurring on that habitat type. Many of these relationships both qualitative and quantitative were identified and used during the soil survey process. Some were documented by Sasich and Nielsen in Indicators of Soil Climate Used by Montana Soil Classifiers: A Survey, 1984.

Sasich and Nielsen (1984) documented how, in some cases, the same habitat type was being used to estimate different soil temperature or moisture regimes in different geographical areas; and in other cases how there was much similarity between areas in the interpretation of a habitat type's relationship to soil climate.

In many cases there has not been field data to verify the hypothesized relationship between climax vegetation and soil temperature/moisture. This thesis compiles soil temperature and soil moisture data from five national forests across northern Idaho and western Montana, spanning a nine year time period. This data set represents more monitoring sites across a larger geographical area than previous data sets. These data allow for testing of the relationship between climax vegetation and soil moisture/temperature across a large geographical area.

This thesis reports the soil temperature and soil moisture data in a format that aids in the interpretation of the soil temperature and soil moisture regimes for each monitoring site. The use of forest habitat types to estimate soil moisture and soil temperature regimes for soil classification is analyzed. The seasonal soil moisture and soil temperature data for nineteen forest habitat type sites are displayed. The hypothesis that the forest habitat types of western Montana and northern Idaho have specific micro-climatic characteristics is tested.

THESIS OBJECTIVES

The primary objectives of this thesis are:

1. Compile and document the U.S. Forest Service, Northern Region's soil moisture and soil temperature data set for present and future use.
2. Test the hypothesis that the climax forest vegetation communities (habitat types) of western Montana and northern Idaho have specific, consistent micro-climatic (soil temperature and soil moisture) characteristics.
3. Describe the relative differences in soil moisture and soil temperature associated with representative habitat types.
4. Determine if habitat types can be used to estimate soil moisture and soil temperature regimes for soil classification purposes.
5. Demonstrate uses for these data other than for the original intended uses for soil classification and soil compaction management.

LITERATURE REVIEW

Soil Temperature

Smith et al. (1964) observed that soil temperatures generally reflect air temperatures. Subsurface soil temperatures however, do not reach the extremes of air temperatures. Because soil temperature is a reflection of climatic conditions, which in turn affect plant growth, soil temperature has been used as differentia in the United State Department of Agriculture's soil taxonomy system.

Soil temperature is determined by site location, atmospheric weather conditions, and the physical properties of the on-site vegetation and soil profile. Location of the site (latitude, elevation, slope, and aspect) influences the reception of solar energy. Atmospheric conditions determine the supply of radiation, heat and water to the ground surface. Vegetation and snow cover modify the effects of atmospheric weather by shading and insulating the soil surface. The soil's thermal and hydraulic properties determine how the soil responds to the changing supply of heat and water. (Stathers and Splittlehouse, 1990)

Temperature is one of the physical environmental characteristics that is capable of affecting plant growth and development. In a given environment, the effect of temperature depends upon interactions with other environmental forces. (Cleary and Waring 1968). Hansen-Bristow (1985) noted that a large amount of the variability in the timing of bud flushing can be explained by the soil temperature at 50 cm. Even though bud flushing is usually the first observable sign of plant growth initiation in the spring, Richardson (1958) confirmed that for most species root growth starts before shoot growth; however, impulses from the buds are necessary for the initiation of root growth. Apparently auxins are transported from the shoots to the roots, which start growing earlier because of a lower temperature optimum. An exception to this rule is *Larix* as noted by Engler (1903). Therefore, as there is a linkage to the above and below ground temperatures, there is a linkage of the above and below ground plant growth processes.

The plant roots are the portion of plants most directly affected by soil temperature. Pritchett (1979) observed that maximum, optimum, and minimum soil temperatures for root growth are very

species dependent. The maximum range is 25 to 30° C; optimum temperatures range from 10 to 30° C, with the minimum limits somewhere between 0 to 7° C. Leitch (1916) noted the the rate of elongation of pea seedlings increased consistently with rising temperatures above -2° C. Stuckey (1941) found evidence of cell division in the root tips of grasses at temperatures very close to 0° C. Jack pine roots that were dormant in winter were found to resume growth when the temperature in the first 15 cms of soil reached 5°C (Batjer et al. 1939). Jacobs (1989) reported minimum temperature for root growth of *Pinus albicaulis*, *Pinus contorta* and *Pinus flexilis* of 5° C. The Soil Survey Staff (1975) states, "Between the temperatures of 0 and 5° C root growth of most plants and germination of most seeds is impossible. A horizon as cold as 5 degrees centigrade is a thermal pan to roots of most plants". Based upon this literature, 5° C (41° F) was used as the soil temperature to describe root growth initiation or the beginning of seasonal plant growth. Five degrees centigrade was also used as the lower temperature limit in describing the differences in growing seasons between different sites.

Soil Moisture

Other than energy, liquid water is the most important prerequisite for life as we know it. The amount of water utilized by upland forest ecosystems is a function of: the amount of water added to the system, the amount of water lost from the system, and the utilization characteristics of the specific plant species. The primary input of water into the mountainous terrain of the northern Rocky Mountains comes as either rainfall or snowfall. Rainfall dominates at lower elevations and snowfall dominates at the higher elevations. Leaves may also absorb some water from the atmosphere during dew formation or rainfall events (Rutter 1975, Went and Babu 1978). Depending on topographic location, additional water may also come to a site from groundwater flow. The non-plant loss of water from a site occurs as evaporation, surface runoff, and groundwater movement off-site. The water that remains on site is available for plant utilization either in chemical processes or for transpiration.

The primary source of plant available water comes from the soil. Huzulak and Matejka (1983) noted that "At present it is generally accepted that availability of soil water for plants decreases with decreasing soil moisture content, and it is also known that many physiological processes are already influenced at low water deficits. Therefore, the method of determination of the beginning of reduced soil water availability for plants is not only of theoretical but also practical importance...". The soil is the ultimate source for almost all transpired water, but water stored in trees is also an important intermediate buffer and is utilized during periods of high transpiration. (Powell and Thorpe 1977).

The plant available water from the soil is considered as the water held between field capacity and the permanent wilting point. The field capacity is the amount of water held by a soil after free drainage in response to gravity. The force per unit area that a plant has to apply to gain water at field capacity is commonly taken as 0.33 bars tension or (33 kPa).

The permanent wilting point is the soil water content at which plants remain permanently wilted unless water is added to the soil. Briggs and Shantz (1911, 1912) and Richards and Wadleigh (1952) measured soil water content and soil water potential at permanent wilting point for a large number of species. Similar values for a wide range in species resulted in the wide acceptance of 15 bars tension or (1500 kPa) as the soil water potential for permanent wilting point.

The permanent wilting point for tree species is not as consistent as it appears in the literature for field crops. There tends to be a species differentiation. Huzulak and Matejka (1983) noted the rate and quantity of water taken up by the plant depend on plant properties (especially of the root system as well as on the physiological ability of the plant to reduce matrix potential) and micrometeorological conditions which determine the transpiration rate. This determination was based upon research of three tree species. Phelps et al. (1976) indicated that stomatal closure begins at -17 bars for sugar maple, -21 bars for northern red oak, -23 bars for white oak, and -24 bars for black oak. Weaver (1977) noted a difference in drought stress in *Psuedotsuga* stands as compared to *Abies*, *Thuja*, and *Populus* stands.

Taylor (1952) reported on a method to integrate the seasonal soil moisture tension measurements from different depths into a mean soil moisture tension for the season. A single value representing the seasonal soil moisture regime, the mean soil moisture tension, was correlated to yields of alfalfa, sugar beets, and potatoes showing that over the entire plant growth range of soil moisture, the yield was reduced as the mean soil moisture tension increased. In a previous paper Taylor (1951), compared the statistical fitting of linear regression curves for a large number of moisture tension readings taken throughout the season to the approximate solution that assumes linear relationships when weighting observations to adjust for unequal sampling time periods and taking a mean value. Taylor concluded that the approximate solution is adequate for many applications.

Taylor's calculation was done by multiplying the observed tension by the weighting factor (which represented the time interval in days between successive readings), yielding a value (bar-days) for each depth. The results for each depth were then summed and divided by the total soil depth, which resulted in the season-long mean soil moisture tension in bar-days.

Soil moisture is critical to the overall productivity of a forest community, as well as in the regeneration of that forest community. The soil moisture data discussed herein will indicate when representative habitat types were wet, moist, or dry. Also discussed are the relative differences in available soil moisture in representative habitat types.

Soil Climate-Vegetation Relationships

Brewer (1988) in his book Science of Ecology states the following: "The fact that different species have different tolerance ranges is one basic reason why different habitats support different communities, and why communities vary geographically from warmer to cooler and from wetter to drier regions."

Pearson (1919, 1920) used climatic factors to explain the presence or absence of various tree species indigenous to the southeastern region of the United States. Pearson noted "There is a certain well defined relation between temperature and moisture conditions which, with a few local exceptions, holds for all forest types". He also noted "it becomes obvious that temperature and moisture as factors in controlling plant growth are almost inseparable in nature, and although the direct effect of moisture is more obvious, temperature is really the dominant factor because it virtually controls moisture."

Daubenmire (1943) working in the forest communities of northern Idaho made this observation: "Fundamentally, the phenomenon of plant zonation depends on the one hand upon differences among species as to their limits of tolerance of climatic variation, and on the other, upon a progressive change in climate from the top to the bottom of a mountain slope. Each species is best represented at the altitude where its environmental requirements are most completely fulfilled, provided that all other species with similar habitat requirements do not exceed its competitive abilities". He qualified the first statement with the following: "In consequence, a species which depends for its existence upon the climatic type prevailing on one slope is generally found only on that slope, but may be encountered occasionally on the opposite slope where soil or microclimate compensates for the inadequacy of the macroclimate". In addition to describing vegetation changes with increasing elevation, Daubenmire also described vegetation changes with increasing latitude. He observed that a vegetation zone, as it progresses poleward, descends gradually in elevation until it finally reaches the elevation of the valley bottom.

Daubenmire (1968) described his earlier observations to climax vegetation communities. He hypothesized that forest and grassland plant associations represented temperature and moisture growing conditions. He based his hypothesis on field measurements of temperature and soil mois-

ture. He reported that climax communities of *Pseudotsuga* and *Pinus ponderosa* are subject to regular and severe drought. He noted that *Abies lasiocarpa* and *Tsuga heterophylla* climax communities occurred on sites where soil drought is rare. The climax *Thuja* forest communities had soil moisture measurements near field capacity throughout the summer.

Other scientists in the region have also described the relationship of climate to vegetation. Nimlos (1971) observed a general ordination of the ecounits (combination soil and vegetation units) for the Lubrecht Experimental Forest. He noted that the ordination of sites occurred in late summer when differences in soil moisture were measured. In the Forest Habitat Types of Montana, Pfister et al. (1977) stated that "the lower elevational limits of coniferous forests are controlled primarily by moisture, while the upper elevational limits are controlled primarily by temperature". The forest habitat types of Montana were hypothesized to occur along an environmental gradient from warm-dry to cool-moist, determined primarily by climate. Roberts (1984) concluded that "the constraint on vegetation composition due to elevation appears to be variable throughout the state (Montana), and may be related to precipitation or moisture."

During the past two decades several researchers in the northwestern United States have in one format or another described climate and its relationship to forest vegetation. Waring (1969), and later Waring et al. (1972), working in eastern Washington, developed a generalized vegetation or community classification using plant moisture and air temperature. Zobel et al. (1976) used air temperature and plant moisture stress to describe vegetation gradients in the western Cascade mountains of Oregon. Weaver (1980) described the average climates of vegetation types in Montana, Wyoming, and parts of Idaho, North Dakota and South Dakota. The climates of 12 vegetation types were characterized by summarizing data for weather stations located in each type. Nimlos and Tippy (1981) describe the soil moisture and soil temperature regimes for several grassland communities in Beaverhead County, Montana. Vold and Marsh (1981) developed a matrix of climax vegetation occurrence related to soil moisture and soil temperature classes for the Pend Oreille valley in British Columbia. Rehfeldt (1984) describe patterns of genetic variation in conifer species of the northwest in relationship to climatic changes. Greene and Klopsch (1985) used air and soil temperatures to describe the habitat types of Mount Rainer National Park.

Soil Climate-Soil Taxonomy Relationships

Soil temperature and soil moisture are some of the primary differentia used in the U.S. Department of Agriculture, Soil Taxonomy (Soil Survey Staff 1975). Soil temperature was used as differentia because of its major control of physical, chemical, and biological activity, and therefore its relationship to soil formation. Soil moisture was used to differentiate processes of soil genesis associated with leaching.

The definitions of soil temperature and soil moisture regimes are long and complex, and therefore are not included here. The reader may refer to chapter 3 of Soil Taxonomy (Soil Survey Staff, 1975) for a full discussion of soil temperature and moisture regimes, including the technical definitions.

Soil Taxonomy uses four soil temperature criteria to differentiate various soil classes: 1) Mean Annual Soil Temperature (MAST), 2) Mean Summer Soil Temperature (MSST), 3) Mean Winter Soil Temperature (MWST), and 4) the difference between Mean Summer Soil temperature and Mean Winter Soil Temperature (MSST-MWST).

Site characteristics such as elevation, aspect, and latitude have been related to air and soil temperature in several studies. Smith et al (1964) reported that mean annual air temperature decreased about 1.5°C with each 300 meters of increased elevation. Hopkins (1938) noted that isotherms of mean temperature decrease with altitude toward the poles at a rate of 100 feet per 15 minutes of latitude. Munn and Nielsen (1979) developed equations to predict mean summer soil temperature (MSST) and mean annual soil temperature (MAST) for range and forested sites in Montana. All equations had elevation, aspect, slope, and latitude as variables.

McDole and Fosberg (1974) noted for portions of Idaho that mean annual soil temperature was directly related to elevation. The change in temperature varied from 2.5 to 2.7°C (4.5 to 4.8°F) per 300 meter (1000 feet) change in elevation. Jensen (1983, 1984) described the relationship of MAST and MSST to elevation for wildland sites in the Intermountain Region of the US Forest Service. He differentiated between slopes with high and low solar intensity.

Soil Taxonomy differentiates between various soil moisture regimes in terms of the groundwater level and the presence or absence of water held at a tension of <15 bars in the soil during different periods of the year. Nimlos (1971) described the soil moisture and temperature regimes of several plant ecosystems occurring in the Lubrecht Experimental Forest of western Montana.

Hayhoe et al. (1987) noted that reasonably accurate estimates of soil climate parameters were obtained with as little as 3 years of sampled data. Much of the earlier work discussed in the literature review of this thesis is based upon less than three years of monitored site data.

METHODS

Soil Temperature/Moisture Monitoring Sites

During the period 1979 to 1987 soil scientists from five national forests in Montana and Idaho collected soil temperature and soil moisture data at semi-permanent monitoring sites. These data were primarily gathered to aid in soil classification during the soil survey process on each national forest. The soil temperature and moisture monitoring sites were intended to represent typical soil and vegetation conditions for the particular national forest being sampled. Most of these data were collected using the same sampling design, the same monitoring methods, and using similar monitoring equipment. See Figure - 1 for the locations of the national forests having monitoring sites reported in this thesis.

The monitoring sites for soil temperature and soil moisture data compiled in Table - 8 (Appendix - F) came from six sources; they are as follows:

1. The Flathead National Forest had 27 soil temperature and moisture monitoring sites. These 27 monitoring sites were located in 10 different geographic/soil/vegetation locations. Therefore there were 2-3 replicated sites for each monitoring location. All these sites were located in forest vegetation communities. The sites were monitored for 5 years.
2. The Flathead National Forest, in a cooperative research study with the University of Montana, (Hackley, 1982) had 12 soil temperature monitoring sites, located in forest vegetation communities. These sites were monitored for 2 years.
3. The Helena National Forest had 23 soil temperature and moisture monitoring sites. Six of the sites were in rangeland vegetation communities, and 17 sites were in forest vegetation communities. Fourteen sites were monitored for 4 years, and 9 sites were monitored for 2 years.
4. The Lolo National Forest had 11 soil temperature and moisture monitoring sites in forest vegetation communities. These sites were monitored for 2 years.
5. The Clearwater National Forest had 7 soil temperature and moisture monitoring sites in forest vegetation communities. These sites were monitored for 2 years.

6. The Nez Perce National Forest had 24 soil temperature and moisture monitoring sites. Six of the sites were located in rangeland vegetation communities, and 18 sites were in forested vegetation communities. These sites were monitored for 4 years.

The total number of monitored sites is 104. Table - 7 in Appendix - F lists all the monitoring sites, their location, site characteristics, and monitored parameters. Appendix - D presents representative soil pedon descriptions for the monitoring sites. Refer to Appendix A, B, and C for the scientific names and abbreviations of the forest and rangeland habitat types of northern Idaho and western Montana.

Some monitoring sites have only two years of data. These sites were included in the analysis portion of this thesis if only minor annual variation was found in the soil climate measurements. Monitoring sites not used in the analysis portion of this thesis include: 1) 12 sites located in rangeland vegetation; 2) 16 sites located in clearcut, shelterwood, or heavily thinned sites; 3) 7 of the replicated monitoring sites on the Flathead National Forest where only soil moisture monitored; and 4) 3 sites with short-term or sporadic measurement records.

There were a total of 66 monitoring sites located on non-harvested forest vegetation communities. Of the 66 monitoring sites, all had soil temperature data recorded, and 52 sites had soil moisture data recorded at the same locations. Herein is a discussion of the data gathered on the 66 forested sites.

Figure - 1. The locations of the five national forests with soil temperature and soil moisture monitoring sites.

Monitoring Time-Frame Comparison to Long-Term Weather Records

Long-term weather records were examined in order to assess the weather during the years in which the soil temperature and soil moisture data were collected. There are no long-term National Oceanographic and Atmospheric Administration (NOAA) weather stations located in the immediate vicinity of the soil temperature and moisture monitoring sites. The long-term weather stations in the Northern Rocky Mountains are typically located in the valley bottoms of the major river valleys near population centers. The lands of the national forests occur in the mountainous areas surrounding the major river valleys. The soil temperature and moisture monitoring sites were located on typical soil and vegetation conditions for the particular national forest being sampled. For these reasons, the locations of the monitoring sites varied in topography. In some cases the monitoring sites were located along an elevation transect going from valley bottom to mountain top. In mountainous terrain air temperature and precipitation change dramatically in short distances; however the NOAA weather station data should reflect regional trends in climate for each year.

The NOAA annual weather station records were summarized for the four cities in closest proximity to the monitoring sites. The Montana cities include Kalispell, Missoula, and Helena; and in Idaho, Grangeville. The yearly deviations from the long-term normals for air temperature and precipitation are reported for each city for years corresponding to the soil temperature and moisture monitoring. These data reflect whether the climatic conditions for that locale were wetter or drier, warmer or colder than the long-term normals for precipitation and air temperature.

Soil Temperature

Soil temperatures on the Flathead, Lolo, Clearwater, and Helena National Forest monitoring sites were measured at 3 inches (7.5 cm) and at 20 inches (50 cms) below the mineral soil surface. On the Nez Perce National Forest soil temperatures were only measured at a depth of 20 inches (50 cm) below the mineral surface.

On the Flathead National Forest 3 inch depth soil temperatures were monitored as a portion of the original soil temperature sampling design. This monitoring was done to assess the soil temperature and soil moisture change in a natural forested timber stand after timber harvest occurred. For several reasons this study was not completed as planned. However, the Flathead National Forest's soil temperature sampling design was implemented on the Lolo, Helena, and Clearwater National Forests, so the 3 inch depth soil temperatures were measured on those national forests.

The 3 inch soil temperatures were measured with bi-metal dial thermometers. The 20 inch soil temperatures were measured with copper-constantan thermocouple thermometers (Soil Test MC-360) read with a Soil Test MC-300B Soil Moisture-Temperature Resistance Meter. The manufacturer's stated accuracy for the thermocouple thermometers is less than 1 percent error. (Soiltest Inc. 1975)

The monitoring data from the five national forests were consolidated into one computerized data base. All soil temperature data points for each site at a given depth were graphically plotted (soil temperature vs. calendar day) using Data General-Present Software. Then a fitted curve was hand-drawn to represent the plotted data points. From the fitted curve, specific data values including mid-monthly temperatures, maximum temperatures, and the dates which soil temperature reached 41° F, were derived for each site. This was accomplished by registering on an electronic digitizing table the X and Y axis coordinates and units for each plotted graph, then by placing the cursor at a specific point along the fitted curve and recording the data values (either degrees Fahrenheit or calendar date).

There were 18 sites on the Flathead, Helena and Lolo National Forests that were inaccessible in the winter months, so no winter soil temperatures were recorded. Therefore, no MWST could be

calculated from monitoring data for these sites. Instead, for these monitoring sites a average MWST was used during soil temperature regime classification. The average MWST was derived from the monitoring sites with year-long records that occurred in the same climax forest series. For example, for the *Pseudotsuga menziesii* climax forest series, an average MWST was calculated; then this average value was used for *Pseudotsuga menziesii* sites without winter soil temperatures. The MAST were calculated only for sites that had 12 months of data.

The predicted relationships between habitat types and soil temperature regimes used by Montana soil surveyors were documented in Sasich and Nielsen (1984) Indicators of Soil Climate Used by Montana Soil Classifiers: A Survey. A comparison was done for each climax forest series of the predicted soil temperature regimes as compared to the measured soil moisture regime from the monitoring sites.

Soil Moisture

On the Flathead, Lolo and Helena National Forests the soil moisture content was measured at 6 inches (15 cm), 12 inches (30 cm), and 24 inches (61 cm) depth below the mineral soil surface. On the Clearwater National Forest the soil moisture was measured at 6 inches (15 cm) and 16 inches (41 cm) depth below the mineral soil surface. The soil moisture was measured using Boyoucousoy gypsum blocks and a Soil Test MC-300B Soil Moisture-Temperature Resistance Meter.

The gypsum blocks were calibrated to the individual soil conditions for each soil pit they were placed in on the Flathead National Forest (81 soil horizons). The calibration was done following the laboratory procedure for calibration reported in Soil Test bulletin C172-75 (Soiltest Inc. 1975). A resistance versus soil water content curve was developed for each site. At the same time, a moisture release curve (soil tension versus soil water content) was developed for each site using the pressure membrane technique (Richards, 1947). It was noted that for the soils of northwestern Montana (loamy family), 500 Ohms resistance correlated very well to 1/3 bar soil tension, and 50,000 Ohms resistance correlated very well to 15 bars soil tension.

When the gypsum blocks were installed on the Helena National Forest this relationship of resistance to soil tension established on the Flathead National Forest was field tested as per Soil Test field calibration methods. It was noted by the author that the relationship documented on the Flathead National Forest agreed with field results on the Helena National Forest. When the gypsum blocks were installed on the Lolo National Forest, the relationship of resistance to soil tension documented on the Flathead National Forest and Helena National Forest was used rather than laboratory calibration. This was done because the soils on the Lolo National Forest and Flathead National Forest were considered to be similar.

The effective measurement range of gypsum blocks is 0 - 15 bars (0 - 1500 kilo pascals). This characteristic of the gypsum blocks was noted in the field when the Ohm readings would start to increase logarithmically as the soil dried beyond the 15 bar tension. For this reason, any soil tension greater than 15 bars was recorded as 16 bars in the data base, and no data values greater than 15 bars were used in any analysis.

The soil moisture content on the Nez Perce National Forest monitoring sites was measured at 20 inches (50 cm) depth below the mineral soil surface. The soil moisture was monitored using Nylon Soil Moisture Blocks (Soil Test MC-360 cells). These nylon resistance blocks were individually calibrated for each soil pit. A resistance vs. soil water content curve and a soil moisture release curve (soil moisture tension vs. soil water content) was developed for each site. The soil moisture measurements were taken using a Soil Test MC-300B Soil Moisture-Temperature Resistance Meter.

The resistance values recorded for each site were converted into soil moisture percentages, which were then converted into soil moisture tensions using the moisture release curve for the site. The soil moisture tensions data points for each site at a given depth were graphically plotted (bars tension vs. calendar day) using Data General-Present Software. Then a fitted curve was hand-drawn to represent the plotted data points. From the fitted curve the number of days when the soil moisture tension was <15 bars and >15 bars were derived for each site. This was accomplished by first registering on an electronic digitizing table the X and Y axis coordinates and units (bars tension and calendar day) for each plotted graph. Next, the cursor was moved along the fitted curve and the beginning and ending calendar day when the soil tension changed from <15 bars to >15 bars soil moisture tension was recorded. Finally the difference between the beginning and ending calendar day was calculated.

The soil moisture data were integrated across depths into a single mean soil moisture tension for the "growing season". The growing season was defined as the time the soil temperature at 20 inches was greater than 41°F . Taylor's (1952) technique was slightly modified to determine a growing season integrated soil moisture tension for each monitoring site.

There were three steps to this procedure: 1) The time period that the soil temperature at 20 inches was 41°F was determined for the site. This information came from the 20 inch soil temperature graphs discussed earlier. 2) The area under the soil tension curve for the days when the 20 inch soil temperature was 41°F was measured using the electronic digitizer. This process yielded the total number of bar-days at each monitored depth (6, 12, 16 or 24 inches). 3) The total number of bar-days for each monitored depth were summed for the profile; and the unweighted mean for the monitored profile was calculated.

This calculation yielded a mean integrated soil moisture tension of the monitored profile for the time period the soil temperature at 20 inches was greater than 41°F.

United States Department of Agriculture, Soil Taxonomy (Soils Survey Staff, 1975) requires that a soil moisture control section (SMCS) be determined for a soil profile before soil moisture monitoring data can be interpreted to determine a soil moisture regime. None of the monitoring sites had a field determined SMCS. Only a few of the monitoring sites had soil laboratory physical characterization that could have been used to estimate a SMCS. An alternative method using particle size classes to estimate SMCS is described on page 54 of Soil Taxonomy. This method was used to estimate a SMCS for the 54 soil moisture monitoring sites. Soils in western Montana were primarily in the loamy-skeletal family, a 6 to 24 inches (15 to 61 cms) SMCS was estimated for these soils. The soils of Idaho national forests were described as having coarser textures than the Montana soils. The estimated SMSC for the Idaho soils was 10 to 35 inches (25 to 89 cms).

The initial goals of the national forests data gathering was to use the information in soil classification and to describe the soil moisture trends of the ecosystems they were managing. In this thesis 15 bars soil moisture tension or 1500 kilo pascals (kPa) was used to define a dry soil. This is consistent with Soil Taxonomy. This soil moisture tension is not necessarily the permanent wilting point for the climax conifer trees in the forest habitat types. Permanent wilting points have not been determined for most of the conifer species included in the forest habitat types. However, 15 bars soil moisture tension (1500 kPa) is where many of the plant species present in the various habitat types have reached permanent wilting point. Less than 15 bars soil moisture tension (1500 kPa) was used to define a soil as being moist. This is also consistent with Soil Taxonomy. These two reference points greater than 1500 kPa and less than 1500 kPa were used to describe seasonal soil moisture trends in the various habitat types.

During the initial data gathering efforts and during the data compilation, soil moisture tension was reported in bars. The compiled data in Appendix - F is reported in bars tension; however the remaining discussion of results will use kilo pascal (kPa) notation. The conversion of bars tension to kilo pascals is 1.0 bar tension equals 100 kPa.

Soil Climate-Vegetation Relationships

The monitoring sites on the five national forests occurred on nineteen forest habitat types. For some habitat types there were replicated monitoring sites; and for other habitat types there was only one monitoring site. For each habitat type a representative site was chosen. For the habitat types that had more than one monitoring site a modal site was picked. Only monitoring sites meeting the following criteria were chosen as a representative site. Monitoring sites were: 1) natural undisturbed sites; 2) sites having the longest and most consistent records; and 3) sites that represented the average soil temperature and soil moisture conditions sampled for that habitat type. Step 3 was accomplished by a visual examination of the soil temperature and soil moisture graphs for any habitat type having multiple monitoring sites, and the monitoring site that best depicted the mean conditions was used.

For each of the nineteen representative sites a fitted curve was hand-drawn to represent all plotted data points for the soil temperature at 20 inches depth. Then, for each of the nineteen sites all the soil moisture tension data was reviewed for each monitored depth. For each monitored depth it was determined which calendar days the soil moisture tension was <15 bars and >15 bars. Then the number of calendar days the entire profile was all <15 bars, all >15 bars, or a portion of the profile was >15 bars was calculated. Finally, this summarized soil temperature and soil moisture information was combined into a single graph display for each representative site.

For the six habitat types the monitoring sites having both soil temperature and soil moisture measurements were analyzed using discriminate analysis to statistically analyze the soil temperature and soil moisture differences between the habitat types. Two resubstitution summaries using a linear discriminate function were completed using SAS statistical software. First, the variables of habitat type, average soil temperature, and average soil moisture tension were analyzed. The probability of the membership of a habitat type being predicted by average soil temperature and average soil tension was calculated. Then a second discriminate analysis was done using the variables habitat type, average soil temperature, average soil moisture, and elevation. This discriminate analysis

calculated the probability of the membership of a habitat type being predicted by average soil temperature, average soil moisture tension, and elevation.

RESULTS AND DISCUSSION

The Monitoring Time-Frame Comparison to Long-Term Weather Records

Long-term weather records were examined in order to assess how close to long-term averages the air temperature and precipitation was during the years in which the soil temperature and soil moisture data were collected. Displayed in Figures 2 (a) thru 5 (b) are the monthly deviations of air temperature and precipitation, at the NOAA weather stations in closest proximity to the soil monitoring sites, for each year of monitoring. A review of the graphs for each of the towns for the summer months (important to soil classification) revealed some major deviations from the long-term normals.

The Kalispell area in August 1981 was 5° F warmer and during July 1983 5° F cooler than the long-term monthly average. Kalispell during June 1982 had 1.5 inches more precipitation than the long-term monthly average. The Missoula area during July 1985 was 8° F warmer and during July 1986 was 5° F cooler than the long-term monthly average. Missoula during June 1985 had 1.5 inches less and August 1985 had 2.4 inches more precipitation than the long-term monthly averages. The Helena area during July 1985 was 8° F warmer than the long-term monthly average. Helena during July 1983 had 2.5 inches more precipitation than the long-term monthly averages. During June 1985 Helena had 2.5 inches less and August 1985 had 1.5 inches more precipitation than the long-term monthly averages. The Grangeville area in August 1983 was 4° F warmer and during July 1983 and August 1980 was 4° F cooler than the long-term monthly average. Grangeville during July 1982 had 3 inches more precipitation than the long-term monthly average.

The only time monitoring was discontinued due to weather condition was in the summer of 1985 on the Helena National Forest. In 1985, because of the major drought that was occurring, the data collection was terminated after mid-July.

(a)

(b)

Figure - 2. (a) The monthly deviation from the long-term average air temperature at Kalispell, Montana for years 1980-84. and (b) The monthly deviation from the long-term average precipitation at Kalispell, Montana for years 1980-84.

Figure -3. (a) The monthly deviation from the long-term average air temperature at Helena, Montana for years 1983-86. and (b) The monthly deviation from the long-term average precipitation at Kalispell, Montana for years 1983-86.

(a)

(b)

Figure - 4. (a) The monthly deviation from the long-term average air temperature at Missoula, Montana for years 1984-86, and (b) The monthly deviation from the long-term average precipitation at Missoula, Montana for years 1984-86.

(a)

(b)

Figure - 5. (a) The monthly deviation from the long-term average air temperature at Grangeville, Idaho for years 1980-83. and (b) The monthly deviation from the long-term average precipitation at Grangeville, Idaho for years 1980-83.

Three Inch Soil Temperatures

The discussion of these 3 inch depth soil temperature data is primarily to make the reader aware of the information for future reference. Extensive analysis was not completed on these data. An initial qualitative review of the comparison between the 3 inch soil temperature and the 20 inch soil temperature graphic plots revealed three relationships. Refer to Figure - 6 (a) and 6 (b).

First, the bi-annual reversal of the surface temperature and the subsoil temperature was easily seen graphically. Second, the rate the 3 inch depth soil temperature increased during the spring months was much more rapid than the 20 inch depth soil temperature. The amount of temperature difference between the 3 inch and the 20 inch soil temperature appeared to correlate to the habitat type of the monitoring site. The monitoring sites with habitat types that characteristically had open canopies and occurred on southern exposures had a more rapid and pronounced difference between the 3 inch depth soil temperature and the 20 inch depth soil temperatures than the habitat types that characteristically occurred on northern aspects with dense canopies. There was no quantitatively analysis done to test this relationship due to the limited number of monitoring sites for comparison.

Third, the review of the 3 inch depth soil temperature revealed the temperature was less than 32° F on only a few monitoring sites. And when a monitoring site was less than 32° F it was only for very short periods of time. According to field crews taking measurements, the sub-freezing near-surface soil temperatures occurred when there was no snow cover, very shallow snow cover, or when air temperatures were below zero for several days.

(a)

(b)

Figure - 6. (a) The 1983 soil temperatures at 3 and 20 inches depth versus calendar day for monitoring site 47. (b) The 1979 to 1983 January thru June soil temperatures at 3 and 20 inches depth versus calendar day for monitoring site 47.

Subsurface Soil Temperatures/Relationship to Climax Vegetation and Soil Taxonomy

Twenty inches (50 cm) is the required depth for soil temperature measurements to be utilized in soil classification using the U.S. Department of Agriculture Soil Taxonomy. Table - 1 is a summarization of the 20 inches (50 cm) subsurface soil temperature data for sixty-six monitoring sites. Listed are the soil temperature parameters used in classification, and the interpreted soil temperature regime. Table - 1 also lists the calendar date when the soil reached 41° F in the spring, when it returned to 41° F in the fall, and the number of days during that time period. In addition the mean soil temperature at a depth of 20 inches for the time period the soil was warmer than 41° F is reported.

The analyses of five relationships are reported herein: 1) The relationship of soil temperature (MSST) to elevation for four climax forest series. 2) The relationship of growing season soil temperature (41+° F) to elevation with climax forest series. 3) The relationship of climax forest series to U.S.D.A. Soil Taxonomy soil temperature regimes. 4) The inter-relationship of climax forest vegetation, soil temperature, and elevation, across different geographical areas. and 5) The relationship of latitude to subsurface soil temperature (50 cm).

The 66 monitoring sites were grouped by the climax forest series and then the MSST was correlated to elevation. When the 66 monitoring sites were pooled together regardless of location, these data allowed the review of four climax forest series. These were *Pseudotsuga menziesii* (PSME), *Abies grandis* (ABGR), *Abies lasiocarpa* (ABLA), and *Thuja plicata* (THPL). Figure - 7 displays a linear regression of the MSST versus elevation for the monitoring sites of the four climax forest series. In Figure - 8 the four previous regressions are combined to show the relationship of one climax forest series to another.

For the same groups of climax forest series monitoring sites, the average soil temperature at 20 inches depth for the period the soil temperature was 41+° F was correlated to elevation. Figure - 9 displays the linear regressions for each climax forest series. A comparison of Figure - 8 and Figure - 9 reveals there is a similarity in the relationship of MSST and average soil temperature for 41+° F

TABLE 1 - SUMMARY TABLE OF THE SOIL TEMPERATURES AT 20 INCHES (50 CM) DEPTH

Site	N.F.	Habitat Type	MAST	MSST	MWST	MSST-MWST	Meas. Soil Temp. Regime	First Day 41°F	Last Day 41°F	Total Days 41+°F	Mean Soil Temp. Days 41+°F
65	NEZ	PIPO/AGSP	49.5	64.7	37.3	27.4	MESIC	99	332	233	56.5
69	NEZ	PIPO/FEID	47.8	60.3	36.3	24.0	MESIC	87	331	244	53.0
8	HEL	PSME/FESC		50.3	35.1*	15.2	FRIGID	146	288	142	48.5
92	LOLO	PSME/FESC	48.5	65.3	36.0	29.3	MESIC	86	309	223	56.1
56	CLW	PSME/PHMA		69.3	35.1	34.2	MESIC	65	330	265	60.8
64	NEZ	PSME/PHMA	44.7	54.0	37.3	16.7	FRIGID	127	322	195	50.3
71	NEZ	PSME/PHMA	43.3	53.0	35.3	17.1	FRIGID	133	325	192	49.9
90	LOLO	PSME/PHME-PHMA	40.2	51.3	32.3	19.0	FRIGID	134	287	153	48.7
86	LOLO	PSME/PHMA-CARU	42.0	54.0	34.0	20.0	FRIGID	130	296	166	50.1
89	LOLO	PSME/PHMA-CARU	42.2	53.0	34.0	19.0	FRIGID	131	297	166	50.1
2	HEL	PSME/SYAL		49.6	35.1*	14.5	FRIGID	130	298	168	47.4
4	HEL	PSME/SYAL		50.3	35.1*	15.2	FRIGID	152	286	134	48.7
7	HEL	PSME/SYAL		51.7	35.1*	16.6	FRIGID	140	307	167	49.4
66	NEZ	PSME/SYAL	44.4	53.7	37.7	16.0	FRIGID	131	328	197	50.2
73	NEZ	PSME/SYAL	42.0	51.3	35.0	16.3	FRIGID	140	306	166	48.9
98	FLHD	PSME/SYAL-CARU		50.0	35.1*	14.9	FRIGID	146	324	178	49.0
97	FLHD	PSME/SYAL-CARU		47.3	35.1*	12.2	FRIGID	153	333	180	46.5
10	HEL	PSME/CARU		49.0	35.1*	13.9	FRIGID	136	279	143	46.9
16	HEL	PSME/CARU		56.7	35.1*	26.1	FRIGID	130	302	172	52.6
91	LOLO	PSME/CARU-AGSP	46.4	63.6	34.7	28.9	FRIGID	96	302	206	54.9
83	LOLO	PSME/CARU-PIPO	42.7	52.3	34.3	18.0	FRIGID	127	308	181	49.3
67	NEZ	ABGR/COOC	39.0	44.3	35.0	9.3	CRYIC	166	285	119	44.8
68	NEZ	ABGR/COOC	39.2	45.0	35.0	10.0	CRYIC	166	292	126	45.6
75	NEZ	ABGR/COOC	39.3	47.3	34.0	13.3	FRIGID	160	291	131	47.2
74	NEZ	ABGR/ASCA	39.4	46.7	34.3	12.4	CRYIC	163	295	132	47.2
33	FLHD	ABGR/CLUN	41.4	50.2	33.9	16.3	FRIGID	128	307	179	48.2
70	NEZ	ABGR/CLUN	44.0	53.7	35.7	18.0	FRIGID	117	313	196	50.1
72	NEZ	ABGR/CLUN	40.3	49.7	33.3	16.4	FRIGID	147	298	151	47.9
99	FLHD	ABGR/CLUN-ARNU	43.1	51.0	36.7	14.3	FRIGID	139	321	182	48.7
31	FLHD	ABGR/CLUN-XETE	43.8	55.3	34.3	21.0	FRIGID	114	311	197	50.9
26	FLHD	THPL/CLUN	43.3	51.0	36.3	14.7	FRIGID	118	322	204	48.1
27	FLHD	THPL/CLUN	44.4	52.3	36.7	15.6	FRIGID	113	328	215	49.6
28	FLHD	THPL/CLUN	43.4	51.3	35.7	15.6	FRIGID	120	322	202	48.8
29	FLHD	THPL/CLUN	46.1	54.0	38.3	15.7	FRIGID	100	334	234	50.3
53	CLW	THPL/CLUN		52.0	36.5*	15.5	FRIGID	133	304	171	50.1
85	LOLO	THPL/CLUN	41.9	52.3	34.0	18.3	FRIGID	132	296	164	49.0
37	FLHD	THPL/CLUN/CLUN	43.8	52.6	36.3	16.3	FRIGID	122	319	197	49.8
38	FLHD	THPL/CLUN-CLUN	46.2	56.7	37.0	19.7	FRIGID	99	327	228	51.9
100	FLHD	THPL/CLUN-CLUN	41.4	45.7	37.3	8.4	CRYIC	161	46.1		
101	FLHD	THPL/CLUN-CLUN	41.3	47.0	37.0	10.0	FRIGID	159	321	162	46.6
79	NEZ	ABLA/CLUN	37.7	42.0	34.3	7.7	CRYIC	187	279	92	44.4
102	FLHD	ABLA/CLUN-ARNU	42.0	49.0	37.0	12.0	FRIGID	141	308	167	47.0
103	FLHD	ABLA/CLUN-ARNU	43.0	49.7	38.0	11.7	FRIGID	123	316	103	53.2
46	FLHD	ABLA/CLUN-VACA	39.1	45.0	34.3	10.7	CRYIC	162	297	135	45.6

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation where monitoring site is located. Habitat Type = habitat type at the monitoring site. MAST = mean annual soil temperature, U.S.D.A., Soil Taxonomy. MSST = mean summer soil temperature. MWST = mean winter soil temperature. MSST-MWST = difference between mean summer soil temperature and mean winter soil temperature. Meas. Soil Temp. Regime = measured soil temperature regime as defined by U.S.D.A., Soil Taxonomy. First Day 41° F = the calendar date the soil at 20 inches depth reaches 41° F in the spring. Last Day 41° F = the calendar date the soil at 20 inches depth goes below 41° F in the fall. Total Days 41+° F = total number of days the soil temperature at 20 inches depth is 41+° F. Mean Soil Temp. Days 41+° F = the mean soil temperature at 20 inches depth for the time the soil temperature was 41+° F.

Footnotes: 1) The values marked with a * are non-measured temperature values, rather are calculated mean temperatures. 2) The MAST was not calculated unless there were 12 months of field measured temperatures.

TABLE 1 CONT. - SUMMARY TABLE OF THE SOIL TEMPERATURES AT 20 INCHES (50 CM) DEPTH

Site	N.F.	Habitat Type	MAST	MSST	MWST	MSST-MWST	Meas. Soil Temp. Regime	First Day 41°F	Last Day 41°F	Total Days 41+°F	Mean Soil Temp. Days 41+°F
47	FLHD	ABLA/CLUN-VACA	40.3	46.0	35.3	10.7	CRYIC	147	311	164	45.9
104	FLHD	ABLA/CLUN-VACA	42.0	50.7	35.3	15.4	FRIGID	140	307	167	48.6
94	FLHD	ABLA/CLUN-MEFE		43.7	34.8*	8.9	CRYIC	178	292	114	45.4
96	FLHD	ABLA/CLUN-MEFE		42.7	34.8*	7.9	CRYIC				
6	HEL	ABLA/VACA		46.0	34.8*	11.2	CRYIC	161	276	115	45.7
34	FLHD	ABLA/VACA	43.4	52.0	36.3	15.7	FRIGID	122	317	195	49.3
35	FLHD	ABLA/VACA	43.9	54.7	35.7	19.0	FRIGID	124	315	191	51.2
40	FLHD	ABLA/VACA	39.3	45.3	34.3	11.0	CRYIC	163	307	144	45.7
41	FLHD	ABLA/VACA	39.2	45.0	34.6	10.4	CRYIC	171	297	126	45.3
43	FLHD	ABLA/VACA	38.7	46.7	33.3	13.4	FRIGID	159	288	129	46.3
44	FLHD	ABLA/VACA	39.5	47.6	34.6	13.0	FRIGID	155	291	136	46.7
48	FLHD	ABLA/VACA	39.0	45.7	33.6	12.1	CRYIC	155	299	144	45.3
50	FLHD	ABLA/VACA	39.2	45.0	33.3	11.7	CRYIC	162	307	145	46.3
77	NEZ	ABLA/CACA-LEGL	38.8	45.3	34.3	11.0	CRYIC	168	290	122	45.7
1	HEL	ABLA/LIBO		48.7	34.8*	13.9	FRIGID	153	286	133	47.4
76	NEZ	ABLA/XETE	41.7	51.3	34.3	17.0	FRIGID	139	310	171	48.6
78	NEZ	ABLA/XETE	39.5	48.0	33.7	14.3	FRIGID	160	290	130	47.8
80	NEZ	ABLA/XETE	38.7	45.3	34.3	11.0	CRYIC	169	283	114	46.0
12	HEL	ABLA/XETE-VAGL		47.0	34.8*	12.2	FRIGID	164	277	113	46.3
93	FLHD	ABLA/XETE-VAGL		42.0	34.8*	7.2	CRYIC	165	317	152	45.8
95	FLHD	ABLA/XETE-VAGL		46.0	34.8*	11.2	CRYIC	165	317	152	45.8
11	HEL	ABLA/VASC		43.3	34.8*	8.5	CRYIC	177	260	83	45.3

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation where monitoring site is located. Habitat Type = habitat type at the monitoring site. MAST= mean annual soil temperature, U.S.D.A., Soil Taxonomy. MSST = mean summer soil temperature. MWST = mean winter soil temperature. MSST-MWST = difference between mean summer soil temperature and mean winter soil temperature. Meas. Soil Temp. Regime = measured soil temperature regime as defined by U.S.D.A., Soil Taxonomy. First Day 41° F = the calendar date the soil at 20 inches depth reaches 41° F in the spring. Last Day 41° F = the calendar data the soil at 20 inches depth goes below 41° F in the fall. Total Days 41+° F = total number of days the soil temperature at 20 inches depth is 41+° F. Mean Soil Temp. Days 41+° F = the mean soil temperature at 20 inches depth for the time the soil temperature was 41+° F.

Footnotes: 1) The values marked with a * are non-measured temperature values, rather are calculated mean temperatures. 2) The MAST was not calculated unless there were 12 months of field measured temperatures.

PSEUDOTSUGA MENZIESII

THUJA PLICATA

ABIES GRANDIS

ABIES LASIOCARPA

Figure - 7. The linear regression of elevation versus MSST for the PSME, THPL, ABGR, and ABLA climax forest series.

days versus elevation for the climax forest series. The slopes of the linear-regression lines are very similar for MSST vs. elevation and $41 + ^\circ \text{F}$ days vs. elevation. This is true even though MSST and the average soil temperature for $41 + ^\circ \text{F}$ days are calculated in two different ways. In most cases the time period for the average soil temperature $41 + ^\circ \text{F}$ is either shorter or longer than the 90-day period used to calculate the MSST.

See Table - 2 for the correlation coefficient and the probability level for the eight linear regressions discussed in this section.

In the forested portions of the Northern Rocky Mountains there is a question sometimes about whether or not a site has a frigid or cryic soil temperature regimes. A comparison of the predicted soil temperature regimes as documented in Sasich and Nielsen (1984) to the measured soil moisture regime for each group of climax forest series monitoring sites was done.

Sasich and Nielsen (1984) reported the soil scientists considered, in all cases, that *Abies lasiocarpa* (ABLA) habitat types have a cryic soil temperature regime; and the *Abies grandis* (ABGR) and *Thuja plicata* (THPL) habitat types have a frigid soil temperature regime. The soil scientists considered the *Pseudotsuga menziesii* (PSME) habitat types as either all frigid, or a combination of some frigid and some cryic. With these assumptions in mind, an examination of the soil temperature summary data was done.

The primary differentia between the frigid and cryic temperature regimes for a well-drained soil is 1) whether the MAST is greater than or less than 47°F (8°C), and 2) if the difference between the MSST and MWST is greater than 9°F (5°C). An examination of these data reveals that all Psme sites have MSST greater than 47°F , and more than 9°F difference between the MSST and MWST. Therefore, all PSME sites are classified as a frigid soil temperature regime. This is different than the soil temperature regimes assumed by the field soil scientists for some PSME habitat types. For example the Gallatin and Beaverhead National Forests considered *Pseudotsuga menziesii*/*Symphoricarpos albus* (PSME/SYAL) as occurring on a cryic soil temperature regime. Three PSME/SYAL monitoring sites on the Helena National Forest classified as a frigid soil temperature regime.

A review of these data for the other climax forest series reveals that the ABLA, THPL, and ABGR sites occurred in both frigid or cryic soil temperature regimes. The ABLA sites classified primarily as cryic, with some exceptions occurring mostly on low elevation or southerly aspects monitoring sites.

This is different than the soil scientists' assumption that all ABLA sites are cryic soil temperature regimes. The THPL sites were almost totally frigid, with one exception. This is similar to the assumptions made by the soil scientists concerning THPL sites. The ABGR sites in Montana all classified as a frigid soil temperature regime, which is what the soil scientists had predicted. However, in Idaho the ABGR sites classified as both frigid and cryic soil temperature regimes.

With this additional information, a reexamination of the linear regressions that compared MSST to elevation by forest climax series was done. Figure - 10 and 11 display the linear regression of MSST versus elevation for each climax forest series. A line representing 47° F is plotted on each chart. The author concludes from this analysis that a field soil scientist in western Montana or northern Idaho can estimate the soil temperature regime of a site by knowing the climax forest series and elevation of a site. For example if a soil scientist was mapping a landscape having *Abies lasiocarpa* climax vegetation above a elevation of 5000 feet, a prediction of a cryic soil temperature regime for that site would probably be correct.

An analysis to examine the inter-relationship of climax forest vegetation, soil temperature, and elevation with changes in geographical area was done. It was recognized that when plotted for an individual national forest, the regression between MSST and elevation for a climax forest series would vary from the regression for the combined national forests data set. The reasons for these differences were perceived to be due to: 1) major geologic structure (i.e. the elevation of the valley bottoms and mountain tops), 2) changes in latitude, and 3) the regional climatic characteristics. An example of this is the base elevation of the valley bottoms, which range between 2935 feet elevation in Kalispell, Montana to 3840 feet elevation in Helena, Montana.

This observation suggests two implications. First, a better correlation of MSST to elevation for a climax forest series or a habitat type could be expected if data from a smaller geographic area were used. Second, there probably is a geographical limit beyond the initial study area to which the correlation between elevation and MSST should not be extrapolated.

To assess if the geographic location of monitoring sites had any affect on the MSST vs. elevation relationships, the data set was sorted by national forest, and the correlation of MSST vs. elevation by climax forest series was done. However, because of the small number of monitoring sites for a climax forest series on a given national forest, this effort proved indeterminate. So all the monitoring

sites on an individual national forest were grouped, and a linear regression of MSST vs. elevation was done for each forest's monitoring sites (except the Clearwater National Forest). Figure - 12 is a graph of the linear regressions of MSST vs. elevation for all monitoring sites on four national forests. There appear to be significant differences in three of the four regression lines. The Helena and Lolo National Forests have similar correlation relationships and they differ from the Flathead and Nez Perce National Forest's correlation relationship.

Based upon these data and his own field experience, the author submits that an established relationship between elevation and MSST should be recalibrated for a new geographic locale if one of the following is true: 1) The new locale is located more than 150 miles north or south of the initial study area. or 2) There is more than a 500 to 600 feet in elevation difference of the major valley bottoms between the initial study site and the new locale.

A general trend of decreasing temperature with increasing latitude is expected. Latitude of the study sites ranges from 45 degrees 39 minutes on the Nez Perce National Forest to 48 degrees 19 minutes on the Flathead National Forest. Linear regressions of latitude versus soil temperature at 20 inches (50 cm) depth by climax forest series and for a single habitat type were tested. No significant correlations were found between the two variables using this data set. The reason for this lack of correlation may be due to small sample size and therefore the inability to segregate enough similar sites along a latitude gradient to examine the relationship of latitude to soil temperature.

TABLE 2 - STATISTICS OF TESTED LINEAR CORRELATIONS OF SOIL TEMPERATURE TO ELEVATION

Tested Relationship	Correlation Coefficient	Probability Level
MSST vs. Elevation - PSME	.52	.026
MSST vs. Elevation - THPL	.41	.231
MSST vs. Elevation - ABLA	.63	.0005
MSST vs. Elevation - ABGR	.96	.0002
AVG. SOIL TEMP. vs. Elevation- PSME	.51	.030
AVG. SOIL TEMP. vs. Elevation- THPL	.28	.425
AVG. SOIL TEMP. vs. Elevation- ABLA	.58	.002
AVG. SOIL TEMP. vs. Elevation- ABGR	.91	.002

Figure - 8. The linear regression of elevation versus mean summer soil temperature for the PSME, THPL, ABLA, and ABGR climax forest series.

Figure - 9. The linear regression of elevation versus average soil temperature at 20 inches depth during the time the soil temperature is 41+°F for the PSME, THPL, ABLA, and ABGR climax forest series.

Figure - 10. The linear regression of elevation versus mean summer soil temperature for the PSME and ABLA climax forest series in relation to the cryic/frigid soil temperature regime criteria.

Figure - 11. The linear regression of elevation versus mean summer soil temperature for the THPL and ABGR climax forest series in relation to the cryic/frigid soil temperature regime criteria.

Figure - 12. The linear regression of elevation versus mean summer soil temperature at 20 inches depth for all monitoring sites on the Helena, Flathead, Lolo, and Nez Perce National Forests.

Soil Moisture - Relationship to Climax Vegetation and Soil Taxonomy

Of the 104 monitoring sites, there were 54 sites with multi-depth subsurface soil moisture measurement records that were used in this analysis. Monitoring sites where soil moisture measurements were recorded for only one year or were measured on a sporadic basis were not used. Table - 3 is a summarization of these soil moisture data for the fifty-four monitoring sites. The number of days each monitoring depth was greater than or less than 1500 kPa is reported. Also reported is the mean soil tension for the time period the soil temperature at 20 inches depth was $41 \pm ^\circ \text{F}$.

The 54 soil moisture monitoring sites were examined to determine if a soil moisture regime could be interpreted from the monitoring data. As discussed in the methods section a soil moisture control section (SMCS) was determined for each monitoring site. Soils in western Montana were primarily in the loamy-skeletal family, so one SMCS was estimated for them, and another SMCS was estimated for the coarser textured soils of the Idaho national forests.

All the monitoring sites in the Montana national forests--the Flathead, Lolo, and Helena Forest--had soil moisture sensors buried at depths of 6, 12, and 24 inches (15, 30, and 61 cms). Therefore the estimated 6 to 24 inches (15 to 61 cms) SMCS for the soils on these national forests were well monitored. The Idaho national forests were a different situation. On the Nez Perce National Forest the one soil moisture sensor was buried at a depth of 20 inches (50 cms). On the Clearwater National Forest the soil moisture sensors were buried at depths of 6 and 16 inches (15 and 41 cms). The estimated SMSC for the Idaho soils was 10 to 35 inches (25 to 89 cms). It is the interpretation of the author that an insufficient portion of the SMCS was monitored on the Nez Perce or Clearwater sites to make an accurate determination of the soil moisture regime.

The entire soil moisture measurement record was then examined for the remaining monitoring sites to analyze the yearly variation in the soil moisture record. The Lolo and Helena National Forest sites had the shortest records--2 and 3 1/2 seasons respectively. Due to similar moisture trends from season to season the author concludes a soil moisture

regime could be interpreted from the data. The moisture regime determination for the monitoring sites on these two national forests should be viewed with some skepticism because of the short time period of the record.

Table - 4 lists the thirty-four monitoring sites for which a soil moisture regime could be interpreted. A comparison of the measured moisture regimes and the predicted moisture regimes by the field soil scientists was made. This was done in two ways. First, a comparison was made of the habitat types and their predicted soil moisture regimes, as documented in Sasich and Nielsen (1984) to the measured soil moisture regime. And second, a review of the preliminary soil classification of the soils at each monitoring site was done. Three observations were made from this comparison.

1. The Montana field soil scientists predicted that sites on the ABLA, THPL, and ABGR series have a udic soil moisture regime. Twenty-two monitoring sites occurred on these habitat types and all of them classify to a udic soil moisture regime.
2. The soil scientists predicted that the PIPO series and the grass understory PSME habitat types would have either an ustic or xeric soil moisture regimes. Four of the six grass understory PSME habitat types classify to a xeric soil moisture regime. Data from the measured sites would indicate that xeric soil temperature regimes may be more prevalent than ustic regimes in western Montana and northern Idaho on these drier habitat types.
3. Most of the western and southwestern Montana national forest soil scientists predicted the majority of the PSME sites to be in a ustic soil moisture regime. Seven out of the twelve PSME sites monitored classify as udic. This conclusion however is based on some of the sites with shorter periods of record. The author suggests that a udic soil moisture regime should be considered on the moister PSME sites. More local examination of this question is needed to make a final determination.

TABLE 3 - SUMMARY TABLE OF THE SOIL MOISTURE SITES

Site	N.F.	Habitat Type	6" Days >1500 kPa	6" Days <1500 kPa	12/16" Days >1500 kPa	12/16" Days <1500 kPa	20/24" Days >1500 kPa	20/24" Days <1500 kPa	Profile Mean Soil Tension Days 41 + °F (kPa)
65	NEZ	PIPO/AGSP					35	198	410
69	NEZ	PIPO/FEID					133	111	1080
8	HEL	PSME/FESC	24	118	55	87	61	81	990
92	LOLO	PSME/FESC	59	164	71	152	84	139	750
56	CLW	PSME/PHMA	45	220	36	229	480		
64	NEZ	PSME/PHMA					125	70	1160
71	NEZ	PSME/PHMA					125	67	1230
90	LOLO	PSME/PHME-PHMA	46	107	69	84	77	76	900
86	LOLO	PSME/PHMA-CARU	10	156	10	156	29	137	440
89	LOLO	PSME/PHMA-CARU	18	148	23	143	58	108	610
2	HEL	PSME/SYAL	18	150	18	150	39	129	550
4	HEL	PSME/SYAL	18	116	19	115	52	82	650
7	HEL	PSME/SYAL	100	67	98	69	103	64	1150
66	NEZ	PSME/SYAL					167	35	1460
73	NEZ	PSME/SYAL					78	88	950
10	HEL	PSME/CARU	37	106	32	111	34	109	740
16	HEL	PSME/CARU	29	143	29	143	5	167	540
91	LOLO	PSME/CARU-AGSP	24	182	31	175	49	157	560
83	LOLO	PSME/CARU-PIPO	76	105	52	129	78	103	940
67	NEZ	ABGR/COOC					25	94	550
68	NEZ	ABGR/COOC					13	113	420
75	NEZ	ABGR/COOC					15	116	390
74	NEZ	ABGR/ASCA					0	132	40
33	FLHD	ABGR/CLUN-VACA	0	179	0	179	0	179	500
55	CLW	ABGR/CLUN	0	165	44	121			420
70	NEZ	ABGR/CLUN					110	86	1060
72	NEZ	ABGR/CLUN					72	79	1020
31	FLHD	ABGR/CLUN-XETE	71	126	34	163	64	133	720
26	FLHD	THPL/CLUN	0	204	0	204	0	204	170
27	FLHD	THPL/CLUN	0	215	0	215	0	215	490
28	FLHD	THPL/CLUN	0	202	0	202	0	202	460
29	FLHD	THPL/CLUN	0	234	0	234	0	234	390
53	CLW	THPL/CLUN	5	166	0	171			240
85	LOLO	THPL/CLUN	0	164	0	164	0	164	110
37	FLHD	THPL/CLUN/CLUN	0	197	0	197	0	197	420
38	FLHD	THPL/CLUN-CLUN	0	228	0	228	0	228	150
79	NEZ	ABLA/CLUN					17	75	580
46	FLHD	ABLA/CLUN-VACA	0	135	0	135	0	135	190
47	FLHD	ABLA/CLUN-VACA	0	164	0	164	0	164	70
34	FLHD	ABLA/VACA	0	195	0	195	0	195	510

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation. Habitat Type = habitat type at monitoring site. 6" Days >1500 kPa = at a 6 inch depth the number of days the soil moisture tension was >1500 kPa. 6" Days <1500 kPa = at a 6 inch depth the number of days the soil moisture tension was <1500 kPa. 12/16" Days >1500 kPa = at a 12 inch depth (Flathead, Lolo, & Helena NF sites) or 16 inch depth (Clearwater NF), the number of days the soil moisture tension was >1500 kPa. 12/16" Days <1500 kPa = at a 12 inch depth (Flathead, Lolo, & Helena NF sites) or 16 inch depth (Clearwater NF), the number of days the soil moisture tension was <1500 kPa. 20/24" >1500 kPa = at a 20 inch depth (Nez Perce NF) or a 24 inch depth (Flathead, Lolo, & Helena NF sites), the number of days the soil moisture tension was >1500 kPa. 20/24" Days <1500 kPa = at a 20 inch depth (Nez Perce NF) or a 24 inch depth (Flathead, Lolo, & Helena NF sites), the number of days the soil moisture tension was <1500 kPa. Mean Soil Tension Days 41°F+ (kPa) = the unweighted mean soil moisture tension of the profile for the time the soil temperature at 20 inches was 41 + °F.

TABLE 3 CONT. - SUMMARY TABLE OF THE SOIL MOISTURE SITES

Site	N.F.	Habitat Type	6" Days >1500 kPa	6" Days <1500 kPa	12/16" Days >1500 kPa	12/16" Days <1500 kPa	20/24" Days >1500 kPa	20/24" Days <1500 kPa	Profile Mean Soil Tension Days 41+°F (kPa)
35	FLHD	ABLA/VACA	0	191	0	191	0	191	470
40	FLHD	ABLA/VACA	0	144	0	144	0	144	200
41	FLHD	ABLA/VACA	0	126	0	126	0	126	170
43	FLHD	ABLA/VACA	0	129	0	129	0	129	40
44	FLHD	ABLA/VACA	0	136	0	136	0	136	50
48	FLHD	ABLA/VACA	0	144	0	144	0	144	380
50	FLHD	ABLA/VACA	0	145	0	145	0	145	460
77	NEZ	ABLA/CACA-LEGL					0	122	30
1	HEL	ABLA/LIBO	59	74	0	133	20	113	550
76	NEZ	ABLA/XETE					0	171	50
78	NEZ	ABLA/XETE					0	130	30
80	NEZ	ABLA/XETE					22	92	520
12	HEL	ABLA/XETE-VAGL	0	113	0	113	0	113	240
11	HEL	ABLA/VASC	0	83	0	83	0	83	290

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation. Habitat Type = habitat type at monitoring site. 6" Days >1500 kPa = at a 6 inch depth the number of days the soil moisture tension was >1500 kPa. 6" Days <1500 kPa = at a 6 inch depth the number of days the soil moisture tension was <1500 kPa. 12/16" Days >1500 kPa = at a 12 inch depth (Flathead, Lolo, & Helena NF sites) or 16 inch depth (Clearwater NF), the number of days the soil moisture tension was >1500 kPa. 12/16" Days <1500 kPa = at a 12 inch depth (Flathead, Lolo, & Helena NF sites) or 16 inch depth (Clearwater NF), the number of days the soil moisture tension was <1500 kPa. 20/24" >1500 kPa = at a 20 inch depth (Nez Perce NF) or a 24 inch depth (Flathead, Lolo, & Helena NF sites), the number of days the soil moisture tension was >1500 kPa. 20/24" Days <1500 kPa = at a 20 inch depth (Nez Perce NF) or a 24 inch depth (Flathead, Lolo, & Helena NF sites), the number of days the soil moisture tension was <1500 kPa. Mean Soil Tension Days 41°F+ (kPa) = the unweighted mean soil moisture tension of the profile for the time the soil temperature at 20 inches was 41+°F.

TABLE 4 - SOIL MOISTURE REGIMES FOR SELECTED SOIL MOISTURE SITES

Site	N.F.	Habitat Type	6" Days >1500 kPa	12" Days >1500 kPa	24" >1500 kPa	Mean Soil Tension Days 41+°F (kPa)	Measured Soil Moisture Regime
8	HEL	PSME/FESC	24	55	61	990	XERIC
92	LOLO	PSME/FESC	59	71	84	750	XERIC
90	LOLO	PSME/PHME-PHMA	46	69	77	900	XERIC
86	LOLO	PSME/PHMA-CARU	10	10	29	440	UDIC
89	LOLO	PSME/PHMA-CARU	18	23	58	610	UDIC
2	HEL	PSME/SYAL	18	18	39	550	UDIC
4	HEL	PSME/SYAL	18	19	65	650	UDIC
7	HEL	PSME/SYAL	100	98	103	1150	ARIDIC
10	HEL	PSME/CARU	37	32	34	740	UDIC
16	HEL	PSME/CARU	29	29	5	540	UDIC
91	LOLO	PSME/CARU-AGSP	24	31	49	560	UDIC
83	LOLO	PSME/CARU-PIPO	76	52	105	940	XERIC
33	FLHD	ABGR/CLUN-VACA	0	0	0	500	UDIC
31	FLHD	ABGR/CLUN-XETE	71	34	64	720	USTIC
26	FLHD	THPL/CLUN	0	0	0	170	UDIC
27	FLHD	THPL/CLUN	0	0	0	490	UDIC
28	FLHD	THPL/CLUN	0	0	0	460	UDIC
29	FLHD	THPL/CLUN	0	0	0	390	UDIC
85	LOLO	THPL/CLUN	0	0	0	110	UDIC
37	FLHD	THPL/CLUN/CLUN	0	0	0	420	UDIC
38	FLHD	THPL/CLUN-CLUN	0	0	0	150	UDIC
46	FLHD	ABLA/CLUN-VACA	0	0	0	190	UDIC
47	FLHD	ABLA/CLUN-VACA	0	0	0	70	UDIC
34	FLHD	ABLA/VACA	0	0	0	510	UDIC
35	FLHD	ABLA/VACA	0	0	0	470	UDIC
40	FLHD	ABLA/VACA	0	0	0	200	UDIC
41	FLHD	ABLA/VACA	0	0	0	170	UDIC
43	FLHD	ABLA/VACA	0	0	0	40	UDIC
44	FLHD	ABLA/VACA	0	0	0	50	UDIC
48	FLHD	ABL/VACA	0	0	0	380	UDIC
50	FLHD	ABLA/VACA	0	0	0	460	UDIC
1	HEL	ABLA/LIBO	73	0	20	550	UDIC
12	HEL	ABLA/XETE-VAGL	0	0	0	240	UDIC
11	HEL	ABLA/VASC	0	0	0	290	UDIC

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation, where monitoring site located. Habitat Type = habitat type at monitoring site. 6" Days >1500 kPa = at a 6 inch depth the number of days the soil moisture tension was >1500 kPa. 12" Days >1500 kPa = at a 12 inch depth the number of days the soil moisture tension was >1500 kPa. 24" >1500 kPa = at a 24 inch depth the number of days the soil moisture tension was >1500 kPa. Mean Soil Tension Days 41+°F (kPa) = the mean soil moisture tension of the profile for the time the soil temperature at 20 inches was > 41°F. Measured Soil Moisture Regime = soil temperature regime as defined in U.S.D.A. Soil Taxonomy.

Soil Climate-Vegetation Relationships

There are two topics discussed in this section. The first is the graphic and numeric description of the soil temperature and soil moisture characteristics for a set of 19 monitoring sites. Each monitoring site occurs on a different habitat type that is present in Montana and or Idaho. The second is an analysis of the relationship of soil temperature and soil moisture to climax forest series and to individual habitat types.

Table - 5 lists the nineteen representative habitat type monitoring sites, their location, physical and vegetative characteristics. Following the Table - 5 for each of the nineteen representative habitat type monitoring sites two graphics are displayed. The first graph displays the data points for the soil temperature at 20 inches (50 cm) depth for the entire record. The second graph displays a fitted curve of the soil temperature at 20 inches depth; and under the fitted soil temperature curve is the soil moisture status (shaded areas) for the soil profile during the same time period. Reported in a footnote at the bottom of the second graphic are two values. They are the average soil temperature at 20 inches depth and the average soil tension of the soil profile for the time period the soil temperature was $41 \pm ^\circ\text{F}$. Refer to Figures - 13 to 31 for the soil temperature and moisture characteristics of the nineteen representative habitat type monitoring sites.

A review by the author of the soil temperature and soil moisture data for the nineteen representative habitat type monitoring sites revealed five differences from his hypothesized seasonal soil moisture trends for a specific habitat type. First, data from the ABLA/VACA monitoring sites revealed moister site conditions than previously thought for this habitat type. Second, The ABLA/XETE sites stayed below 1500 kPa longer into the summer season than expected. Third, the ABLA/CLUN site located on the Nez Perce National Forest dried out more than expected for this habitat type. Fourth, the ABLA/VASC site was moist for longer than expected in the surface soil horizon. And fifth, the THPL/CLUN sites were wet in all soil horizons at all times.

NOTE TO THE READER: For brevity in the remainder of this document, Average Soil Temperature refers to the average soil temperature at 20 inches depth for the time the soil temperature was $41 \pm ^\circ\text{F}$. Also the Average Soil Tension refers to the average soil moisture tension of the profile for the time the soil temperature at 20 inches depth was $41 \pm ^\circ\text{F}$.

TABLE 5 - REPRESENTATIVE HABITAT TYPE SITES

Site	N.F.	Habitat Type	Slope (%)	Elevation (Feet)	Aspect	Latitude	Longitude	Geology	Soil Classification
65	NEZ	PIPO/AGSP	35	4280	NE	45° 39'	116°25'	Basalt	Typic Argixeroll, L-SK
69	NEZ	PIPO/FEID	73	2650	SW	45° 48'	115°53'	Schist	Lithic Haploxeroll, L-SK
92	LOLO	PSME/FESC	55	4080	SW	47° 07'	113°58'	Limestone	Calcic Haploxeroll, F-L
90	LOLO	PSME/PHMA-PHMA	55	4160	N	47° 07'	113°58'	Argillite	Typic Eutrochrept, L-SK
89	LOLO	PSME/PHMA-CARU	50	4550	W	47° 16'	115°21'	Argillite	Andic Eutrochrept, L-SK
73	NEZ	PSME/SYAL	63	4900	NE	45° 40'	114°55'	Schist	Typic Eutrochrept, S-SK
10	HEL	PSME/CARU	25	6880	E	46° 17'	111°48'	Basalt	Typic Eutrochrept, L-SK
91	LOLO	PSME/CARU-AGSP	35	4200	S	47° 00'	114°7'	Argillite	Typic Eutrochrept, L-SK
68	NEZ	ABGR/XETE COOC	08	5120	SE	45° 50'	116°5'	Basalt	Andeptic Cryoboralf, F-L
74	NEZ	ABGR/SETR	03	4760	NW	45° 40'	115°21'	Alluvium	Entic Cryumbrept, S-SK
72	NEZ	ABGR/CLUN	70	3903	NW	45° 49'	115°26'	Schist	Typic Haploboroll, C-L
26	FLHD	THPL/CLUN	08	3200	E	47° 54'	113°52'	Limestone	Andeptic Paleboralf F-L
79	NEZ	ABLA/CLUN	31	6150	N	45° 36'	115°28'	Gneiss	Andic Cryochrept, Sandy
47	FLHD	ABLA/CLUN VACA	16	4703	E	48° 19'	114°46'	Argillite	Andeptic Cryoboralf, L-SK
48	FLHD	ABLA/VACA	15	4520	SE	48° 19'	114°46'	Quartzite	Andeptic Cryoboralf, L-SK
77	NEZ	ABLA/CACA-LEGL	18	5283	NE	45° 39'	115°26'	Gneiss	Andeptic Cryoboralf, F-L
01	HEL	ABLA/LIBO	30	5800	NE	46° 52'	112°43'	Argillite	Typic Cryoboralf, F-L
80	NEZ	ABLA/XETE	18	6480	SE	45° 36'	115°27'	Gneiss	Andic Cryochrept, C-L
11	HEL	ABLA/VASC	05	7000	E	46° 37'	112°18'	Granite	Andic Cryochrept, L-SK

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation where monitoring site located. Habitat Type = the habitat type at monitoring site. Slope = the percent slope at the monitoring site location. Elevation = The elevation at the monitoring site in feet. Latitude = the latitude to the nearest minute of the monitoring site. Longitude = the longitude to the nearest minute of the monitoring site. Geology = the geologic lithology occurring at the monitoring site. Soil Classification = the field soil classification of the monitoring site to the family level.

(a) **SITE-65 PIPO/AGSP H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-65 PIPO/AGSP H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 13. (a) The soil temperature at 20 inches depth versus calendar day for PIPO/AGSP. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PIPO/AGSP.

(a) **SITE-69 PIPO/FEID H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-69 PIPO/FEID H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 14. (a) The soil temperature at 20 inches depth versus calendar day for PIPO/FEID. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PIPO/FEID.

(a) **SITE-92 PSME/FESC H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-92 PSME/FESC H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 15. (a) The soil temperature at 20 inches depth versus calendar day for PSME/FESC. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/FESC.

(a) **SITE-90 PSME/PHMA-PHMA H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-90 PSME/PHMA-PHMA H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 16. (a) The soil temperature at 20 inches depth versus calendar day for PSME/PHMA-PHMA. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/PHMA-PHMA.

(a) **SITE-89 PSME/PHMA-CARU H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-89 PSME/PHMA-CARU H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 17. (a) The soil temperature at 20 inches depth versus calendar day for PSME/PHMA-CARU. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/PHMA-CARU.

(a) **SITE-73 PSME/SYAL H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-73 PSME/SYAL H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 18. (a) The soil temperature at 20 inches depth versus calendar day for PSME/SYAL. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/SYAL.

(a) **SITE-10 PSME/CARU H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-10 PSME/CARU H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 19. (a) The soil temperature at 20 inches depth versus calendar day for PSME/CARU. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/CARU.

(a) **SITE-91 PSME/CARU-AGSP H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-91 PSME/CARU-AGSP H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 20. (a) The soil temperature at 20 inches depth versus calendar day for PSME/CARU-AGSP. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for PSME/CARU-AGSP.

(a) **SITE-68 ABGR/XETE-COOC H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-68 ABGR/XETE-COOC H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 21. (a) The soil temperature at 20 inches depth versus calendar day for ABGR/XETE-COOC, and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABGR/XETE-COOC.

(a) **SITE-74 ABGR/SETR H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-74 ABGR/SETR H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 22. (a) The soil temperature at 20 inches depth versus calendar day for ABGR/SETR. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABGR/SETR.

(a) **SITE-72 ABGR/CLUN H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-72 ABGR/CLUN H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 23. (a) The soil temperature at 20 inches depth versus calendar day for ABGR/CLUN. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABGR/CLUN.

(a) **SITE-26 THPL/CLUN H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-26 THPL/CLUN H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 24. (a) The soil temperature at 20 inches depth versus calendar day for THPL/CLUN, and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for THPL/CLUN.

(a) **SITE-79 ABLA/CLUN H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-79 ABLA/CLUN H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 25. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/CLUN. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/CLUN.

(a) **SITE-47 ABLA/CLUN-VACA H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-47 ABLA/CLUN-VACA H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 26. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/CLUN-VACA. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/CLUN-VACA.

(a) **SITE-48 ABLA/VACA H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-48 ABLA/VACA H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 27. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/VACA. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/VACA.

(a) **SITE-77 ABLA/CACA-LEGL H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-77 ABLA/CACA-LEGL H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 28. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/CACA-LEGL. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/CACA-LEGL.

(a) **SITE-1 ABLA/LIBO H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-1 ABLA/LIBO H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 29. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/LIBO, and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/LIBO.

(a) **SITE-80 ABLA/XETE H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-80 ABLA/XETE H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 30. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/XETE. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/XETE.

(a) **SITE-11 ABLA/VASC H.T.**
SOIL TEMPERATURE AT 20 INCHES DEPTH

(b) **SITE-11 ABLA/VASC H.T.**
SOIL TEMPERATURE AND MOISTURE STATUS

Figure - 31. (a) The soil temperature at 20 inches depth versus calendar day for ABLA/VASC. and (b) The average soil temperature at 20 inches with the profile soil tension versus calendar day for ABLA/VASC.

For many years habitat types have been described by the general microclimate (temperature and moisture) they occur in. This climatic characterization of habitat types has been done by both the ecologists who initially described the habitat types, as well as users of the habitat type classification system. In several cases, groups of habitat types were used to describe temperature and moisture environments across the landscape. For example, some of the *Pinus ponderosa* habitat and *Pseudotsuga menziesii* types are considered to represent a "hot and dry" forest environment. A graphic to display the ordination of the nineteen representative habitat type monitoring sites on a soil temperature and soil moisture gradient was developed. Refer to Figure - 32 for the graphic plot of the average soil temperature versus the average soil tension for each representative habitat type monitoring sites. To the author's knowledge, this is one of few characterizations of the temperature and moisture ordination for several habitat types that is based upon quantitative data.

The remainder of this results/discussion section examines the relationships of climax forest vegetation to soil temperature and soil moisture. Of the sixty-six monitoring sites discussed so far within this thesis, fifty-two of them have both soil temperature and soil moisture measured at the same location (a paired monitoring site). Only paired monitoring sites were used in the remainder of the analyses. Table - 6 summarizes the average soil temperature and average soil tension for the fifty two paired monitoring sites.

The paired monitoring sites were grouped by climax forest series. Then the average soil temperature vs. the average soil tension was plotted for each of the paired monitoring sites. The resulting plot of these soil temperature and moisture data (Figure - 33) shows a clustering of monitoring sites that are the same climax forest series.

An initial hypothesis of this thesis is that there are distinct soil temperature and soil moisture characteristics (niche) associated with each forest habitat type. This hypothesis was tested using a subset of the paired monitoring sites. Only monitoring sites that had a group of four or more with the same habitat type were included in the analysis. The monitoring sites were grouped by habitat type (6 habitat types); then the average soil temperature vs. the average soil tension was graphically plotted for each monitoring site. The resulting graphic plot Figure - 34 showed some clustering of monitoring sites having the same habitat types.

Figure - 32. The average soil temperature versus the average soil tension when the soil temperature is 41+ degrees F for nineteen representative habitat type monitoring sites.

* ABLA ■ THPL ○ ABGR △ PSME × PIPO
 Figure - 33. The average soil temperature versus the average soil tension when the soil temperature is 41+ degrees F grouped by climax forest series monitoring sites.

TABLE 6 - SUMMARY TABLE OF PAIRED SOIL TEMPERATURE/MOISTURE SITES

Site	N.F.	Habitat Type	Average Soil Temp. Days 41 + °F (°F)	Average Soil Tension Days 41 + °F (kPa)
65	NEZ	PIPO/AGSP	56.5	410
69	NEZ	PIPO/FEID	53.0	1080
8	HEL	PSME/FESC	48.5	990
92	LOLO	PSME/FESC	56.1	750
64	NEZ	PSME/PHME	37.3	1160
71	NEZ	PSME/PHME	49.9	1230
90	LOLO	PSME/PHMA-PHMA	48.7	900
86	LOLO	PSME/PHMA-CARU	50.1	440
89	LOLO	PSME/PHMA-CARU	50.1	610
2	HEL	PSME/SYAL	47.7	550
4	HEL	PSME/SYAL	48.7	650
7	HEL	PSME/SYAL	49.4	1150
66	NEZ	PSME/SYAL	50.2	1460
73	NEZ	PSME/SYAL	48.9	950
10	HEL	PSME/CARU	46.9	740
16	HEL	PSME/CARU	52.6	540
91	LOLO	PSME/CARU-AGSP	54.9	560
83	LOLO	PSME/CARU-PIPO	49.3	940
67	NEZ	ABGR-COOC	44.8	550
68	NEZ	ABGR-COOC	45.6	420
75	NEZ	ABGR-COOC	47.2	390
74	NEZ	ABGR/ASCA	47.2	40
33	FLHD	ABGR/CLUN-VACA	48.2	500
70	NEZ	ABGR/CLUN	50.1	1060
72	NEZ	ABGR/CLUN	47.9	1020
31	FLHD	ABGR/CLUN-XETE	50.9	720
26	FLHD	THPL/CLUN	48.1	170
27	FLHD	THPL/CLUN	49.6	490
28	FLDH	THPL/CLUN	48.8	460
29	FLHD	THPL/CLUN	50.3	390
53	CLW	THPL/CLUN	50.1	240
85	LOLO	THPL/CLUN	49.0	110
37	FLHD	THPL/CLUN-CLUN	49.8	420
38	FLHD	THPL/CLUN-CLUN	51.9	150
79	NEZ	ABLA/CLUN	44.4	580
46	FLHD	ABLA/CLUN-VACA	45.6	190
47	FLHD	ABLA/CLUN-VACA	45.9	70
34	FLHD	ABLA/VACA	49.3	510
35	FLHD	ABLA/VACA	51.2	470
40	FLHD	ABLA/VACA	45.7	200
41	FLHD	ABLA/VACA	45.3	170
43	FLHD	ABLA/VACA	46.3	40
44	FLHD	ABLA/VACA	46.7	50
48	FLHD	ABLA/VACA	45.3	380
50	FLHD	ABLA/VACA	46.3	460
77	NEZ	ABLA/VACA-LEGL	45.7	30
1	HEL	ABLA/LIBO	47.4	550
76	NEZ	ABLA/XETE	48.6	50
78	NEZ	ABLA/XETE	47.8	30
80	NEZ	ABLA/XETE	46.0	520
12	HEL	ABLA/XETE-VAGL	46.3	240
11	HEL	ABLA/VASC	45.3	290

TABLE DESCRIPTION - Site = monitoring site number. N.F. = national forest abbreviation where monitoring site located. Habitat Type = the habitat type at monitoring site. Average Soil Temp. Days 41 + °F = the mean soil temperature at 20 inches depth, for the time the soil temperature was 41 + °F. Average Soil Tension days 41 + °F = the unweighted mean soil moisture tension of the profile for the time the soil temperature at 20 inches was 41 + °F.

Using a similar graphic presentation as Waring (1969), the "soil temperature and soil tension limits" were estimated for four of the six habitat types depicted in Figure - 34. See Figure - 35 for a graphic display of the limits of the average soil temperature and average soil tension of four habitat types.

Figure- 35 shows an overlap between the combined soil temperature and moisture range for some of the habitat types. The author theorized that overlap of soil temperature and soil moisture ranges for the habitat types would be differentiated with the addition of elevation as a third variable. A three dimension graphic was developed to examine the relationship of soil temperature, soil moisture, and elevation to the six habitat types. Refer to Figure - 36 for the three dimension graphic. There is notably more segregation and less overlap of the climate variables between the habitat types with the addition of the elevation variable. The elevation variable is hypothesized to be reflecting the effect air temperature has on indicator species autecology that the soil temperature variable can not totally describe.

Discriminant analyses were done on the data from the paired monitoring sites for the six habitat types. The probability of the membership of a habitat type being predicted by average soil temperature and average soil tension was 40.5 percent. The probability of the membership of a habitat type being predicted by average soil temperature, average soil tension, and elevation, was 86.3 percent. See Appendix - E for the discriminant analyses results.

After the development of Figures - 34, 35, and 36, a review of each individual paired monitoring site and its summary data was done. Reviewed for each monitoring site were the average soil temperature, average soil tension, and geographic location. Four tendencies were indicated by a review of these data.

1. There are many forest habitat types of northern Idaho and western Montana that occupy sites having a narrow range of soil temperature, soil moisture, and elevation characteristics.
2. There are some forest habitat types of northern Idaho and western Montana that occupy sites having a wide range of the soil temperature and soil moisture conditions. This may be due to two situations: a) The range of adaptability of some plant species, allowing them to occupy sites with a wide range of soil temperature and soil moisture conditions. Or b) Occupancy of a habitat type on a given site may be more dependent on a site characteristic such as high levels of soil calcium carbonate, and not dependent on the soil temperature or soil moisture conditions of a site.

3. The amount of variability of the average soil temperature and average soil moisture of a habitat type as displayed in Figures 34, 35, and 36 may be a result of the geographical extent of the monitoring sites, rather than a description of the actual soil temperature and soil moisture limits of a habitat type in a specific locale. In other words, the soil temperature and soil moisture limits of PSME/SYAL on the Helena National Forest are probably much narrower than the limits of PSME/SYAL for the whole of Idaho and Montana. This is hypothesized to be a result of genetic variation of conifer species from one geographic location to another within the Rocky Mountains, as described by Rehfeldt (1984).
4. The relative micro-climatic niche that two different habitat types occupy in relationship to one another are approximately the same from one geographic location to another, even though the absolute values for average soil temperature and average soil tension can be significantly different. For example, PSME/FEID will occupy a drier and warmer site than ABLA/LIBO on both Flathead National Forest and The Helena National Forest; however, the actual limits of the average soil temperature and average soil moisture for each habitat type may be different on the two national forests.

ELEVATION FEET

Figure - 36. A graph of the average soil temperature versus, the average soil tension, versus the elevation for the monitoring sites of six habitat types.

CONCLUSIONS

The analyses of the soil temperature and soil moisture data from western Montana and northern Idaho national forests conclusively demonstrated the following relationships: 1) All ABLA, THPL, and ABGR climax forest series monitoring sites in western Montana classify as a udic soil moisture regime. 2) All the ABGR climax forest series monitoring sites classify as a frigid soil temperature regime in western Montana. 3) All PSME climax forest series monitoring sites in western Montana and northern Idaho classify as a frigid soil temperature regime. 4) The probability of the membership in a habitat type being correctly predicted by the site characteristics alone (i.e. average soil temperature, average soil moisture tension, and elevation) was eighty-six percent. This probability figure is based upon a discriminant analysis applied to thirty-four monitoring sites representing six habitat types.

Some of the analyses of the soil temperature and soil moisture data from western Montana and northern Idaho national forest revealed variation in data; however, the results of the analyses indicated several strong relationships between climax forest series and soil temperature or soil moisture regimes.

1) The analysis of the soil temperature data indicates that ABLA climax forest series monitoring sites classify primarily as a cryic soil temperature regime, with some frigid soil temperature regime exceptions occurring mostly on low elevation or southerly aspects monitoring sites. 2) The THPL climax forest series monitoring sites classify primarily as a frigid soil temperature regime, with some borderline cryic soil temperature regime exceptions. 3) The ABGR sites in northern Idaho classify as both frigid and cryic soil temperature regimes. 4) In western Montana the majority of the monitoring sites on savanna grass understory PSME habitat types classify as a xeric soil moisture regime. 5) In western Montana the majority of the monitoring sites on shrub understory PSME habitat types classify as a udic soil moisture regime.

The analyses of the soil temperature and soil moisture data from western Montana and northern Idaho in relation to climax forest series or habitat types indicated several relationships or tendencies.

1) There are many forest habitat types of northern Idaho and western Montana that occupy sites having a narrow range of soil temperature, soil moisture, and elevation characteristics. 2) There are some forest habitat types of northern Idaho and western Montana that occur on sites having a wide range in the soil

temperature and soil moisture conditions. 3) The relative micro-climatic niche that two different habitat types occupy in relationship to one another are approximately the same from one geographic location to another, even though the absolute values for average soil temperature and average soil tension can be significantly different.

It is the author's interpretation of these analyses that a field soil scientist in western Montana or northern Idaho can generally estimate the soil temperature regime and soil moisture regime of a site by knowing the climax forest series and elevation of the site. He also concluded that habitat types are a useful tool for mapping the geographical extent of soil temperature and soil moisture regimes if local relationships between the habitat types and the soil temperature and moisture regimes are established with monitoring data.

RECOMMENDATION FOR FUTURE STUDIES

1. Site productivity measurements should be done on these soil temperature/moisture monitoring sites, and those measurements correlated to average soil temperature and average soil moisture.
2. The forest habitat types of northern Idaho and western Montana not discussed in this thesis should have additional micro-climatic monitoring if they represent major acreages across the landscape.
3. The relationship of micro-climatic characteristics and genetic variation in climax vegetation should be investigated in the future.

LITERATURE CITED

LITERATURE CITED

- Batjter, L.P., Magness J.P., and Regimbal L.O. 1939. The Effect of Root Temperature of Growth and Nitrogen Intake in Apple Trees. *Proceedings American Society of Horticulture Science*. Vol.37, pp. 11-18.
- Brewer, R. 1988. *The Science of Ecology*. Saunders College Publishing. New York, New York.
- Briggs, L.T. and H.L. Shantz 1911. Application of Wilting Point Determinations in Agronomic Investigation. *Journal American Society of Agronomy*, Vol: 3, pp. 250-260.
- Briggs, L.T. and H.L. Shantz 1912. The Relative Wilting Coefficient for Different Plants. *Botany Gaz.*, Vol: 53, pp. 229-235.
- Cleary, B. D., and R. H. Waring. 1968. Temperature: Collection of Data and its Analysis for the Interpretation of Plant Growth and Distribution. *Canadian Journal of Botany*. Vol. 47. pp. 167-173.
- Cooper, S.V. , K.E. Neiman and D.W. Roberts 1991. *Forest Habitat Types of Northern Idaho: A Second Approximation*. U.S. Department of Agriculture, General Technical Report INT-236.
- Daubenmire, R.F. 1968. Soil Moisture in Relation to Vegetation Distribution in the Mountains of Northern Idaho. *Ecology* 49, #3, PP. 431-438.
- Daubenmire, R. F. 1943. Vegetational Zonation in the Rocky Mountains. *The Botanical Review*. Vol. IX. #6, pp. 325-395.
- Engler A. 1903. Untersuchungen uber das Wurzelwachstum der Holzarten. *Mitt. Schweiz. Centralanstalt forstl. Versuchswes*, Vol. 7, pp. 247-272.
- Green, S.E., and M. Klopsch. 1985. Soil and Air Temperatures for Different Habitats in Mount Rainier National Park. USDA Pacific NW Forest and Range Experim. Sta., Research Paper PNW-342. 50 pp.
- Hackley, P.R. and T.J. Nimlos 1982. Report on the Soil Temperature Regime Study of the Swan Valley. U.S. Department Of Agriculture, Contract Report.
- Hansen-Bristow, Katherine. 1985. Influence of Increasing Elevation on Growth Characteristics at Timberline. *Canadian Journal of Botany*. Vol. 64. pp. 2517-2523.
- Hopkins, A. D. 1938. *Bioclimatics*, U. S. Department of Agriculture, Misc. Publ. 280, pp. 1-188.
- Hayhoe, H. N., A. Bootsma, and L. M. Dwyer. 1987. Monitoring and Analysis of Soil Temperature Regimes for Soil Climate Classification. *Can. J. Soil Sci.* Vol. 67, pp. 667-678.
- Huzulak, J., and F. Matejka. 1983. Relationship Between Soil Moisture and Leaf Water Potential of Three Forest Tree Species. *Biologia Plantarum (Praha)*. 25 (6) pp. 462-467.
- Jacobs, J. 1989. Temperature and Light Effects on Seedling Performance of *Pinus Albicaulis*. Thesis, Montana State University.

- Jensen, M. E. 1983. Soil Temperature Elevation Relationships in Southern Idaho and Western Wyoming Wildlands. *Soil Science*. Vol. 137, #1, pp. 47-51.
- Jensen, M. E. 1984. Soil Moisture Regimes on Some Rangelands of Southeastern Idaho. *Soil Science Society of America Journal*. Vol. 48, #6, pp. 1328-1330.
- Leitch, I. 1916. Some Experiments on the Influence of Temperature on the Rate of Growth of *Pisum Sativum*. *Annual Botany*, Vol.:30, pp. 25-46.
- McDole, R. E., and M. A. Fosberg. 1974. Soil Temperatures in Selected Southeastern Idaho Soils: II. Relation to Soil and Site Characteristics. *Soil Science Amer. Proc.*, Vol. 38, 6 pp.
- Munn, L.C., B.A. Buchanan and G.A. Nielsen. 1978. Soil Temperatures in Adjacent High Elevation Forests and Meadows of Montana. *Soil Science Society American Journal*. Vol. 42, 2 pp.
- Munn, L.C. and G.A. Nielsen. 1979. Soil Temperature Predictions in Mountains and Foothills of Montana, Bulletin 705. Montana Agricultural Experiment Station, Montana State University,
- Nimlos, T. J. 1971. Soil Moisture and Temperature Regimes on the Lubrecht Experimental Forest. Montana Forest and Conservation Experiment Forest Station, Completion Report A-046-Mont.
- Nimlos, T. J., and D. Tippy. 1981. Soil Moisture and Temperature Regimes in Beaverhead County, Montana. MT. Forest and Experim. Sta., School of Forestry, U. of Mont. 5 pp.
- Pearson, G. A. 1920. Factors Controlling the Distribution of Forest Types, Part 1. *Ecology*, Vol. 1, #3. pp. 139-159.
- Pearson, G. A. 1919. Factors Controlling the Distribution of Forest Types, Part II. *Forest Examiner*, Fort Valley Forest Experim. Station. pp. 289-308.
- Pfister, R.D., B.L. Kovalchik, S.F. Arno, and R.C. Presby 1977. Forest Habitat Types of Montana. U.S. Department of Agriculture, General Technical Report INT_34.
- Phelps, J.F., J.L. Chambers, and T.M. Hinckley. 1976. Some Morphological, Ecological, and Physiological Traits of Four Ozark Forest Species. In *Proc. Central Hardwood For. Conf.* Fralish et al editors. pp. 251-242.
- Powell, D.B. and M.R. Thorpe 1977. Dynamic Aspects of Plant-Water Relations in "Environmental Effects on Crop Physiology" edited by J.Landsberg and C.Cutting. pp.53-57. Academic Press.
- Pritchett, W.L. 1979. Soil and Roots, Ch 10. *From Properties and Management of Forest Soils*. John Wiley & Sons, pp. 156-172.
- Rehfeldt, J. 1984. Microevolution of Conifers in the Northern Rocky Mountains: A View From Common Gardens. In, *Proceeding of the Eight North American Forest Biology Workshop*. Logan, Utah. pp. 32-46.
- Richards, L.A. 1947. Pressure Membrane Apparatus Construction and Use. *Agric. Eng.* 28:451-455.

- Richards, L. A. and C. H. Wadleigh 1952. Soil Water and Plant Growth, in Soil Physical Condition and Plant Growth by B.T. Shaw, pp.73-251. Academic Press.
- Richardson, S.D. 1958. Bud Dormancy and Root Development in *Acer saccharum*. In, "The Physiology of Forest Trees", (K.V. Thimann, editor), pp.409-425. Ronald Press, New York, New York.
- Roberts, D. W. 1984. Forest Vegetation and Site Relations: Theory, Methods, and Application to the Forests of Montana. pp. 126-179.
- Rutter, A.J. 1975. The Hydrological Cycle in Vegetation. "In Vegetation and the Atmosphere" (J.L. Monteith, ed.), pp. 111-154. Academic Press, New York.
- Sasich, J. and Nielsen G.A. 1984. Indicators of Soil Climate Used by Montana Soil Classifiers: A Survey. Mont. Agri. Experim. Sta., Montana State Univ. 45 pp.
- Smith, G. D., F. Newhall, Luther H. Robinson, Dwight Swanson. 1964. Soil-Temperature Regimes--Their Characteristics and Predictability. USDA, Soil Conservation Service. 14 pp.
- Soil Survey Staff. 1975. Soil Taxonomy, A Basic System of Soil Classification for Making and Interpreting Soil Surveys. U.S.D.A Soil Conservation Service. Agriculture Handbook No. 436. U.S. Gov. Print. Office, Washington, D.C.
- Soiltest, Inc. 1975. MC-300 series Soil Moisture-Temperature Meter and Soil Cells. Bulletin C172-75.
- Stathers, R.J. and Spittlehouse D.L. 1990. Forest Soil Temperature Manual. Canada-BC Forest Resource Development. Gov. of Canada. Prov. of British Columbia.
- Stuckey, I.H. 1941. Seasonal growth of grass roots. American Journal of Botany, Vol:28 pp. 486-491.
- Taylor, S.A. 1951. Estimating the Integrated Soil Moisture Tension in the Root Zone of Growing Crops. Soil Science, Vol. 73, #5 pp. 331-339.
- Taylor, S.A. 1952. Use of Mean Soil Moisture Tension to Evaluate the Effect of Soil Moisture on Crop Yields. Soil Science, Vol. 74, #5 pp. 217-226.
- Vold, T. and R. D. Marsh. 1981. Determination of Soil Climate Classes and Soil Families for a Level 3 Survey in the Cordillera. Canadian Journal of Soil Science. Vol. 61 pp. 203-210.
- Waring, R.H. 1969. Forest Plants of the Eastern Siskiyou: Their Environmental and Vegetational Distribution. Northwest Science, Vol:43, No. 1.
- Waring, R.H., K.L. Reed and W.H. Emmingham 1972. An Environmental Grid for Classifying Coniferous Forest Ecosystems. Proceedings-Research on Coniferous Forest Ecosystems, Bellingham, Washington.
- Weaver, T. 1977. Root Distribution and Soil Water Regimes in Nine Habitat Types of the Northern Rocky Mountains. Range Sci. Dept. Series 26. pp. 239-245.

- Weaver, T. 1980. Climates of Vegetation Types of the Northern Rocky Mountains and Adjacent Plains. The American Midland Naturalist. Vol:103, pp. 392-398.
- Went, F.W. and V.R. Babu 1978. The Effect of Dew on Plant Water Balance In *Citrullus vulgaris* and *Cucumis mebo*. Physiol. Plant, Vol. 44. pp.307-311.
- Zobel, D.B., W.A. McKee, G.M.Hawk, and C.T. Dyrness. 1976. Relationship of Environment to Composition, Structure, and Diversity of Forest Communities of the Central Western Cascades of Oregon. Ecological Monographs, Vol: 46 , No 2, pp.135-156.

APPENDICES

APPENDIX A

EXCERPT:

USDA Forest Service

Intermountain Research Station

General Technical Report INT-34

May 1977

**FOREST HABITAT TYPES
OF MONTANA**

Robert D. Pfister

Benard L. Kovalchik

Stephen F. Arno

Richard C. Presby

SCIENTIFIC NAME**ABBREVIATION****PINUS FLEXILIS CLIMAX SERIES**

Pinus flexilis/Agropyron spicatum h.t.	PIFL/AGSP h.t.
Pinus flexilis/Festuca idahoensis h.t.	PIFL/FEID h.t.
-Festuca idahoensis phase	-FEID phase
-Festuca scabrella phase	-FESC phase
Pinus flexilis/Juniperus communis h.t.	PIFL/JUCO h.t.

PINUS PONDEROSA CLIMAX SERIES

Pinus ponderosa/Andropogon spp. h.t.	PIPO/AND h.t. ²
Pinus ponderosa/Agropyron spicatum h.t.	PIPO/AGSP h.t.
Pinus ponderosa/Festuca idahoensis h.t.	PIPO/FEID h.t.
-Festuca idahoensis phase	-FEID phase
-Festuca scabrella phase	-FESC phase
Pinus ponderosa/Purshia tridentata h.t.	PIPO/PUTR h.t.
-Agropyron spicatum phase	-AGSP phase
-Festuca idahoensis phase	-FEID phase
Pinus ponderosa/Symphoricarpos albus h.t.	PIPO/SYAL h.t.
-Symphoricarpos albus phase	-SYAL phase
-Berberis repens phase	-BERE phase
Pinus ponderosa/Prunus virginiana h.t.	PIPO/PRVI h.t.
-Prunus virginiana phase	-PRVI phase
-Shepherdia canadensis phase	-SHCA phase

PSEUDOTSUGA MENZIESII CLIMAX SERIES

Pseudotsuga menziesii/Agropyron spicatum h.t.	PSME/AGSP h.t.
Pseudotsuga menziesii/Festuca idahoensis h.t.	PSME/FEID h.t.
Pseudotsuga menziesii/Festuca scabrella h.t.	PSME/FESC h.t.
Pseudotsuga menziesii/Vaccinium caespitosum h.t.	PSME/VACA h.t.
Pseudotsuga menziesii/Physocarpus malvaceus h.t.	PSME/PHMA h.t.
-Physocarpus malvaceus phase	-PHMA phase
-Calamagrostis rubescens phase	-CARU phase
Pseudotsuga menziesii/Vaccinium globulare h.t.	PSME/VAGL h.t.
-Vaccinium globulare phase	-VAGL phase
-Arctostaphylos uva-ursi phase	-ARUV phase
-Xerophyllum tenax phase	-XETE phase
Pseudotsuga menziesii/Linnaea borealis h.t.	PSME/LIBO h.t.
-Symphoricarpos albus phase	-SYAL phase
-Calamagrostis rubescens phase	-CARU phase
-Vaccinium globulare phase	-VAGL phase
Pseudotsuga menziesii/Symphoricarpos albus h.t.	PSME/SYAL h.t.
-Agropyron spicatum phase	-AGSP phase
-Calamagrostis rubescens phase	-CARU phase
-Symphoricarpos albus phase	-SYAL phase

SCIENTIFIC NAME**ABBREVIATION****Pseudotsuga Menziesii Climax Series (cont.)**

Pseudotsuga menziesii/Calamagrostis rubescens h.t.	PSME/CARU h.t.
-Agropyron spicatum phase	-AGSP phase
-Arctostaphylos uva-ursi phase	-ARUV phase
-Calamagrostis rubescens phase	-CARU phase
-Pinus ponderosa phase	-PIPO phase
Pseudotsuga menziesii/Carex geyeri h.t.	PSME/CAGE h.t.
Pseudotsuga menziesii/Spiraea betulifolia h.t.	PSME/SPBE h.t.
Pseudotsuga menziesii/Arctostaphylos uva-ursi h.t.	PSME/ARUV h.t.
Pseudotsuga menziesii/Juniperus communis h.t.	PSME/JUCO h.t.
Pseudotsuga menziesii/Arnica cordifolia h.t.	PSME/ARCO h.t.
Pseudotsuga menziesii/Symphoricarpos oreophilus h.t.	PSME/SYOR h.t. ²

PICEA CLIMAX SERIES

Picea/Equisetum arvense h.t.	PICEA/EQAR h.t.
Picea/Clintonia uniflora h.t.	PICEA/CLUN h.t.
-Vaccinium caespitosum phase	-VACA phase
-Clintonia uniflora phase	-CLUN phase
Picea/Physocarpus malvaceus h.t.	PICEA/PHMA h.t.
Picea/Galium triflorum h.t.	PICEA/GATR h.t.
Picea/Vaccinium caespitosum h.t.	PICEA/VACA h.t.
Picea/Senecio streptanthifolius h.t.	PICEA/SEST h.t.
-Pseudotsuga menziesii phase	-PSME phase
-Picea phase	-PICEA phase
Picea/Linnaea borealis h.t.	PICEA/LIBO h.t.
Picea/Smilacina stellata h.t.	PICEA/SMST h.t.

ABIES GRANDIS CLIMAX SERIES

Abies grandis/Xerophyllum tenax h.t.	ABGR/XETE h.t.
Abies grandis/Clintonia uniflora h.t.	ABGR/CLUN h.t.
-Clintonia uniflora phase	-CLUN phase
-Aralia nudicaulis phase	-ARNU phase
-Xerophyllum tenax phase	-XETE phase
Abies grandis/Linnaea borealis h.t.	ABGR/LIBO h.t.
-Linnaea borealis phase	-LIBO phase
-Xerophyllum tenax phase	-XETE phase

THUJA PLICATA CLIMAX SERIES

Thuja plicata/Clintonia uniflora h.t.	THPL/CLUN h.t.
-Clintonia uniflora phase	-CLUN phase
-Aralia nudicaulis phase	-ARNU phase
-Menziesia ferruginea phase	-MEFE phase
Thuja plicata/Oplopanax horridum h.t.	THPL/OPHO h.t.

SCIENTIFIC NAME**ABBREVIATION****TSUGA HETEROPHYLLA CLIMAX SERIES**

Tsuga heterophylla/Clintonia uniflora h.t.	TSHE/CLUN h.t.
-Clintonia uniflora phase	-CLUN phase
-Aralia nudicaulis phase	-ARNU phase

ABIES LASIOCARPA CLIMAX SERIES**Lower subalpine h.t.s**

Abies lasiocarpa/Oplopanax horridum h.t.	ABLA/OPHO h.t.
Abies lasiocarpa/Clintonia uniflora h.t.	ABLA/CLUN h.t.
-Clintonia uniflora phase	-CLUN phase
-Aralia nudicaulis phase	-ARNU phase
-Vaccinium caespitosum phase	-VACA phase
-Xerophyllum tenax phase	-XETE phase
-Menziesia ferruginea phase	-MEFE phase
Abies lasiocarpa/Galium triflorum h.t.	ABLA/GATR h.t.
Abies lasiocarpa/Vaccinium caespitosum h.t.	ABLA/VACA h.t.
Abies lasiocarpa/Calamagrostis canadensis h.t.	ABLA/CACA h.t.
-Calamagrostis canadensis phase	-CACA phase
-Galium triflorum phase	-GATR phase
-Vaccinium caespitosum phase	-VACA phase
Abies lasiocarpa/Linnaea borealis h.t.	ABLA/LIBO h.t.
-Linnaea borealis phase	-LIBO phase
-Xerophyllum tenax phase	-XETE phase
Abies lasiocarpa/Menziesia ferruginea h.t.	ABLA/MEFE h.t.
Tsuga mertensiana/Menziesia ferruginea h.t.	TSME/MEFE h.t.
Abies lasiocarpa/Xerophyllum tenax h.t.	ABLA/XETE h.t.
-Vaccinium globulare phase	-VAGL phase
-Vaccinium scoparium phase	-VASC phase
Tsuga mertensiana/Xerophyllum tenax h.t.	TSME/XETE h.t.
Abies lasiocarpa/Vaccinium globulare h.t.	ABLA/VAGL h.t.
Abies lasiocarpa/Vaccinium scoparium h.t.	ABLA/VASC h.t.
-Calamagrostis rubescens phase	-CARU phase
-Vaccinium scoparium phase	-VASC phase
-Thalictrum occidentale phase	-THOC phase
Abies lasiocarpa/Alnus sinuata h.t.	ABLA/ALSI h.t.
Abies lasiocarpa/Calamagrostis rubescens h.t.	ABLA/CARU h.t.
Abies lasiocarpa/Clematis pseudoalpina h.t.	ABLA/CLPS h.t.
Abies lasiocarpa/Arnica cordifolia h.t.	ABLA/ARCO h.t.
Abies lasiocarpa/Carex geyeri h.t.	ABLA/CAGE h.t.
-Carex geyeri phase	-CAGE phase
-Pseudotsuga menziesii phase	-PSME phase

Upper subalpine h.t.s

Abies lasiocarpa/Ribes montigenum h.t.	ABLA/RIMO h.t. ²
Abies lasiocarpa-Pinus albicaulis/Vaccinium scoparium h.t.	ABLA-PIAL/VASC h.t.
Abies lasiocarpa/Luzula hitchcockii h.t.	ABLA/LUHI h.t.
-Vaccinium scoparium phase	-VASC phase
-Menziesia ferruginea phase	-MEFE phase

SCIENTIFIC NAME**ABBREVIATION****Abies Lasiocarpa Climax Series (cont.)****Timberline h.t.s**

Pinus albicaulis-Abies lasiocarpa h.t.

PIAL-ABLA h.t.

Larix lyallii-Abies lasiocarpa h.t.

LALY-ABLA h.t.

Pinus albicaulis h.t.

PIAL h.t.

PINUS CONTORTA CLIMAX SERIES

Pinus contorta/Purshia tridentata h.t..

PICO/PUTR h.t.

Pinus contorta/Vaccinium caespitosum c.t.

PICO/VACA c.t.

Pinus contorta/Linnaea Borealis c.t.

PICO/LIBO c.t.

Pinus contorta/Vaccinium scoparium c.t.

PICO/VASC c.t.

Pinus contorta/Calamagrostis rubescens c.t.

PICO/CARU c.t.

Total Number of Habitat Types = 64

Total Number of Habitat Types, Phase, and Pinus contorta Community Type
Categories = 105

² Minor type in Montana; described in other study areas.

APPENDIX B

EXCERPT:

USDA Forest Service

Intermountain Research Station

General Technical Report INT-236

Revised April 1991

**FOREST HABITAT TYPES
OF NORTHERN IDAHO:
A SECOND APPROXIMATION**

Stephen V. Cooper

Kenneth E. Neiman

David W. Roberts

SCIENTIFIC NAME**ABBREVIATION****TSUGA HETEROPHYLLA SERIES**

T. heterophylla/Gymnocarpium dryopteris h.t.	TSHE/GYDR
T. heterophylla/Asarum caudatum h.t.	TSHE/ASCA
-Aralia nudicaulis phase	-ARNU
-Menziesia ferruginea phase	-MEFE
-Asarum caudatum phase	-ASCA
T. heterophylla/Clintonia uniflora h.t.	TSHE/CLUN
-Aralia nudicaulis phase	-ARNU
-Menziesia ferruginea phase	-MEFE
-Xerophyllum tenax phase	-XETE
-Clintonia uniflora phase	-CLUN
T. heterophylla/Menziesia ferruginea h.t.	TSHE/MEFE ²

THUJA PLICATA SERIES

T. plicata/Oplopanax horridum h.t.	THPL/OPHO
T. plicata/Athyrium filix-femina h.t.	THPL/ATFI
-Adiantum pedatum phase	-ADPE
-Athyrium filix-femina phase	-ATFI
T. plicata/Adiantum pedatum h.t.	THPL/ADPE
T. plicata/Gymnocarpium dryopteris h.t.	THPL/GYDR
T. plicata/Asarum caudatum h.t.	THPL/ASCA
-Menziesia ferruginea phase	-MEFE
-Taxus brevifolia phase	-TABR
-Asarum caudatum phase	-ASCA
T. plicata/Clintonia uniflora h.t.	THPL/CLUN
-Menziesia ferruginea phase	-MEFE
-Taxus brevifolia phase	-TABR
-Xerophyllum tenax phase	-XETE
-Clintonia uniflora phase	-CLUN

TSUGA MERTENSIANA SERIES

T. mertensiana/Streptopus amplexifolius h.t.	TSME/STAM
-Luzula hitchcockii phase	-LUHI
-Menziesia ferruginea phase	-MEFE
T. mertensiana/Clintonia uniflora h.t.	TSME/CLUN
-Menziesia ferruginea phase	-MEFE
-Xerophyllum tenax phase	-XETE
T. mertensiana/Menziesia ferruginea h.t.	TSME/MEFE
-Luzula hitchcockii phase	-LUHI
-Xerophyllum tenax phase	-XETE
T. mertensiana/Xerophyllum tenax h.t.	TSME/XETE
-Luzula hitchcockii phase	-LUHI
-Vaccinium scoparium phase	-VASC
-Vaccinium globulare phase	-VAGL
T. mertensiana/Luzula hitchcockii h.t.	TSME/LUHI ²

SCIENTIFIC NAME**ABBREVIATION****ABIES LASIOCARPA SERIES**

A. lasiocarpa/Calamagrostis canadensis h.t.	ABLA/CACA
-Ledum glandulosum phase	-LEGL
-Vaccinium caespitosum phase	-VACA ²
-Ligusticum canbyi phase	-LICA ²
-Calamagrostis canadensis phase	-CACA
A. lasiocarpa/Streptopus amplexifolius h.t.	ABLA/STAM
-Menziesia ferruginea phase	-MEFE
-Ligusticum canbyi phase	-LICA
A. lasiocarpa/Clintonia uniflora h.t.	ABLA/CLUN
-Menziesia ferruginea phase	-MEFE
-Xerophyllum tenax phase	-XETE
-Clintonia uniflora phase	-CLUN ²
A. lasiocarpa/Menziesia ferruginea h.t.	ABLA/MEFE
-Luzula hitchcockii phase	-LUHI
-Vaccinium scoparium phase	-VASC
-Coptis occidentalis phase	-COOC ²
-Xerophyllum tenax phase	-XETE
A. lasiocarpa/Vaccinium caespitosum h.t.	ABLA/VACA ²
A. lasiocarpa/Xerophyllum tenax h.t.	ABLA/XETE
-Luzula hitchcockii phase	-LUHI
-Vaccinium scoparium phase	-VASC
-Coptis occidentalis phase	-COOC
-Vaccinium globulare phase	-VAGL
A. lasiocarpa/Vaccinium globulare h.t.	ABLA/VAGL ²
A. lasiocarpa/Calamagrostis rubescens h.t.	ABLA/CARU ²
A. lasiocarpa/Vaccinium scoparium h.t.	ABLA/VASC ²
A. lasiocarpa/Luzula hitchcockii h.t.	ABLA/LUHI ²
Larix lyallii-Abies lasiocarpa communities	LALY-ABLA ²
Pinus albicaulis-Abies lasiocarpa communities	PIAL-ABLA ²

ABIES GRANDIS SERIES

A. grandis/Senecio triangularis h.t.	ABGR/SETR ²
A. grandis/Asarum caudatum h.t.	ABGR/ASCA
-Menziesia ferruginea phase	-MEFE
-Taxus brevifolia phase	-TABR
-Asarum caudatum phase	-ASCA
A. grandis/Clintonia uniflora h.t.	ABGR/CLUN
-Menziesia ferruginea phase	-MEFE
-Taxus brevifolia phase	-TABR
-Xerophyllum tenax phase	-XETE
-Physocarpus malvaceus phase	-PHMA
-Clintonia uniflora phase	-CLUN
A. grandis/Linnaea borealis h.t.	ABGR/LIBO
-Xerophyllum tenax phase	-XETE
-Linnaea borealis phase	-LIBO
A. grandis/Xerophyllum tenax h.t.	ABGR/XETE
-Coptis occidentalis phase	-COOC
-Vaccinium globulare phase	-VAGL
A. grandis/Vaccinium globulare h.t.	ABGR/VAGL ²

SCIENTIFIC NAME**ABBREVIATION****ABIES GRANDIS SERIES (CONT.)**

A. grandis/Physocarpus malvaceus h.t.	ABGR/PHMA
-Coptis occidentalis phase	-COOC
-Physocarpus malvaceus phase	-PHMA
A. grandis/Spiraea betulifolia h.t.	ABGR/SPBE

PSEUDOTSUGA MENZIESII SERIES

P. menziesii/Physocarpus malvaceus h.t.	PSME/PHMA
-Smilacina stellata phase	-SMST
-Physocarpus malvaceus phase	-PHMA
P. menziesii/Vaccinium caespitosum h.t.	PSME/VACA
P. menziesii/Vaccinium globulare h.t.	PSME/VAGL ²
P. menziesii/Symphoricarpos albus h.t.	PSME/SYAL ²
P. menziesii/Spiraea betulifolia h.t.	PSME/SPBE ²
P. menziesii/Calamagrostis rubescens h.t.	PSME/CARU
-Arctostaphylos uva-ursi phase	-ARUV
-Calamagrostis rubescens phase	-CARU
P. menziesii/Carex geyeri h.t.	PSME/CAGE ²
P. menziesii/Festuca idahoensis h.t.	PSME/FEID ²
P. menziesii/Agropyron spicatum h.t.	PSME/AGSP ²

PINUS CONTORTA SERIES

P. contorta/Vaccinium caespitosum c.t.	PICO/VACA ²
P. contorta/Xerophyllum tenax c.t.	PICO/XETE ²
P. contorta/Vaccinium scoparium h.t.	PICO/VASC ²

PINUS PONDEROSA SERIES

P. ponderosa/Physocarpus malvaceus h.t.	PIPO/PHMA
P. ponderosa/Symphoricarpos albus h.t.	PIPO/SYAL
P. ponderosa/Festuca idahoensis h.t.	PIPO/FEID ²
P. ponderosa/Agropyron spicatum h.t.	PIPO/AGSP ²

² Incidental habitat type, phase, or community type in northern Idaho; eliminated from some other tables and appendixes.

APPENDIX C

EXCERPT:

USDA Forest Service

Intermountain Research Station

General Technical Report INT-66

January 1980

**GRASSLAND AND SHRUBLAND
HABITAT TYPES OF
WESTERN MONTANA**

W. F. Mueggler

W. L. Stewart

KEY TO MAJOR GRASSLAND AND SHRUBLAND HABITAT TYPES IN WESTERN MONTANA

SCIENTIFIC NAMEABBREVIATION**STIPA COMATA CLIMAX SERIES**

Stipa comata/Bouteloua gracilis h.t.	STCO/BOCR h.t.
-Agropyron smithii phase	-AGSM phase

AGROPHYRON SPICATUM CLIMAX SERIES

Agropyron spicatum/Bouteloua gracilis h.t.	AGSP/BOGR h.t.
-Liatris punctata phase	-Lipun phase
Agropyron spicatum/Agropyron smithii phase	AGSP/AGSM h.t.
-Stipa viridula phase	-STVI phase
Agropyron spicatum/Poa sandbergii (Mont) h.t.	AGSP/BOGR h.t.
-Stipa comata phase	-STCO phase

FESTUCA SCABRELLA CLIMAX SERIES

Festuca scabrella/Agropyron spicatum h.t.	FESC/AGSP h.t.
-Stipa comata phase	-STCO phase
Festuca scabrella/Festuca idahoensis h.t.	FESC/FEID h.t.
-Geranium viscosissimum phase	-GEVI phase
-Stipa richardsonii phase	-STRI phase

FESTUCA IDAHOENSIS CLIMAX SERIES

Festuca idahoensis/Agropyron smithii h.t.	FEID/AGSM h.t.
Festuca idahoensis/Agropyron spicatum h.t.	FEID/AGSP h.t.
-Stipa occidentalis phase	-STOC phase
Festuca idahoensis/Agropyron caninum h.t.	FEID/AGCA h.t.
-Geranium viscosissimum phase	-GEVI phase
Festuca idahoensis/Carex filifolia h.t.	FEID/CAFI h.t.
Festuca idahoensis/Stipa richardsonii h.t.	FEID/STRI h.t.
Festuca idahoensis/Deschampsia caespitosa h.t.	FEID/DECA h.t.

DESCHAMPSIA CAESPITOSA CLIMAX SERIES

Deschampsia caespitosa/Carex spp. h.t.	FEID/CAREX h.t.
--	-----------------

ARTEMISIA ARBUSCULA CLIMAX SERIES

Artemisia arbuscula/Agropyron spicatum h.t.	ARAR/AGSP h.t.
-Stipa comata phase	-STCO phase
Artemisia arbuscula/Festuca idahoensis h.t.	ARAR/FEID h.t.

SCIENTIFIC NAME**ABBREVIATION****ARTEMISIA TRIDENTATA CLIMAX SERIES**

Artemisia tripartata/Agropyron spicatum (Mont) h.t.	ARTR/AGSP h.t.
Artemisia tridentata/Festuca scabrella h.t.	ARTR/FESC h.t.
Artemisia tridentata/Festuca idahoensis h.t.	ARTR/FEID h.t.
-Geranium viscosissimum phase	-GEVI phase

ARTEMISIA TRIPARTITA CLIMAX SERIES

Artemisia tripartita/Festuca idahoensis (Mont) h.t.	ATRI/FEID h.t.
---	----------------

PONTENTILLA FRUITCOSA CLIMAX SERIES

Potentilla fruitcosa/Festuca scabrella h.t.	POFR/FESC h.t.
-Danthonia intermedia phase	-DAIN phase
Potentilla fruitcosa/Festuca idahoensis h.t.	POFR/FEID h.t.

PURSHIA TRIDENTATA CLIMAX SERIES

Purshia tridentata/Agropyron spicatum (Mont) h.t.	PUTR/AGSP h.t.
Purshia tridentata/Festuca scabrella h.t.	PUTR/FESC h.t.
Purshia tridentata/Festuca idahoensis (Mont) h.t.	PUTR/FEID h.t.

CEROCARPUS LEDIFOLIUS CLIMAX SERIES

Cercarpus Ledifolius/Agropyron spicatum h.t.	CELE/AGSP h.t.
--	----------------

RHUS TRILOBATA CLIMAX SERIES

Rhus trilobata/Agropyron spicatum h.t.	RHTR/AGSP h.t.
Rhus trilobata/Festuca idahoensis h.t.	RHTR/FEID h.t.

SARCOBATUS VERMICULATUS CLIMAX SERIES

Sarcobatus vermiculatus/Agropyron smithii h.t.	SAVE/AGSM h.t.
Sarcobatus vermiculatus/Elymus cinereus h.t.	SAVE/ELCI h.t.

APPENDIX D**REPRESENTATIVE SOIL PROFILES FOR
SOIL TEMPERATURE AND MOISTURE MONITORING SITES**

Appendix E contains soil pedon descriptions excerpted from the soil surveys of the Flathead, Helena, Lolo, and Nez Perce National Forests. These soil pedon descriptions either describe a specific soil temperature/moisture monitoring site, or are a description of a representative soil pedon having similar soil characteristics to a soil temperature/moisture monitoring site. The representative soils may or may not match the soil occurring at a specific monitoring site in all physical characteristics. The soil temperature/moisture monitoring site or sites described by each soil pedon description are listed in the subtitle of each description.

FLATHEAD NATIONAL FOREST

REPRESENTATIVE SOIL PROFILES FOR

SOIL TEMPERATURE AND SOIL MOSITURE MONITORING SITES

GLOSSIC CRYOBORALFS
Fine-Silty, Mixed

REPRESENTATIVE PEDON - MONITORING SITES # 39, 40, and 41.

Soil colors are for moist soil unless otherwise indicated.

- Bs** 0 to 3 inches; dark yellowish brown (10YR 4/6) silt loam, yellowish brown (10YR 5/6) dry; weak very fine granular structure; soft, very friable, non-sticky and non-plastic; many fine and common medium roots; common very fine discontinuous interstitial pores; slightly acid; abrupt smooth boundary.
- 2E** 3 to 12 inches; light gray (2.5Y 7/2) silt loam, white (2.5Y 8/2) dry; moderate coarse subangular blocky structure parting to weak medium platy; hard, friable, slightly sticky and non-plastic; few very fine roots; common very fine discontinuous tubular pores; strongly acid; clear wavy boundary.
- 2E/B** 12 to 20 inches; 75 percent (E); light gray (2.5Y 7/2) silt loam, white (2.5Y 8/2) dry; with 25 percent (B) peds of pale yellow (2.5Y 7/4) silt loam, pale yellow (2.5Y 8/4) dry; moderate coarse subangular blocky structure parting to weak medium platy; hard, firm, slightly sticky and non-plastic; few very fine roots; few fine discontinuous interstitial pores; strongly acid; clear wavy boundary.
- 2B/E** 20 to 27 inches; 70 percent (B); pale yellow (2.5Y 7/4) silt loam, pale yellow (2.5Y 8/4) dry; with 30 percent (E) light gray (2.5Y 7/2) silt loam, white (2.5Y 8/2) dry; tongues 3/4- to 1 inch wide; moderate coarse subangular blocky structure parting to weak medium platy; hard, firm, sticky and non-plastic; few very fine roots; few fine discontinuous interstitial pores; slightly acid; diffuse wavy boundary.
- 2Bt** 27 to 45 inches; light yellowish brown (2.5Y 6/4) silt loam, pale yellow (2.5Y 8/3) dry; strong very coarse prismatic structure parting to moderate coarse platy; hard, firm, sticky and non-plastic; few very fine roots; few very fine roots on faces of peds; few very fine discontinuous interstitial pores; common moderately thick clay films on face of peds; neutral; diffuse wavy boundary.
- 2C** 45 to 60 inches; light gray (10YR 7/1) silt loam, white (10YR 8/2) dry; massive, 2- to 3-inch laminations; hard, firm, slightly sticky and non-plastic; few medium discontinuous tubular pores; neutral.

LOCATION AND SETTING: NW Montana, Flathead County, 300 feet east and 2000 feet north of SW corner, section 23, Map Unit 14-2. The profile described is in a depression on a moraine. Parent material is volcanic ash influenced loess overlying silty, lacustrine deposits. Elevation is 4900 feet. Vegetation is moist, mixed forest. Habitat type is subalpine fir/queencup beadleily.

AQUEPTS

REPRESENTATIVE PEDON - MONITORING SITES # 42,43, and 44.

Soil colors are for moist soil unless otherwise indicated.

- O 3 inches to 0; mosses, roots, and litter; clear smooth boundary.
- Ag 0 to 7 inches; light brownish gray (2.5Y 6/2) silt loam, light brownish gray (10YR 6/2) dry; few fine faint yellowish brown (10YR 5/6 and 5/8) and grayish brown (10YR 5/2) mottles; moderate medium platy structure parting to moderate fine platy; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine discontinuous interstitial pores; slightly acid; diffuse wavy boundary.
- Bgx 7 to 11 inches; light brownish gray (2.5Y 6/2) silt loam, light gray (10YR 7/1) dry; common fine distinct strong brown (7.5YR 5/6 and 5/8) and pinkish gray (7.5YR 6/2) mottles; moderate, coarse subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; dense and somewhat brittle; common very fine discontinuous random tubular pores; neutral; clear wavy boundary.
- Bg 11 to 18 inches; light yellowish brown (2.5Y 6/4) silt, light gray (10YR 7/1) dry; many large prominent strong brown (7.5YR 5/6 and 5/8) and pinkish gray (7.5YR 6/2) mottles; moderate, coarse subangular blocky structure; hard, firm, non-sticky and non-plastic; few very fine discontinuous random tubular pores; neutral; clear wavy boundary.
- Cg 18 to 60 inches; light gray (2.5Y 7/2) and pale yellow (2.5Y 7/4) variegated silt, light gray (10YR 7/1) and white (10YR 8/1) dry; moderate medium platy structure; hard, firm, non-sticky and non-plastic; few very fine discontinuous random tubular pores; strongly effervescent; moderately alkaline.

LOCATION AND SETTING: NW Montana, Flathead County; 150 feet west and 1300 feet north of the SE corner, section 15, Map Unit 14-3. The profile described is in a depression on a moraine. Elevation is 4500 feet. The parent material is silty lacustrine deposits. Vegetation is wet forest. Habitat type is subalpine fir/bluejoint.

ANDIC CRYOCHREPTS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITES # 37, 38, 93, 95, 96, 98, and 101.

Soil colors are for moist soil unless otherwise indicated.

- O 1 inch to 0; roots, needles and leaves.
- A 0 to 4 inches; brown (7.5YR 5/2) gravelly silt loam, pinkish gray (7.5YR 7/2) dry; weak very fine subangular blocky structure; soft, very friable, non-sticky and non-plastic; common fine and medium roots; many fine discontinuous interstitial pores; 15 percent pebbles; extremely acid; clear abrupt boundary.
- Bs 4 to 12 inches; brown (7.5YR 4/4) very gravelly silt loam, strong brown (7.5YR 5/6) dry; moderate fine subangular blocky structure; soft, very friable, non-sticky and non-plastic; common fine, few medium roots; common very fine discontinuous interstitial pores; 45 percent pebbles; very strongly acid; diffuse wavy boundary.
- 2Bw 12 to 32 inches; yellowish brown (7.5YR 4/4) extremely gravelly silt loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure; soft, very friable, non-sticky and non-plastic; few very fine discontinuous interstitial pores; 80 percent pebbles; strongly acid; abrupt irregular boundary.
- R 32 inches; fractured, slightly acid, strongly weathered argillite.

LOCATION AND SETTING: NW Montana, Flathead County, 1800 feet west and 900 feet north of SE corner, section 25, Map Unit 57-8. The profile described is on a 9 percent slope on a glaciated mountain ridge. Elevation is 6200 feet. Parent material is volcanic ash influenced loess overlying material weathered from argillite. Vegetation is lower subalpine forest. Habitat type is subalpine fir/grouse whortleberry, pinegrass phase.

DYSTRIC CRYOCHREPTS
Loamy-skeletal, mixed

REPRESENTATIVE PEDON - MONITORING SITE # 32, 33, 48, 49, and 50.

Soil colors are for moist soil unless otherwise indicated.

- O 2 to 0 inches; partially decomposed leaves and needles with many medium and fine roots.
- Bs 0 to 6 inches; dark yellowish brown (10YR 4/4) gravelly loam, pale brown (10YR 6/3) dry; weak fine granular structure; soft, very friable, non-sticky and non-plastic; common fine and medium, few coarse roots; many very fine continuous interstitial pores; 25 percent pebbles; medium acid; abrupt and wavy boundary.
- 2A 6 to 14 inches; grayish brown (10YR 5/2) very gravelly very fine sandy loam, light gray (10YR 7/2) dry; weak fine granular structure; slightly hard, friable, non-sticky and non-plastic; common medium and coarse roots; few very fine discontinuous interstitial pores; 40 percent pebbles; strongly acid; clear and wavy boundary.
- 2Bw 14 to 27 inches; light brownish gray (10YR 6/2) very gravelly very fine sandy loam, light gray (10YR 7/2) dry; weak very fine subangular blocky structure; soft, friable, non-sticky and non-plastic; common medium and coarse roots; few very fine discontinuous interstitial pores; 45 percent pebbles; very strongly acid; diffuse and wavy boundary.
- 2Cd 27 to 60 inches; light brownish gray (10YR 6/2) very gravelly very fine sandy loam, light gray (10YR 7/2) dry; massive; hard, brittle, non-sticky and non-plastic; few medium and coarse roots in cracks; 50 percent pebbles; strongly acid.

LOCATION AND SETTING: NW Montana, Flathead County, 1400 feet east and 800 feet south of NW corner, section 29, Map Unit 26D-8. The profile described is on a 25 percent slope on a glaciated mountain slope at 4,800 feet elevation. Parent material is glacial till derived primarily from quartzite. The surface layer forms in volcanic ash influenced loess mixed with underlying material. Vegetation is lower subalpine forest. Habitat type is subalpine fir/beargrass, blue huckleberry phase.

DYSTRIC EUTROCHREPTS
Loamy-Skeletal, Mixed, Frigid

REPRESENTATIVE PEDON - MONITORING SITES # 34, 35, 36, and 104.

Soil colors are for moist soil unless otherwise indicated.

0	3 inches to 0; semi-decomposed needles and leaves.
Bs	0 to 6 inches; brown (7.5YR 4/4) very gravelly silt loam, yellowish brown (10YR 5/6) dry; weak fine granular structure; soft, very friable, non-sticky and non-plastic; many fine and medium roots; many fine discontinuous interstitial pores; 50 percent pebbles; slightly acid; clear wavy boundary.
2Bw1	6 to 15 inches; light yellowish brown (2.5Y 6/4) extremely cobbly sandy loam, pale yellow (2.5Y 7/4) dry; weak fine subangular blocky structure; slightly hard, friable, non-sticky and non-plastic; common fine and medium roots; many fine discontinuous interstitial pores; 30 percent pebbles; 30 percent cobbles; medium acid; clear smooth boundary.
2Bw2	15 to 28 inches; light olive brown (2.5Y 5/4) extremely cobbly sandy loam, light yellowish brown (2.5Y 6/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and non-plastic; common fine, few medium roots, many fine discontinuous interstitial pores; 35 percent pebbles, 25 percent cobbles; slightly acid, clear smooth boundary.
2C	28 to 60 inches; light yellowish brown (2.5 Y 6/4) extremely cobbly loamy sand, pale yellow (2.5Y 7/4) dry; single grain; loose, very friable, non-sticky and non-plastic; few fine and medium roots; many medium discontinuous interstitial pores; 30 percent pebbles; 30 percent cobbles; slightly acid.

LOCATION AND SETTING: NW Montana, Flathead County, 1900 feet west and 1350 feet south of NE corner, section 6, Map Unit 27-7. The profile described is on a 10 percent slope on a terrace. Elevation is 3650 feet. Parent material is water reworked glacial till with a mantle of volcanic ash influenced loess. Vegetation is moist, mixed forest. Habitat type is western redcedar/queencup beadrily.

TYPIC EUTROBORALFS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITES # 97, and 99.

Soil colors are for moist soil unless otherwise indicated.

- O 2 inches to 0; decomposed needles; many very fine and fine roots, few medium and coarse roots.
- Bs 0 to 4 inches; dark yellowish brown (10YR 4/4) silt loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure; soft, friable, non-sticky and non-plastic; many fine and very fine roots, few medium and coarse roots; many very fine discontinuous interstitial pores; 5 percent pebbles; medium acid; abrupt smooth boundary.
- 2E 4 to 22 inches; pale brown (10YR 6/3) gravelly silt loam, very pale brown (10YR 7/3) dry; moderate medium subangular blocky structure; hard, firm, non-sticky and non-plastic; common very fine and fine roots, few medium roots; common fine discontinuous vesicular pores; 30 percent pebbles; medium acid; clear wavy boundary.
- 2Bt 22 to 30 inches; yellowish brown (10YR 5/4) very gravelly silt loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine and fine roots; common fine discontinuous interstitial pores; common moderately thick clay films on peds and in pores; 45 percent pebbles; neutral; clear wavy boundary.
- 2Bk 30 to 60 inches; yellowish brown (10YR 5/4) extremely gravelly silt loam, very pale brown (10YR 7/3) dry; massive; slightly hard, firm, slightly sticky and non-plastic; common fine discontinuous vesicular pores; 65 percent pebbles; lime disseminated throughout and coatings on the undersides of pebbles; strongly effervescent; mildly alkaline.

LOCATION AND SETTING: NW Montana, Flathead County, 900 feet west and 1700 feet north of SE corner, section 2, Map Unit 26G-7. The profile described is on a 5 percent slope on a moraine. Elevation is 4020 feet. Parent material is calcareous medium textured glacial till mantled by volcanic ash influenced loess. Vegetation is moist, mixed forest. Habitat type is spruce/dwarf huckleberry.

ANDEPTIC CRYOBORALFS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITES # 24, 25, 26, 27, 28, 29, 30, 31, 45, 46, 47, 94, 100, 102, and 103.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 3 inches; dark yellowish brown (10YR 4/4) silt loam, very pale brown (10YR 7/4) dry; moderate fine granular structure; soft, very friable, non-sticky and non-plastic; many very fine and fine roots, few coarse roots; many very fine discontinuous interstitial pores; 10 percent pebbles; strongly acid; abrupt smooth boundary.

- Bs 3 to 11 inches; dark yellowish brown (10YR 4/6) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; soft, very friable, non-sticky and non-plastic; common very fine and fine roots, few coarse roots; many very fine discontinuous interstitial pores; 10 percent pebbles; strongly acid; clear wavy boundary.

- 2E 11 to 29 inches; pale brown (10YR 6/3) very gravelly sandy loam, very pale brown (10YR 7/3) dry; moderate coarse subangular blocky structure; slightly hard, friable, non-sticky and non-plastic; few very fine, fine and medium roots; common fine discontinuous interstitial pores; 35 percent pebbles; medium acid; clear wavy boundary.

- 2Bt 29 to 43 inches; brown (10YR 5/3) very gravelly sandy clay loam, very pale brown (10YR 7/3) dry; strong coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few fine discontinuous interstitial pores; common moderately thick clay films on peds; 40 percent pebbles; neutral; gradual wavy boundary.

- 2Bk1 43 to 59 inches; brown (10YR 5/3) very gravelly sandy loam, very pale brown (10YR 7/3) dry; moderate coarse subangular blocky structure; slightly hard, friable, non-sticky and non-plastic; few very fine and fine roots; few fine discontinuous interstitial pores; few thin clay films on peds; 40 percent pebbles; lime disseminated throughout and coatings on the undersides of pebbles; strongly effervescent; mildly alkaline; gradual wavy boundary.

- 2Bk2 59 to 71 inches; brown (10YR 5/3) very gravelly sandy loam, very pale brown (10YR 7/3) dry; weak coarse subangular blocky structure; slightly hard, friable, non-sticky and non-plastic; 40 percent pebbles; lime disseminated throughout and coatings on the undersides of pebbles; slightly effervescent; mildly alkaline.

LOCATION AND SETTING: NW Montana, Flathead County, 2500 feet west and 2600 feet north of SE corner, section 27, Map Unit 26J-7. The profile described is on a 10 percent slope on a moraine. Elevation is 4100 feet. Parent material is calcareous, very gravelly sandy loam glacial till. Vegetation is moist, mixed forest. Habitat type is subalpine fir/twinflower.

Range of Characteristics for Andeptic Cryoboralf, Loamy-Skeletal, Mixed:

A horizon: Hue is 7.5YR or 10YR; value is 4 to 6 when moist and 5 to 7 when dry; and chroma is 2 to 4 moist or dry. Texture is silt loam or loam. Rock fragment content is 0 to 15 percent. Thickness is 0 to 4 inches.

Bs horizon: Hue is 7.5 YR or 10YR; value is 4 to 5 when moist and 5 to 7 when dry; and chroma is 2 to 6 moist or dry. Texture is silt loam or loam. Rock fragment content is 0 to 15 percent. Thickness is 3 to 10 inches.

2E horizon: Hue is 5YR to 10YR; value is 5 to 7 when moist and 6 to 8 when dry; and chroma is 2 or 3 moist or dry. Texture is silt loam, loam or sandy loam. Rock fragment content is 25 to 40 percent. Reaction is strongly to slightly acid. Thickness is 16 to 20 inches.

2Bt horizon: Hue is 5YR to 10YR; value is 4 to 6 when moist and 5 to 7 when dry; and chroma is 3 to 6 moist or dry. Texture is clay loam, silty clay loam, sandy clay loam, sandy loam, loam, or silt loam. Rock fragment content is 35 to 55 percent. Reaction is slightly acid to neutral. Thickness is 12 to 30 inches.

2Bk horizons: Hue is 5YR to 10YR; value is 5 to 7 when moist and 6 to 8 when dry; and chroma is 2 or 3 moist or dry. Texture is loam, silt loam, sandy loam or clay loam. Rock fragment content is 35 to 55 percent. These horizons are present only in some pedons; when parent materials are non-calcareous, they are replaced by non-calcareous 2Bt and 2C horizons. When 2C horizons are present, they can be dense and brittle when moist with dry bulk density of 1.5 to 1.8 grams/cubic centimeter.

HELENA NATIONAL FOREST
REPRESENTATIVE SOIL PROFILES FOR
SOIL TEMPERATURE AND SOIL MOSITURE MONITORING SITES

TYPIC ARGIBOROLLS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITES # 9, 13, 14, and 15.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 11 inches; black (10YR 2/1) silt loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; few very fine discontinuous interstitial pores; 5 percent pebbles; medium acid; abrupt wavy boundary.
- Bt1 11 to 19 inches; brown (10YR 4/3) very gravelly clay loam, brown (10YR 5/3) dry; strong medium angular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; few fine discontinuous interstitial pores; common thin clay films on face of peds and lining pores; 40 percent pebbles; slightly acid; clear wavy boundary.
- Bt2 19 to 32 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam, brown (10YR 5/3) dry; moderate coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine discontinuous random tubular pores; few thin clay films line pores; 45 percent pebbles; neutral; gradual wavy boundary.
- Bk 32 to 60+ inches; yellowish brown (10YR 5/3) very gravelly clay loam, pale brown (10YR 6/3) dry; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine discontinuous interstitial pores; 50 percent pebbles; finely divided lime disseminated throughout; slightly effervescent; mildly alkaline.

LOCATION AND SETTING: Broadwater County, Montana, NW 1/4, Sec. 4, T. 6 N., R. 1 W., Map Unit 110. The profile described is on a 10 percent slope on an alluvial fan. Parent material is alluvium. Elevation is 5360 feet. Vegetation is grass. Habitat type is Idaho fescue/rough fescue.

ARGIC CRYOBOROLLS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITE # 3, 5, and 17.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak coarse subangular blocky structure; soft, friable, nonsticky and nonplastic; common very fine roots; few very fine discontinuous vertical interstitial pores; 7 percent pebbles; neutral; abrupt smooth boundary.
- Bt1 10 to 17 inches; dark brown (10YR 4/3) very cobbly loam, brown (10YR 5/3) dry; moderate coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine roots; few fine discontinuous vertical tubular pores; very few thin clay films on faces of peds; 40 percent cobbles; neutral; clear wavy boundary.
- Bt2 17 to 26 inches; dark yellowish brown (10YR 4/6) very cobbly loam, yellowish brown (10YR 5/4) dry; weak very coarse subangular blocky; slightly hard, friable, nonsticky and nonplastic; common fine discontinuous vertical tubular pores; 45 percent cobbles; neutral; clear wavy boundary.
- CB 26 to 40 inches; yellowish brown (10YR 5/4) very cobbly loam, light yellowish brown (10YR 6/4) dry; massive; slightly hard, friable, nonsticky and slightly plastic; many medium continuous random interstitial pores; 55 percent cobbles; neutral.
- R 40 inches; fractured sandstone.

LOCATION AND SETTING: Broadwater County, Montana, SW 1/4, Sec. 29, T. 6 N., R. 1 W., Map Unit 39A. The profile described is on a 35 percent easterly aspect mountain slope. Parent material is derived from sandstone. Elevation is 6400 feet. Vegetation is shrubland. Habitat type is big sagebrush/rough fescue.

TYPIC HAPLOBOROLLS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITE # 8.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 11 inches; very dark gray (10YR 3/1) gravelly loam, grayish brown (10YR5/2) dry; weak fine and medium granular structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; common fine discontinuous interstitial pores; slightly effervescent; 20 percent angular pebbles; moderately alkaline; clear smooth boundary.
- Bw 11 to 27 inches; very dark grayish brown (10YR 3/2) very cobbly loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; soft, very friable, slightly sticky, nonplastic; common very fine roots; common fine discontinuous interstitial pores; strongly effervescent; 55 percent cobbles; moderately alkaline; abrupt wavy boundary.
- R 27 inches; fractured argillite.

LOCATION AND SETTING: Broadwater County, Montana, NE 1/4, Sec. 27, T. 6N, R. 4 E., Map Unit 390. The profile described is on a 40 percent westerly aspect mountain slope. Parent material is derived from weakly calcareous argillite. Elevation is 5800 feet. Vegetation is upper, mixed forest. Habitat type is Douglas fir/Idaho fescue.

TYPIC USTOCHREPTS
Loamy-Skeletal, Carbonatic, Frigid

REPRESENTATIVE PEDON - MONITORIN SITES # 21, 22, and 23.

Soil colors are for moist soil unless otherwise indicated.

- O 1 to 0 inches; slightly decomposed grass and fir needles.
- A 0 to 6 inches; dark brown (10YR 3/3) very gravelly loam, light brownish gray (10YR 6/2) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine, many medium, and few coarse roots; many very fine continuous interstitial pores; strongly effervescent; 35 percent angular limestone pebbles; moderately alkaline; clear wavy boundary.
- Bk1 6 to 26 inches; brown (10YR 5/3) extremely gravelly loam, white (10YR 8/2) dry; moderate medium subangular structure; soft, very friable, slightly sticky and nonplastic; many fine, common medium, few coarse roots; many very fine continuous interstitial pores; violently effervescent; 75 percent angular limestone pebbles; moderately alkaline; diffuse wavy boundary.
- Bk2 23 to 35 inches; brown (10YR 5/3) extremely gravelly silt loam, white (10YR 8/2) dry; very weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; few very fine roots on rock faces; common very fine continuous interstitial pores; finely divided lime disseminated throughout and lime pendants on the underside of pebbles; violently effervescent; 85 percent angular limestone pebbles; moderately alkaline.
- R 35 inches; fractured limestone.

LOCATION AND SETTING: Lewis and Clark County, Montana, SW 1/4, Sec. 31, T. 11 N., R. 1 E., Map Unit 210. The profile described is on a 55 percent southerly aspect slope on a structural breakland. Parent material is derived from limestone. Elevation is 4500 feet. Vegetation is lower, mixed forest. Habitat is Douglas-fir/bluebunch wheatgrass.

TYPIC USTOCHREPTS
Loamy-Skeletal, Mixed, Frigid

REPRESENTATIVE PEDON - MONITORING SITES # 4 and 7.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 8 inches; dark reddish brown (5YR 3/4) very channery sandy loam, pale red (2.5YR 6/2) dry; weak medium subangular blocky structure parting to weak very fine granular; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine continuous interstitial pores; 50 percent fragments; mildly alkaline; clear wavy boundary.
- Bw1 8 to 26 inches; dark reddish brown (2.5YR 3/4) very channery sandy loam, pinkish gray (5YR 7/2) dry; weak medium subangular blocky structure; soft very friable; slightly sticky and nonplastic; few fine roots; many very fine, continuous interstitial pores; 40-percent fragments; slightly effervescent; moderately alkaline; clear wavy boundary.
- Bw2 26 to 47 inches; dark reddish brown (2.5YR 3/4) extremely channery sandy loam, pinkish gray (5YR 7/2) dry; very weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine continuous interstitial pores; 85 percent fragments; strongly effervescent; moderately alkaline; clear smooth boundary.
- R 47 inches; fractured argillite.

LOCATION AND SETTING: Lewis and Clark County, Montana, NE 1/4, Sec. 30, T. 11 N., R. 1 E., Map Unit 39. The profile described is on a 45 percent southerly aspect mountain slope. Parent material is derived from argillite. Elevation is 4400 feet. Vegetation is upper, mixed forest. Habitat type is Douglas-fir/Idaho fescue.

TYPIC USTOCHREPTS
Sandy, Mixed, Frigid

REPRESENTATIVE PEDON - MONITORING SITES # 12, 16, 18, 19, and 20.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 2 inches; dark brown (10YR 3/3) gravelly sandy loam, brown (10YR 5/3) dry; very weak medium subangular blocky structure parting to weak medium and fine granular; soft, very friable, nonsticky and nonplastic; many fine, common medium roots; 15 percent subangular fine pebbles; slightly acid; clear wavy boundary.
- Bw1 2 to 16 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, very friable, nonsticky and nonplastic; common medium and coarse roots; 25 percent subangular fine pebbles; slightly acid; clear wavy boundary.
- Bw2 16 to 30 inches; olive brown (2.5Y 4/4) gravelly loamy sand, light yellowish brown (2.5Y 6/4) dry; single grain; soft, loose, nonsticky and nonplastic; few medium roots; 30 percent subangular fine pebbles; slightly acid; abrupt wavy boundary.
- Cr 30 to 60 inches; soft, moderately weathered granite.

LOCATION AND SETTING: Lewis and Clark County, Montana, SE 1/4, Sec. 6, T. 8 N., R. 2 W., Map Unit 26. The profile described is on a 20 percent southerly aspect slope on rolling uplands. Parent material is derived from granite. Vegetation is lower mixed forest. Habitat type is Douglas-fir/pinegrass, kinnikinnick phase.

ANDIC CRYOCHREPTS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITE # 11.

Soil colors are for moist soil unless otherwise indicated.

- Bs 0 to 8 inches; dark yellowish brown (10YR 4/4) loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; common fine, few very fine roots; many very fine continuous interstitial pores; 5 percent angular pebbles; strongly acid; clear wavy boundary.
- 2A 8 to 16 inches; brown (10YR 5/3) very cobbly coarse sandy loam, light gray (10YR 7/1) dry; very weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and very fine roots; common very fine continuous interstitial pores; few small very pale brown (10YR 7/4) mottles; 35 percent cobbles; strongly acid; gradual wavy boundary.
- 2Bw1 16 to 24 inches; yellowish brown (10YR 5/3) very cobbly coarse sandy loam, light gray (10YR 7/1) dry; moderate medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine roots; common very fine continuous interstitial pores; 40 percent cobbles; extremely acid; gradual wavy boundary.
- 2Bw2 24 to 37 inches; yellowish brown (10YR 5/3) very cobbly coarse sandy loam, light gray (10YR 7/1) dry; single grain; loose, loose, nonsticky and nonplastic; common fine continuous intersitial pores; 35 percent cobbles; extremely acid; abrupt wavy boundary.
- R 37 inches; fractured rhyolite.

LOCATION AND SETTING: Lewis and Clark County, Montana, NE 1/4, Sec. 25 T. 14 N., R. 7 W., Map Unit 58. The profile described is on a 30 percent southeasterly aspect mountain ridge. Parent material is volcanic ash influenced loess overlying material derived from rhyolite. Elevation is 6600 feet. Vegetation is lower subalpine forest. Habitat type is subalpine fir/beargrass.

TYPIC CRYOCHREPTS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITE # 10.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 4 inches; dark brown (10YR 4/3) very cobbly loam, pale brown (10YR 6/3) dry; weak medium and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common medium and coarse roots; common fine continuous random interstitial pores; 40 percent cobbles; slightly acid; clear wavy boundary.
- Bw1 4 to 10 inches; yellowish brown (10YR 5/4) very cobbly loam, very pale brown (10YR 7/4) dry; weak medium subangular blocky structure parting to weak medium and fine granular; slightly hard, friable; slightly sticky and slightly plastic; common fine continuous random interstitial pores; 60 percent cobbles; slightly acid; clear wavy boundary.
- Bw2 10 to 20 inches; yellowish brown (10YR 5/6) extremely cobbly loam, very pale brown (10YR 7/4) dry; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; few fine continuous random interstitial pores; 80 percent cobbles; neutral; clear wavy boundary.
- Bw3 20 to 40 inches; yellowish brown (10YR 5/6) extremely cobbly loam, very pale brown (10YR 7/4) dry; massive; slightly hard, friable, slightly sticky and slightly plastic; 80 percent cobbles; neutral; abrupt wavy boundary.
- R 40 inches; fractured basalt.

LOCATION AND SETTING: Lewis and Clark County, Montana, NW 1/4, Sec. 5, T. 15 N., R. 6 W., Map Unit 44. The profile described is on a 50 percent northwesterly aspect mountain slope. Parent material is derived from basalt. Elevation is 5890 feet. Vegetation is upper, mixed forest. Habitat type is subalpine fir/beargrass, blue huckleberry phase.

TYPIC EUTROBORALFS
Loamy-Skeletal, Mixed

REPRESENTATIVE PEDON - MONITORING SITES # 1 and 6.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 4 inches; dark grayish brown (10YR 4/2) very gravelly loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; many fine and medium roots; 40 percent pebbles; slightly acid; clear wavy boundary.
- Bt 4 to 20 inches; yellowish brown (10YR 5/4) very gravelly clay loam, very pale brown (10YR 7/4) dry; weak medium angular blocky structure parting to moderate medium granular; slightly hard, slightly firm, slightly sticky and slightly plastic; common fine and medium roots; common clay films in pores; 55 percent pebbles; neutral, clear, wavy boundary.
- CB 20 to 55 inches; brown (10YR 5/3) extremely gravelly loam, very pale brown (10YR 7/3) dry; weak granular structure; slightly hard, friable, slightly sticky and slightly plastic; few medium roots; slightly effervescent; 50 percent angular cobbles, 30 percent angular pebbles; moderately alkaline; abrupt irregular boundary.
- R 55 inches; hard, fractured argillite.

LOCATION AND SETTING: Lewis and Clark County, Montana, SE 1/4, Sec. 9, T. 13 N., R. 7 W., Map Unit 380. The profile described is on a 50 percent southerly aspect mountain slope. The parent material is derived from argillite. Elevation is 6200 feet. Vegetation is upper, mixed forest. Habitat type is Douglas-fir/elk sedge.

TYPIC CRYOBORALFS
Fine-Loamy, Mixed

REPRESENTATIVE PEDON - MONITORING SITE # 2.

Soil colors are for moist soil unless otherwise indicated.

- A1 0 to 7 inches; brown (10YR 4/3) coarse sand, pale brown (10YR 6/3) dry; weak coarse subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; common very fine, common fine, and few medium roots; many very fine continuous interstitial pores; 10 percent pebbles; medium acid; abrupt wavy boundary.
- A2 7 to 23 inches; brown (10YR 4/3) gravelly coarse sandy loam, pale brown (10 YR 6/3) dry; weak medium subangular blocky structure; hard, friable, nonsticky and nonplastic; few fine and medium roots; common fine continuous interstitial pores; 25 percent pebbles; medium acid; diffuse wavy boundary.
- Bt 23 to 57 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam, light yellowish brown (10YR 6/4) dry; strong very coarse angular blocky structure; very hard, friable, slightly sticky and slightly plastic; few very fine roots; common fine discontinuous interstitial pores; many moderately thick clay films on face of peds and in pores; 25 percent pebbles; slightly acid; abrupt smooth boundary.
- CB 57 to 60+ inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam, very pale brown (10YR 7/3) dry; massive; hard, friable, slightly sticky and slightly plastic; common medium discontinuous interstitial pores; 40 percent pebbles; medium acid.

LOCATION AND SETTING: Lewis and Clark County, Montana, SW 1/4, Sec. 6, T. 8 N., R. 2 W., Map Unit 36. The profile described is on a 15 percent westerly aspect slope on rolling uplands. Parent material is derived from granite. Elevation is 5440 feet. Vegetation is upper, mixed forest. Habitat type is Douglas-fir/snowberry.

DYSTRIC CRYOCHREPTS
Sandy-Skeletal, Mixed

REPRESENTATIVE PEDON: Soil colors are for moist soil unless otherwise indicated.

- O 2 to 0 inches; litter; weakly decomposed needles and twigs.
- A 0 to 6 inches; brown (7.5YR 5/2) very gravelly sandy loam, pinkish gray (7.5YR 7/2) dry; weak very fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; many fine continuous interstitial pores; 40 percent pebbles; neutral; clear wavy boundary.
- Bw 6 to 14 inches; brown (7.5YR 5/2) very gravelly sandy loam, pinkish white (7.5YR 8/2) dry; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine common medium roots; many medium continuous interstitial pores; 50 percent pebbles; medium acid; clear wavy boundary.
- CB 14 to 38 inches; brown (7.5YR 5/2) extremely cobbly coarse loamy sand, pinkish white (7.5YR 8/2) dry; single grain; loose, loose, nonsticky and nonplastic many medium continuous interstitial pores; 80 percent cobbles; medium acid.
- R 38 inches; fractured rhyolite.

LOCATION AND SETTING: Lewis and Clark County, Montana, NE 1/4, Sec. 35, T. 14 N., R. 7 W., Map Unit 48. The profile described is on a 45 percent southeasterly aspect mountain slope. Parent material is derived from rhyolite. Elevation is 6500 feet. Vegetation is lower subalpine forest. Habitat type is subalpine fir/beargrass.

Range of Characteristics: Bedrock is at a depth of 20 to 40 inches.

O horizon: Thickness is 1/2 to 3 inches.

A horizon: Hue is 7.5YR or 10YR; value is 4 to 6 moist and 5 to 7 dry; chroma is 1 to 3 moist or dry. Texture is loam or sandy loam. Rock fragment content is 15 to 50 percent. Reaction is medium acid to neutral. Thickness is 4 to 10 inches.

Bw horizon: Hue is 7.5YR or 10YR; value is 4 to 6 moist and 5 to 7 dry; chroma is 2 to 4 moist or dry. Rock fragment content is 35 to 80 percent. Reaction is extremely to medium acid. Thickness is 10 to 20 inches.

CB horizon: Hue is 7.5YR or 10Y; value is 4 to 6 moist and 5 to 8 dry; chroma is 2 to 4 moist or dry. Rock fragment content is 35 to 80 percent. Reaction is extremely to medium acid.

LOLO NATIONAL FOREST

REPRESENTATIVE SOIL PROFILES FOR

SOIL TEMPERATURE AND SOIL MOSITURE MONITORING SITES

TYPIC EUTROBORALFS
Loamy-Skeletal, Mixed

REFERENCE PEDON - MONITORING SITE # 84 and 85.

Colors are for moist soil unless otherwise indicated.

- E 0 to 10 inches; dark yellowish brown (10YR 4/4) very gravelly silt loam, pale brown (10YR 6/3) dry; weak fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine, common medium roots; 40 percent pebbles; slightly acid; abrupt wavy boundary.
- Bt 10 to 30 inches; yellowish brown (10YR 5/6) very gravelly silt loam, yellow (10YR 7/6) dry; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common fine, few coarse roots; common thin clay films lining pores; 40 percent pebbles; neutral; abrupt wavy boundary.
- Bk 30 to 48 inches; brown (10YR 5/3) very gravelly silt loam, light gray (10YR 7/2) dry; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; violently effervescent; finely divided lime disseminated throughout; moderately alkaline; 35 percent pebbles; clear wavy boundary.
- Cr 48+ inches; soft, calcareous, weathered metasedimentary rocks.

LOCATION AND SETTING: West-central Montana; Ninemile Divide; Flat Creek drainage; SW1/4 of SE1/4, section 18, T17N, R25W, map unit 60MC. This soil is formed in material derived from weathered metasedimentary rocks on a stream breakland. The slope gradient is 65 percent on a west aspect at 5,120 feet elevation. The habitat type is Douglas-fir/ninebark-ninebark.

ANDIC DYSTRIC EUTROCHREPTS

Loamy-Skeletal, Mixed, Frigid

REFERENCE PEDON -MONITORING SITES # 87, 88, and 89.

Colors are for moist soil unless otherwise indicated.

- O 6 to 0 inches; partially decomposed forest litter.
- Bs 0 to 8 inches; dark brown (7.5YR 4/4) silt loam, light brown (7.5YR 6/4) dry; weak fine subangular blocky structure; soft, friable, nonsticky and nonplastic; many medium, few fine and coarse roots; 10 percent cobbles; medium acid; clear wavy boundary.
- 2Bw1 8 to 14 inches; light gray (10YR 7/1) gravelly fine sandy loam, white (10YR 8/1) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine and medium roots; 10 percent pebbles, 5 percent cobbles; neutral; clear wavy boundary.
- 2Bw2 14 to 29 inches; light gray (10YR 7/1) very gravelly sandy loam, white (10YR 8/1) dry; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine and medium roots; 35 percent pebbles; 5 percent cobbles; neutral; gradual irregular boundary.
- 2Bw3 29 to 60 inches; very pale brown (10YR 7/3) very gravelly sandy loam, very pale brown (10YR 8/3) dry; weak fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few medium and coarse roots; 45 percent pebbles; 5 percent cobbles; neutral.

LOCATION AND SETTING: West-central Montana; Cabinet Mountains; North Fork Murr Creek drainage; E1/2 of SE1/4, section 35, T26 N, R26W; map unit 30QD. This soil is formed in volcanic ash influenced loess overlying material derived from metasedimentary rocks on a mountain slope. The slope gradient is 37 percent on a northwest aspect at 4,600 feet elevation. The habitat type is grand fir/queencup beadlily.

TYPIC USTOCHREPTS

Loamy-Skeletal, Mixed, Frigid

REFERENCE PEDON - MONITORING SITES # 82, 83, 86, and 91.

Colors are for moist soil unless otherwise indicated.

- O 1 to 0 inches; forest litter.
- A 0 to 9 inches; dark grayish brown (10YR 4/2) gravelly silt loam, light brownish gray (10YR 6/2) dry; moderate fine subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine and fine, few medium and coarse roots; 20 percent pebbles; neutral; abrupt smooth boundary.
- Bw1 9 to 19 inches; dark grayish brown (2.5Y 4/2) very gravelly silt loam, light brownish gray (2.5Y 6/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium; few coarse roots; 50 percent pebbles; neutral; clear smooth boundary.
- Bw2 19 to 28 inches; very dark grayish brown (2.5Y 3/2) extremely gravelly silt loam, grayish brown (2.5Y 5/2) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few fine, medium, and coarse roots; 45 percent pebbles, 20 percent cobbles; moderately alkaline; clear smooth boundary.
- Bk 28 to 60 inches; grayish brown (2.5Y 5/2) extremely gravelly silt loam, light gray (10YR 7/1) dry; moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few, medium and fine roots; violently effervescent; finely divided lime disseminated throughout; 40 percent pebbles, 20 percent cobbles; moderately alkaline.

LOCATION AND SETTING: West-central Montana; Ninemile Divide; Houle Creek; SW1/4 NW1/4, section 8, T15N, R21W; map unit 30MB. This soil is formed in material derived from metasedimentary rocks on a mountain slope. The slope gradient is 50 percent on a southwest aspect at 4,800 feet elevation. The habitat type is Douglas-fir/ninebark-pinegrass.

CALCIXEROLIC XEROCHREPTS

Loamy-Skeletal, Mixed, Frigid

REFERENCE PEDON - MONITORING SITE # 90.

Colors are for moist soil unless otherwise indicated.

- A 0 to 4 inches; dark grayish brown (10YR 4/2) gravelly silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; common fine, few medium roots; 30 percent pebbles; moderately alkaline; clear smooth boundary.
- Bw1 4 to 13 inches; grayish brown (10YR 5/2) very gravelly silt loam, light gray (10YR 7/2) dry; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common medium, few coarse roots; 40 percent pebbles; mildly alkaline; gradual smooth boundary.
- Bw2 13 to 20 inches; grayish brown (2.5Y 5/2) very gravelly silt loam, light gray (2.5Y 7/2) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; 25 percent pebbles, 15 percent cobbles; neutral; clear smooth boundary.
- Bw3 20 to 29 inches; olive brown (2.5Y 4/4) very gravelly silt loam, light yellowish brown (2.5Y 6/4) dry; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine, medium, and coarse roots; 40 percent pebbles; neutral; clear smooth boundary.
- Bk 29 to 60 inches; olive brown (2.5Y 4/4) very gravelly silt loam, light yellowish brown (2.5Y 6/4) dry; very weak medium subangular blocky structure; hard, firm, nonsticky and nonplastic; few medium and coarse roots; violently effervescent with finely divided lime disseminated throughout; 30 percent pebbles; 10 percent cobbles; moderately alkaline.

LOCATION AND SETTING: West-central Montana; Ninemile Divide; Houle Creek; NW1/4 of NE1/4, section 7, 15N, R21W; map unit 60MA. This soil is formed in material derived from metasedimentary rocks on a stream breakland. The slope gradient is 75 percent on a west aspect at 4,400 feet elevation. The habitat type is Douglas-fir/Idaho fescue.

TYPIC HAPLOXEROLLS

Loamy-Skeletal, Mixed, Frigid

REFERENCE PEDON -MONITORING SITE # 92.

Colors are for moist soil unless otherwise indicated.

- O 1 to 0 inches; partially decomposed forest litter.
- A1 0 to 6 inches; very dark brown (10YR 2/2) gravelly loam, dark brown (10YR 4/3) dry; weak medium granular structure; soft, very friable, nonsticky and slightly plastic; many very fine and fine, common medium roots; 30 percent pebbles; neutral; clear smooth boundary.
- A2 6 to 11 inches; dark brown (10YR 3/3) very gravelly loam, brown (10YR 5/3) dry; weak medium subangular blocky structure; soft, friable, nonsticky and slightly plastic; many very fine, fine, and medium roots; 30 percent pebbles, 5 percent cobbles; slightly acid; clear smooth boundary.
- Bw1 11 to 20 inches; light brownish gray (10YR 6/2) very gravelly sandy loam, light gray (10YR 7/1) dry; weak fine subangular blocky structure; hard, friable, nonsticky and nonplastic; common medium, few fine roots; 40 percent pebbles, 10 percent cobbles; neutral; clear smooth boundary.
- Bw2 20 to 48 inches; light gray (10YR 7/2) very gravelly sandy loam, white (10YR 8/1) dry; moderate fine angular blocky structure; hard, very friable, nonsticky and nonplastic; few fine and medium roots; 40 percent pebbles, 15 percent cobbles; slightly acid; clear smooth boundary.
- C 48 to 60 inches; light gray (10YR 7/2) extremely gravelly sandy loam, white (10YR 8/1) dry; massive; hard, friable, nonsticky and nonplastic; 55 percent pebbles, 15 percent cobbles; slightly acid.

LOCATION AND SETTING: West-central Montana; Ninemile Divide; Sixmile Creek; SW1/4 of SW1/4, section 35, T16N, R22W, map unit 30QA. This soil is formed in material derived from metasedimentary rocks on a mountain slope. The slope gradient is 40 percent on a south aspect at 4,640 feet elevation. The habitat type is Douglas-fir/pinegrass-bluebunch wheatgrass.

NEZ PERCE NATIONAL FOREST
REPRESENTATIVE SOIL PROFILES FOR
SOIL TEMPERATURE AND SOIL MOSITURE MONITORING SITES

ANDEPTIC CRYOBORALFS

REFERENCE PEDON - MONITORING SITE # 67, 68, and 77.

Soil colors are for moist soil unless otherwise indicated.

- O 2 to 0 inches; undecomposed to partially decomposed forest litter.
- Bs 0 to 9 inches; brown to dark brown (7.5YR 4/4) gravelly silt loam; moderate medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; 25 percent pebbles; medium acid; clear smooth boundary.
- 2BA 9 to 15 inches; brown to dark brown (10YR 4/3) very gravelly silt loam; moderate medium subangular blocky structure breaking to moderate medium granular; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, medium and coarse roots; 45 percent pebbles; strongly acid; clear wavy boundary.
- 2Btl 15 to 27 inches; dark yellowish brown (10YR 4/4) very gravelly silt loam; moderate medium subangular blocky structure breaking to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine, many medium roots, common faint clay films on faces of peds and lining tubular, and interstitial pores; 50 percent pebbles; medium acid; clear smooth boundary.
- 2Bt2 27 to 44 inches; dark yellowish brown (10YR 4/4) very gravelly silty clay loam; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine and medium roots; clay films on pebbles; 40 percent pebbles; strongly acid; abrupt smooth boundary.
- 3Bt3 44 to 60 inches; brown to dark brown (10YR 4/4) extremely gravelly clay loam; 90 percent pebbles; medium acid.

LOCATION AND SETTING: North Central Idaho, Idaho County, Mill Creek, Adams Work Center, NW 1/4 of SW 1/4, Sec. 25, T. 27 N., R. 3 E., Map Unit 22AHR. The Reference Pedon has formed in volcanic ash influenced loess over material derived from basalt. It is on low relief rolling uplands at 5200 feet elevation. The slope gradient is 20 percent and the aspect is westerly. The habitat type is grand fir/beargrass-goldthread. The Reference Pedon is an Andeptic Cryoboralf, loamy-skeletal, mixed. An Andeptic Cryoboralf, fine-loamy, mixed soil differs from the reference pedon by having less rock fragments in the subsoil.

*MOLLIC CRYOBORALFS**REFERENCE PEDON - MONITORING SITE # 61.*

Soil colors are for moist soil unless otherwise indicated.

- Oe 2 to 1 inches; partially decomposed litter.
- Oa 1 to 0 inches; decomposed litter.
- A1 0 to 4 inches; very dark grayish brown (10YR 3/2) gravelly silt loam; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, medium and coarse, few fine roots; 15 percent pebbles; neutral; abrupt wavy boundary.
- A2 4 to 11 inches; dark brown (10YR 3/3) gravelly silt loam; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine, few fine, many medium and coarse roots; 20 percent pebbles; slightly acid; clear wavy boundary.
- Bt1 11 to 27 inches; dark yellowish brown (10YR 4/4) very gravelly silt loam; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine, fine, many medium and coarse roots; few faint clay films on faces of peds; 50 percent pebbles; medium acid; clear wavy boundary.
- Bt2 27 to 36 inches; yellowish brown (10YR 5/4) extremely gravelly silt loam; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine, fine, common medium and coarse roots; few faint clay films on faces of peds; 70 percent pebbles; medium acid; abrupt wavy boundary.
- Cr 36 to 37 inches; fractured andesite.

LOCATION AND SETTING: North Central Idaho, Idaho County, Salmon River drainage, Wickiup Butte, SW 1/4, Sec. 1, T. 25 N., R. 1 W., Map Unit 32AHP. The Reference Pedon has formed in materials derived from andesite. It is on the upper slope of a gently sloping mountain slope at 5080 feet elevation. The aspect is northerly and the slope gradient is 30 percent. The habitat type is grand fir/ninebark. The Reference Pedon is a Mollic Cryoboralf, loamy-skeletal, mixed.

*EUTRIC GLOSSOBORALFS**REFERENCE PEDON - MONITORING SITE # 76.*

Soil colors are for moist soil unless otherwise indicated.

- A1 0 to 9 inches; brown to dark brown (7.5YR 4/3) silt loam; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine, fine, medium and coarse roots; 10 percent rounded quartz pebbles; slightly acid; abrupt wavy boundary.
- 2A2 9 to 15 inches; dark yellowish brown (10YR 3/4) extremely cobbly sandy loam; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common fine and medium roots; 30 percent rounded quartz pebbles and 40 percent rounded quartz cobbles; medium acid; clear wavy boundary.
- 2E 15 to 31 inches; brown to dark brown (10YR 4/3) very gravelly sandy loam; moderate medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; few fine roots; 35 percent rounded quartz pebbles and 10 percent rounded quartz cobbles; slightly acid; abrupt wavy boundary.
- 2Bt1 31 to 53 inches; yellowish brown (10YR 5/6) very gravelly sandy clay loam; strong medium angular blocky structure; very hard, very firm, sticky and very plastic; many faint clay films on faces of peds and pores; 30 percent rounded quartz pebbles and 10 percent rounded quartz cobbles; strongly acid; clear wavy boundary.
- 2Bt2 53 to 60 inches; yellowish brown (10YR 5/6) very gravelly sandy clay loam; strong coarse angular blocky structure; very hard, very firm, sticky and very plastic; many faint clay films on faces of peds and pores; 40 percent rounded quartz pebbles and 10 percent rounded quartz cobbles; medium acid.

LOCATION AND SETTING: North Central Idaho, Idaho County, South Fork of the Clearwater River, Mill Creek drainage, NW of NW 1/4, Sec. 8, T. 29 N., R. 7 E., Map Unit 46AHC. The Reference Pedon has formed in volcanic ash influenced loess deposits over Tertiary sediments derived from quartzite and schist. It is on a gently sloping glacial moraine at 5340 feet elevation. The slope gradient is 20 percent and the aspect is southwesterly. The habitat type is grand fir/queencup beadrily-beargrass. The Reference Pedon is an Eutric Glossoboralf, loamy-skeletal, mixed.

*ENTISOLS**REFERENCE PEDON - MONITORING SITE # 58.*

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 8 inches; dark brown (7.5YR 4/4) gravelly sandy loam; single grain to weak granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots, 15 percent rounded pebbles; strongly acid; gradual smooth boundary.
- 2C 8 to 31 inches; yellowish brown (10YR 5/6) very gravelly sand; single grain; loose, non-sticky and nonplastic; 30 percent rounded pebbles, 10 percent rounded cobbles; medium acid; clear wavy boundary.
- 3C 31 to 38 inches; yellowish brown (10YR 5/6) sand; single grain; loose, nonsticky and nonplastic; 5 percent rounded pebbles, 5 percent rounded cobbles, discontinuous bands 3 inches thick of gravel and cobble; medium acid; clear smooth boundary.
- 4C 38 to 50 inches; yellowish brown (10YR 5/4) extremely cobbly sand; single grain; loose, nonsticky and nonplastic; 40 percent rounded pebbles, 30 percent rounded cobbles; strongly acid; very dark gray bands high in organic matter at the base of this horizon; abrupt smooth boundary.
- 5C 50 to 97 inches; reddish yellow (7.5YR 6/6) very gravelly sand; single grain, loose, non-sticky and nonplastic; 35 percent rounded pebbles, 3 percent rounded cobbles; very strongly acid.

LOCATION AND SETTING: North Central Idaho, Idaho County, American River, Buffalo Gulch, NW of Sw 1/4, Sec. 28, T. 29 N., R. 8 E., Map Unit 10AUU. This soil has formed in alluvium on a stream flood plain at an elevation of 4000 feet. The habitat type is estimated to be subalpine fir/blue huckleberry. The Reference Pedon is a Typic Cryofluvent, sandy-skeletal, mixed. These soils are not extensive in the survey area.

CRYOCHREPTS

REFERENCE PEDON - MONITORING SITES # 81 and 75.

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 2 inches; dark brown (7.5YR 3/2) gravelly loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic, common fine, medium and coarse roots; 20 percent pebbles; slightly acid; abrupt wavy boundary.
- Bs 2 to 9 inches; brown to dark brown (7.5YR 4/4) gravelly silt loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic, common medium and coarse roots; 20 percent pebbles; slightly acid; abrupt wavy boundary.
- 2Bw 9 to 14 inches; brown to dark brown (10YR 4/3) very gravelly loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; 30 percent pebbles and 10 percent cobbles; strongly acid; clear wavy boundary.
- 2C1 14 to 24 inches; yellowish brown (10YR 5/4) very cobbly loamy sand; single grained; loose, loose, nonsticky and nonplastic; few medium and coarse roots; 30 percent pebbles, 20 percent cobbles; 5 percent stones; medium acid; clear wavy boundary.
- 2C2 23 to 38 inches; light yellowish brown (10YR 6/4) extremely stony sand; single grained; soft, very friable, nonsticky and nonplastic; 20 percent pebbles; 20 percent cobbles; 20 percent stones; 10 percent boulders; medium acid.
- R granite bedrock

LOCATION AND SETTING: North Central Idaho, Idaho county, Elk Mountain, NE 1/4, Sec. 34, T. 30 N., R. 11 E., Map Unit 41E67. The Reference Pedon has formed in volcanic ash influenced loess over material derived from granitic rocks. It is midslope on a cirque headwall at 6290 feet elevation. The slope gradient is 65 percent and the aspect is westerly. The habitat type is subalpine fir/beargrass-woodrush. The Reference Pedon is an Andic Cryochrept, sandy-skeletal, mixed.

ANDIC CRYOCHREPTS

REFERENCE PEDON - MONITORING SITES # 79 and 80.

Soil colors are for moist soil unless otherwise indicated.

A	0 to 5 inches; brown to dark brown (7.5YR 4/4) silt loam; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many fine, medium and coarse roots, slightly acid; abrupt wavy boundary.
Bs	5 to 13 inches; yellowish brown (10YR 5/6) gravelly silt loam; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium and coarse roots; 15 percent pebbles; slightly acid; abrupt wavy boundary.
2Bw	13 to 18 inches; yellowish brown (10YR 5/4) gravelly fine sandy loam; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine, medium and coarse roots; 25 percent pebbles and cobbles; strongly acid; abrupt wavy boundary.
2C1	18 to 30 inches; brownish yellow (10YR 6/6) very gravelly coarse sandy loam; massive; slightly hard, firm, nonsticky and nonplastic; few fine and medium roots; 40 percent pebbles and cobbles; strongly acid; abrupt wavy boundary.
2C2	30 to 37 inches; brownish yellow (10YR 6/6) very gravelly coarse sandy loam; massive; slightly hard, firm, nonsticky and nonplastic; few very fine roots; 40 percent pebbles and cobbles; strongly acid; clear wavy boundary.
2C3	37 to 50 inches; yellow (10YR 7/6) very gravelly coarse sandy loam; massive; slightly hard, firm, slightly sticky and slightly plastic; few very fine roots; 50 percent pebbles and cobbles; strongly acid; clear wavy boundary.
2C4	50 to 60 inches; yellow (10YR 7/6) very gravelly coarse sandy loam; massive; slightly hard, firm, nonsticky and nonplastic; few very fine roots; 50 percent pebbles and cobbles; strongly acid.

LOCATION AND SETTING: North Central Idaho, Idaho County, Salmon River drainage, Badger Summit, SW of Sw 1/4, Sec. 19, T. 26 N., R. 8 E., Map Unit 33A65. The Reference Pedon has formed in volcanic ash influenced loess deposits over material derived from moderately weathered quartz monzonite. It is on a gently sloping mountain ridge. The elevation is 6900 feet. The habitat type is subalpine fir/beargrass. The Reference Pedon is an Andic Cryochrept, loamy-skeletal, mixed.

Andic Cryochrepts, sandy, mixed are like the Reference Pedon except the subsoil is thinner, the substratum is always sandy and the subsoil and upper substrata have 0 to 35 percent rock fragments. These soils are associated with well weathered granitic rocks. The lower substratum is well weathered granitic rock in places. Well weathered granitic rock is soft and can be dug with a spade. It restricts root and water penetration. It rapidly breaks down to coarse sand and pea-sized gravel when exposed by excavation.

Andic Cryochrepts, coarse-loamy, mixed are like the Reference Pedon except subsoils and upper substrata contain 0 to 35 percent rock fragments. They are associated with well weathered schist and gneiss and elevations below 6200 feet.

*TYPIC DYSTROCHREPTS**REFERENCE PEDON - MONITORING SITES # 71 and 73.*

Soil colors are for moist soil unless otherwise indicated.

Oi 3 to 2 inches; needles and twigs.

Oe 2 to 0 inches; partially decomposed litter.

A 0 to 7 inches; brown to dark brown (7.5YR 4/3) loam; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine and very fine, many medium and coarse roots; 5 percent pebbles; neutral; clear wavy boundary.

Bw1 7 to 17 inches; brown to dark brown (7.5YR 4/3) loam; moderate medium subangular blocky structure, slightly hard, firm, slightly sticky and slightly plastic; few fine and very fine, many medium and coarse roots; 5 percent pebbles; medium acid; clear wavy boundary.

Bw2 17 to 41 inches; brown to dark brown (7.5YR 4/3) gravelly sandy loam, moderate medium subangular blocky structure; slightly hard, firm, slightly sticky and nonplastic; few fine and very fine, many medium and coarse roots; 15 percent pebbles; medium acid; clear wavy boundary.

C 41 to 60 inches; brown to dark brown (7.5YR 4/4) very gravelly sandy loam; massive; slightly hard, friable, slightly sticky and nonplastic; common medium and coarse roots; 40 percent pebbles; neutral.

LOCATION AND SETTING: North Central Idaho, Idaho County, South Fork of the Clearwater River, Meadow Creek, SW 1/4, Sec. 17, T. 30 N., R.5 E., Map Unit 31D38. The Reference Pedon has formed in material derived from quartzite and gneiss. It is on the upper part of a dissected mountain slope at 4160 feet elevation. The slope gradient is 55 percent and the aspect is southeasterly. The habitat type is grand fir/queencup beadrily. The Reference Pedon is a Typic Dystrochrept, coarse-loamy, mixed, frigid.

*ENTIC CRYUMBREPTS**REFERENCE PEDON - MONITORING SITES # 70, 74, and 78.*

Soil colors are for moist soil unless otherwise indicated.

- A 0 to 16 inches; very dark brown (10YR 2/2) gravelly sandy loam; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine, fine, medium, and coarse roots; 15 percent pebbles; strongly acid; abrupt smooth boundary.
- AC 16 to 30 inches; dark yellowish brown (10YR 3/4) very cobbly sand; single grained; loose, loose, nonsticky and nonplastic; few very fine, fine, common medium and coarse roots; 20 percent pebbles, 30 percent cobbles; medium acid; abrupt wavy boundary.
- Cr 30 to 39 inches; soft, weathered granite bedrock.
- R 39 inches; hard, weakly weathered granite bedrock.

LOCATION AND SETTING: North Central Idaho, Idaho County, Salmon River, Nut Basin Point, SE of Sw 1/4, Sec. 2, T. 25 N., R. 2 E., Map Unit 31D77. The Reference Pedon has formed in volcanic ash influenced loess mixed with material derived from granitic rocks. It is on the upper sideslope of a dissected mountain slope at 7480 feet elevation. The slope gradient is 45 percent and the aspect is northwesterly. The habitat type is subalpine fir/woodrush. The Reference Pedon is an Entic Cryumbrept, sandy-skeletal, mixed.

ULTIC ARGIXEROLLS

REFERENCE PEDON - MONITORING SITES # 59, 60, 62, 63, 64, 65, 66 and 72.

Soil colors are for moist soil unless otherwise indicated.

- Oi 1 to 0 inches; conifer needles and dead mosses.
- Al 0 to 6 inches; very dark brown (10YR 2/2) gravelly silt loam; weak fine granular structure; soft, very friable, slightly sticky and nonplastic; many very fine, fine and medium roots; 20 percent andesite pebbles; medium acid; clear wavy boundary.
- A2 6 to 12 inches; dark brown (10YR 3/3) gravelly loam; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine, fine, medium and coarse roots; 20 percent andesite pebbles; medium acid; clear wavy boundary.
- Bt 12 to 28 inches; dark yellowish brown (10YR 4/4) very gravelly clay loam; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few fine and medium roots; few faint clay films on faces of peds and pores; 45 percent andesite pebbles, 5 percent andesite cobbles; medium acid; clear smooth boundary.
- C 28 to 51 inches; dark yellowish brown (10YR 4/6) extremely gravelly loam; very weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; few fine and medium, common coarse roots; 60 percent andesite pebbles, 20 percent andesite cobbles; neutral; clear smooth boundary.
- R 51 to 60 inches; well fractured bedrock with 5 percent fines in interstices.

LOCATION AND SETTING: North Central Idaho, Idaho County, Salmon River drainage, Joe Creek, NE of Ne 1/4, Sec. 29, T. 27 N., R. 1 E., Map Unit 31D3F. The Reference Pedon has formed in material derived from andesite and mixed volcanic ash influenced loess at 3960 feet elevation. It is midslope on a dissected mountain slope. The slope gradient is 60 percent and the aspect is northerly. The habitat type is grand fir/ninebark-ninebark. The Reference Pedon is an Ultic Argixeroll, loamy-skeletal, mixed, frigid.

*LITHIC ULTIC HAPLOXEROLLS**REFERENCE PEDON - MONITORING SITES # 69.*

Soil colors are for moist soil unless otherwise indicated.

A 0 to 7 inches; very dark grayish brown (10YR 3/2) gravelly loamy sand; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; 20 percent fine pebbles; slightly acid; abrupt smooth boundary.

R 7 inches.

LOCATION AND SETTING: North Central Idaho, Idaho County, South Fork of the Clearwater River, NE 1/4, Sec. 5, T. 28 N., R. 6 E., Map Unit 61E22. The Reference Pedon has formed in material derived from granitic rocks. It is on the lower sideslope of a very steep stream breakland. The elevation is 3370 feet and the aspect is southerly. The slope is 90 percent. The habitat type is Douglas-fir/snowberry. The Reference Pedon is a Lithic Ultic Haploxeroll, sandy, mixed, frigid.

APPENDIX E

DISCRIMINANT ANALYSES RESULTS

FOR THE VARIABLES OF HABITAT TYPE,

SOIL TEMPERATURE, SOIL MOISTURE, AND ELEVATION

Discriminant Analysis Classification Summary for Calibration Data: WORK.MSDATA

Resubstitution Summary using Linear Discriminant Function

Generalized Squared Distance Function:

Posterior Probability of Membership in each HT:

$$D_j(X) = \frac{1}{2} (X - \bar{X}_j)' \text{COV}_j^{-1} (X - \bar{X}_j)$$

$$\Pr(j|X) = \frac{\exp(-.5 D_j(X))}{\sum_k \exp(-.5 D_k(X))}$$

Number of Observations and Percent Classified into HT:

From HT	ABGR/CLUN	ABLA/VACA	ABLA/XETE	PSME/PHMA	PSME/SYAL	THPL/CLUN	Total
ABGR/CLUN	0 0.00	1 25.00	0 0.00	2 50.00	1 25.00	0 0.00	4 100.00
ABLA/VACA	0 0.00	4 50.00	2 25.00	0 0.00	0 0.00	2 25.00	8 100.00
ABLA/XETE	0 0.00	2 50.00	1 25.00	0 0.00	0 0.00	1 25.00	4 100.00
PSME/PHMA	0 0.00	0 0.00	0 0.00	1 20.00	3 60.00	1 20.00	5 100.00
PSME/SYAL	1 20.00	1 20.00	0 0.00	0 0.00	3 60.00	0 0.00	5 100.00
THPL/CLUN	0 0.00	0 0.00	1 12.50	0 0.00	0 0.00	7 87.50	8 100.00
Total	1	8	4	3	7	11	34
Percent	2.94	23.53	11.76	8.82	20.59	32.35	100.00
Priors	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	

Error Count Estimates for HT:

	ABGR/CLUN	ABLA/VACA	ABLA/XETE	PSME/PHMA	PSME/SYAL	THPL/CLUN	Total
Rate	1.0000	0.5000	0.7500	0.8000	0.4000	0.1250	0.5958
Priors	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	

Discriminant Analysis Classification Summary for Calibration Data: WORK.MSDATA

Resubstitution Summary using Linear Discriminant Function

Generalized Squared Distance Function: Posterior Probability of Membership in each HT:

$$D_j^2(X) = (X - \bar{X}_j)' \text{COV}_j^{-1} (X - \bar{X}_j)$$

$$\Pr(j|X) = \exp(-.5 D_j^2(X)) / \sum_k \exp(-.5 D_k^2(X))$$

Number of Observations and Percent Classified into HT:

From HT	ABGR/CLUN	ABLA/VACA	ABLA/XETE	PSME/PHMA	PSME/SYAL	THPL/CLUN	Total
ABGR/CLUN	3 75.00	1 25.00	0 0.00	0 0.00	0 0.00	0 0.00	4 100.00
ABLA/VACA	0 0.00	6 75.00	0 0.00	0 0.00	0 0.00	2 25.00	8 100.00
ABLA/XETE	0 0.00	0 0.00	4 100.00	0 0.00	0 0.00	0 0.00	4 100.00
PSME/PHMA	0 0.00	0 0.00	0 0.00	5 100.00	0 0.00	0 0.00	5 100.00
PSME/SYAL	0 0.00	0 0.00	1 20.00	0 0.00	4 80.00	0 0.00	5 100.00
THPL/CLUN	0 0.00	1 12.50	0 0.00	0 0.00	0 0.00	7 87.50	8 100.00
Total	3	8	5	5	4	9	34
Percent	8.82	23.53	14.71	14.71	11.76	26.47	100.00
Priors	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	

Error Count Estimates for HT:

	ABGR/CLUN	ABLA/VACA	ABLA/XETE	PSME/PHMA	PSME/SYAL	THPL/CLUN	Total
Rate	0.2500	0.2500	0.0000	0.0000	0.2000	0.1250	0.1375
Priors	0.1667	0.1667	0.1667	0.1667	0.1667	0.1667	

APPENDIX F

**SOIL TEMPERATURE AND MOISTURE MONITORING
DATA FOR THE FLATHEAD, HELENA, LOLO, AND
NEZ PERCE NATIONAL FORESTS**

APPENDIX - F

TABLE - 7 : SOIL TEMPERATURE AND SOIL MOISTURE MONITORING SITE CHARACTERISTICS

SITE	N.F.	SITE TYPE	HABITAT TYPE	LATITUDE	LONGITUDE	SLOPE	ASPECT	ELEVATION	GEOLOGY	SOIL CLASSIFICATION
1	HEL	NA-TM	ABLA/LIBO	46/52	112/43	30	NE	5800	ARGILLITE	TYPIC CRYOBORALF F-L
2	HEL	NA-TM	PSME/SYAL	46/29	111/50	15	W	5420	GRANITE	TYPIC EUTROBORALF L-SK
3	HEL	NA-TM	ARTR/FESC	46/15	111/8	0	FL	6490	ARGILLITE	TYPIC CRYOBOROLL L-SK
4	HEL	NA-TM	PSME/SYAL	46/15	111/9	20	SW	6420	ARGILLITE	TYPIC EUTROCHREPT L-SK
5	HEL	NA-TM	FESC/FEID	46/30	111/13	2	E	6540	LIMESTONE	TYPIC CRYOBOROLL L-SK
6	HEL	NA-TM	ABLA/VACA	47/5	112/37	5	N	5600	ARGILLITE	TYPIC CRYOBORALF L-SK
7	HEL	NA-TM	PSME/SYAL	47/5	112/37	55	W	5520	ARGILLITE	TYPIC USTOCHREPT L-SK, FRIGID
8	HEL	NA-TM	PSME/FESC	46/15	111/44	20	NE	6000	BASALT	TYPIC HAPLOBOROLL L-SK
9	HEL	NA-TM	FEID/AGSP	46/15	111/43	3	E	5400	BASALT	TYPIC ARGIBOROLL L-SK
10	HEL	NA-TM	PSME/CARU	46/17	111/48	25	E	6880	BASALT	TYPIC CRYOCHREPT L-SK
11	HEL	NA-TM	ABLA/VASC	46/37	112/18	5	E	7000	BASALT	ANDIC CRYOCHREPT L-SK
12	HEL	NA-TM	ABLA/XETE-VAGL	46/37	112/18	35	SW	6800	GRANITE	TYPIC EUTROCHREPT L-SK
13	HEL	NA-TM	FESC/FEID	46/17	111/45	0	FL	5400	BASALT	TYPIC ARGIBOROLL L-SK
14	HEL	NA-TM	ARTR/FESC	46/17	111/45	0	FL	5400	BASALT	TYPIC ARGIBOROLL L-SK
15	HEL	NA-TM	PSME/CARU	46/17	111/45	15	SW	5420	BASALT	TYPIC ARGIBOROLL L-SK
16	HEL	NA-TM	PSME/CARU	46/29	111/55	20	SW	5423	GRANITE	TYPIC USTIPSAMMENT S, FRIGID
17	HEL	NA-TM	FESC/FEID	46/14	111/55	15	N	6800	BASALT	ARGIC CRYOBOROLL L-SK
18	HEL	CC-TM	PIPO/AGSP	46/30	112/4	20	SE	5200	GRANITE	TYPIC USTOCHREPT C-L, FRIGID
19	HEL	SH-TM	PIPO/AGSP	46/30	112/4	20	SE	5200	GRANITE	TYPIC USTOCHREPT C-L, FRIGID
20	HEL	NA-TM	PIPO/AGSP	46/30	112/4	20	SE	5200	GRANITE	TYPIC USTOCHREPT C-L, FRIGID
21	HEL	CC-TM	PSME/CARU	46/44	112/30	60	S	5800	LIMESTONE	TYPIC USTOCHREPT L-SK, CARBON., FRIGID
22	HEL	SH-TM	PSME/CARU	46/44	112/30	60	S	5800	LIMESTONE	TYPIC USTOCHREPT L-SK, CARBON., FRIGID
23	HEL	NA-TM	PSME/CARU	46/44	112/30	60	S	5800	LIMESTONE	TYPIC USTOCHREPT L-SK, CARBON., FRIGID
24	FLHD	TH-TM	THPL/CLUN	47/54	113/52	8	E	3200	LIMESTONE	ANDEPTIC PALEBORALF F-L
25	FLHD	TH-TM	THPL/CLUN	47/54	113/52	8	E	3200	LIMESTONE	ANDEPTIC PALEBORALF F-L
26	FLHD	NA-TM	THPL/CLUN	47/54	113/52	8	E	3200	LIMESTONE	ANDEPTIC PALEBORALF F-L
27	FLHD	NA-TM	THPL/CLUN	47/59	113/57	30	E	3203	ARGILLITE	ANDEPTIC EUTROBORALF L-SK
28	FLHD	NA-TM	THPL/CLUN	47/59	113/57	30	E	3205	ARGILLITE	ANDEPTIC EUTROBORALF L-SK
29	FLHD	NA-TM	THPL/CLUN	47/59	113/57	30	E	3207	ARGILLITE	ANDEPTIC EUTROBORALF L-SK
30	FLHD	CC-TM	ABGR/CLUN-XETE	47/53	113/47	15	W	3500	ARGILLITE	ANDEPTIC EUTROBORALF L-SK
31	FLHD	TH-TM	ABGR/CLUN-XETE	47/53	113/47	15	W	3500	ARGILLITE	ANDEPTIC EUTROBORALF L-SK
32	FLHD	CC-TM	ABGR/CLUN-VACA	47/53	113/49	1	FL	3300	QUARTZITE	ANDIC DYSTRIC EUTROCHREPT L-SK, FRIGID
33	FLHD	NA-TM	ABGR/CLUN-VACA	47/53	113/49	1	FL	3300	QUARTZITE	ANDIC DYSTRIC EUTROCHREPT L-SK, FRIGID
34	FLHD	NA-TM	ABLA/VACA	47/54	113/51	0	FL	3100	ARGILLITE	ANDIC DYSTRIC EUTROCHREPT S-SK, FRIGID
35	FLHD	NA-TM	ABLA/VACA	47/54	113/51	0	FL	3105	ARGILLITE	ANDIC DYSTRIC EUTROCHREPT S-SK, FRIGID

Table Description: Site = the monitoring site number. N.F. = The National Forest; HEL is the Helena, FLHD is the Flathead, CLW is the Clearwater, NEZ is the Nez Perce, and LOLO is the Lolo. Site Type = the type of monitoring site where Na is natural, CC is a clearcut cutting unit, SW is a shelterwood cutting unit, BR is a brush unit, T is a temperature monitoring site, and M is a moisture monitoring site. Habitat Type = the habitat type at the monitoring site. Latitude = the latitude of the site in degrees and minutes. Longitude = the longitude of the site in degrees and minutes. Slope = the slope of the site in percent slope. Aspect = the primary aspect of the site, where FL denotes flat. Elevation = the elevation of the site in feet. Geology = the bedrock lithology of the site. Soil Classification = the field soil classification of the site.

TABLE - 7 : SOIL TEMPERATURE AND SOIL MOISTURE MONITORING SITE CHARACTERISTICS

Continued

SITE	N.F.	SITE TYPE	HABITAT TYPE	LATITUDE	LONGITUDE	SLOPE	ASPECT	ELEVATION	GEOLOGY	SOIL CLASSIFICATION
36	FLHD	CC-TM	ABLA/VACA	47/54	113/51	0	FL	3100	ARGILLITE	ANDIC DYSTRIC EUTROCHREPT S-SK, FRIGID
37	FLHD	NA-TM	THPL/CLUN-CLUN	47/57	113/55	10	SW	3900	ARGILLITE	ANDIC DYSTRIC EUTROCHREPT L-SK, FRIGID
38	FLHD	NA-TM	THPL/CLUN-CLUN	47/57	113/55	10	SW	3905	ARGILLITE	ANDIC DYSTRIC EUTROCHREPT L-SK, FRIGID
39	FLHD	NA-M	ABLA/VACA	48/19	114/47	10	SW	4400	LACUSTRINE	TYPIC CRYOCHREPT F-L
40	FLHD	NA-TM	ABLA/VACA	48/19	114/47	10	SW	4400	LACUSTRINE	TYPIC CRYOCHREPT F-L
41	FLHD	NA-TM	ABLA/VACA	48/19	114/47	10	SW	4403	LACUSTRINE	TYPIC CRYOCHREPT F-L
42	FLHD	NA-M	ABLA/VACA	48/16	114/46	0	FL	4500	LACUSTRINE	AERIC HAPLAQUENT F-L, FRIGID
43	FLHD	NA-TM	ABLA/VACA	48/16	114/46	0	FL	4505	LACUSTRINE	AERIC HAPLAQUENT F-L, FRIGID
44	FLHD	NA-TM	ABLA/VACA	48/16	114/46	0	FL	4507	LACUSTRINE	AERIC HAPLAQUENT F-L, FRIGID
45	FLHD	NA-M	ABLA/CLUN-VACA	48/19	114/46	16	E	4700	ARGILLITE	ANDEPTIC CRYOBORALF L-SK
46	FLHD	NA-TM	ABLA/CLUN-VACA	48/19	114/46	16	E	4700	ARGILLITE	ANDEPTIC CRYOBORALF L-SK
47	FLHD	NA-TM	ABLA/CLUN-VACA	48/19	114/46	16	E	4703	ARGILLITE	ANDEPTIC CRYOBORALF L-SK
48	FLHD	NA-TM	ABLA/VACA	48/19	114/47	15	SE	4520	QUARTZITE	ANDEPTIC CRYOBORALF L-SK
49	FLHD	NA-M	ABLA/VACA	48/19	114/47	15	SE	4520	QUARTZITE	ANDEPTIC CRYOBORALF L-SK
50	FLHD	NA-TM	ABLA/VACA	48/19	114/47	15	SE	4523	QUARTZITE	ANDEPTIC CRYOBORALF L-SK
51	CLW	BR-TM	THPL/CLUN	46/18	115/38	30	E	4500	GRANITE	TYPIC VITRANDEPT M/CL, FRIGID
52	CLW	BR-M	THPL/CLUN	46/18	115/38	30	E	4500	GRANITE	TYPIC VITRANDEPT M/CL, FRIGID
53	CLW	NA-TM	THPL/CLUN	46/18	115/38	30	W	4500	GRANITE	TYPIC VITRANDEPT M/CL, FRIGID
54	CLW	NA-M	THPL/CLUN	46/18	115/38	30	W	4500	GRANITE	TYPIC VITRANDEPT M/CL, FRIGID
55	CLW	NA-M	ABGR/CLUN	46/30	115/48	35	S	3100	MICA-SCHIST	ANDIC DYSTROCHREPT CL, FRIGID
56	CLW	NA-TM	PSME/PHMA	46/8	115/45	60	S	1800	MICA-SCHIST	DYSTRIC XEROCHREPT L-SK, MESIC
57	CLW	NA-M	PSME/PHMA	46/8	115/45	60	S	1800	MICA-SCHIST	DYSTRIC XEROCHREPT L-SK, MESIC
58	NEZ	NA-TM	AGSP/POSA	45/38	116/29	8	S	1200	ALLUVIUM	TYPIC XEROPSAMMENT S, MESIC
59	NEZ	NA-TM	AGSP/POSA	45/38	116/27	55	W	2080	ANDESITE	LITHIC XERORTHENT L-SK, MESIC
60	NEZ	NA-TM	FEID/AGSP	45/38	116/27	76	NE	2120	ANDESITE	PACHIC ARGIXEROLL F-L, MESIC
61	NEZ	NA-TM	AGSP/POSA	45/39	116/26	35	S	3000	ANDESITE	MOLLIC HAPLOXEROLL C-SK, MESIC
62	NEZ	NA-TM	FEID/AGSP	45/38	116/26	70	N	3160	ANDESITE	PACHIC ARGIXEROLL L-SK, MESIC
63	NEZ	NA-TM	AGSP/POSA	45/38	116/25	62	SW	3860	ANDESITE	TYPIC ARGIXEROLL L-SK, MESIC
64	NEZ	NA-TM	PSME/PHMA	45/38	116/25	84	NE	3860	ANDESITE	TYPIC ARGIBOROLL C-SK, FRIGID
65	NEZ	NA-TM	PIPO/AGSP	45/39	116/25	35	NE	4280	BASALT	TYPIC ARGIXEROLL L-SK, FRIGID
66	NEZ	NA-TM	PSME/SYAL	45/39	116/25	50	E	4360	BASALT	PACHIC ARGIBOROLL F-L, FRIGID
67	NEZ	NA-TM	ABGR/COOC	45/50	116/5	1	SE	5080	BASALT	ANDEPTIC CRYOBORALF F-L
68	NEZ	NA-TM	ABGR/COOC	45/50	116/5	8	SE	5120	BASALT	ANDEPTIC CRYOBORALF F-L
69	NEZ	NA-TM	PIPO/FEID	45/48	115/53	73	SW	2650	SCHIST	LITHIC HAPLOXEROLL L-SK, MESIC
70	NEZ	NA-TM	ABGR/CLUN	45/48	115/53	74	NE	2660	SCHIST	TYPIC HAPLUMBREPT L-SK, FRIGID

Table Description: Site = the monitoring site number. N.F. = The National Forest; HEL is the Helena, FLHD is the Flathead, CLW is the Clearwater, NEZ is the Nez Perce, and LOLO is the Lolo. Site Type = the type of monitoring site where Na is natural, CC is a clearcut cutting unit, SW is a shelterwood cutting unit, BR is a brush unit, T is a temperature monitoring site, and M is a moisture monitoring site. Habitat Type = the habitat type at the monitoring site. Latitude = the latitude of the site in degrees and minutes. Longitude = the longitude of the site in degrees and minutes. Slope = the slope of the site in percent slope. Aspect = the primary aspect of the site, where FL denotes flat. Elevation = the elevation of the site in feet. Geology = the bedrock lithology of the site. Soil Classification = the field soil classification of the site.

TABLE - 7 : SOIL TEMPERATURE AND SOIL MOISTURE MONITORING SITE CHARACTERISTICS

Continued

SITE	N.F.	SITE TYPE	HABITAT TYPE	LATITUDE	LONGITUDE	SLOPE	ASPECT	ELEVATION	GEOLOGY	SOIL CLASSIFICATION
71	NEZ	NA-TM	PSME/PHMA	45/49	115/26	55	SE	4020	MICA-SCHIST	TYPIC DYSTROCHREPT C-L, FRIGID
72	NEZ	NA-TM	ABGR/CLUN	45/49	115/26	70	NW	3903	SCHIST	TYPIC HAPLOBOROLL C-L, FRIGID
73	NEZ	NA-TM	PSME/SYAL	45/40	115/21	63	NE	4900	SCHIST	TYPIC XEROCHREPT S-SK, FRIGID
74	NEZ	NA-TM	ABGR/ASCA	45/40	115/21	3	NW	4760	ALLUVIUM	ENTIC CRYUMBREPT S-SK
75	NEZ	NA-TM	ABGR/COOC	45/40	115/21	53	NE	4905	GNEISS	TYPIC CRYOCHREPT S-SK
76	NEZ	NA-TM	ABLA/XETE	45/39	115/26	37	S	5280	GRANITE	EUTRIC GLOSSOBORALF L-SK, FRIG.
77	NEZ	NA-TM	ABLA/CACA-LEGL	45/39	115/26	18	NE	5283	GNEISS	ANDEPTIC CRYOBORALF F-L
78	NEZ	NA-TM	ABLA/XETE	45/37	115/28	54	NE	5990	GRANITE	TYPIC HAPLUMBREPT S-SK, FRIGID
79	NEZ	NA-TM	ABLA/CLUN	45/36	115/28	31	N	6150	GNEISS	ANDIC CRYOCHREPT S
80	NEZ	NA-TM	ABLA/XETE	45/36	115/27	18	SE	6480	GNEISS	ANDIC CRYOCHREPT C-L
81	NEZ	CC-TM	ABLA/XETE	45/36	115/27	7	NW	6480	GNEISS	TYPIC CRYOCHREPT S
82	LOLO	CC-M	PSME/SYAL-CARU	47/17	115/10	45	S	3400	ARGILLITE	TYPIC XEROCHREPT L-SK, FRIGID
83	LOLO	NA-TM	PSME/CARU-PIPO	47/00	114/7	30	S	4320	ARGILLITE	TYPIC XEROCHREPT L-SK, FRIGID
84	LOLO	CC-M	THPL/CLUN	47/10	114/49	45	N	3780	ARGILLITE	TYPIC EUTROBORALF L-SK
85	LOLO	NA-TM	THPL/CLUN	47/10	114/49	45	N	3780	ARGILLITE	TYPIC EUTROBORALF L-SK
86	LOLO	NA-TM	PSME/PHMA-CARU	47/05	114/22	20	SE	4560	ARGILLITE	DYSTRIC EUTROCHREPT L-SK, FRIGID
87	LOLO	CC-M	PSME/PHMA-CARU	47/05	114/55	50	N	4400	ARGILLITE	ANDIC XEROCHREPT L-SK, FRIGID
88	LOLO	CC-M	PSME/PHMA-CARU	47/16	144/55	50	W	4400	ARGILLITE	ANDIC XEROCHREPT L-SK, FRIGID
89	LOLO	NA-TM	PSME/PHMA-CARU	47/16	114/55	50	W	4550	ARGILLITE	ANDIC XEROCHREPT L-SK, FRIGID
90	LOLO	NA-TM	PSME/PHMA-PHMA	47/07	113/58	55	N	4160	ARGILLITE	TYPIC EUTROCHREPT L-SK, FRIGID
91	LOLO	NA-TM	PSME/CARU-AGSP	47/00	114/7	35	S	4200	ARGILLITE	TYPIC XEROCHREPT L-SK, FRIGID
92	LOLO	NA-TM	PSME/FESC	47/07	113/58	55	SW	4080	LIMESTONE	CALCIC HAPLOXEROLL F-L, FRIGID
93	FLHD	NA-T	ABLA/XETE-VAGL	47/45	113/44	40	SW	6240	LIMESTONE	ANDEPTIC CRYOBORALF L-SK
94	FLHD	NA-T	ABLA/CLUN-MEFE	47/42	113/55	40	SE	5480	LIMESTONE	ANDIC CRYOCHREPT L-SK
95	FLHD	NA-T	ABLA/XETE-VAGL	47/34	113/39	50	SW	6010	ARGILLITE	ENTIC CRYANDEPT L-SK
96	FLHD	NA-T	ABLA/CLUN-MEFE	47/34	113/51	25	N	5680	LIMESTONE	ANDIC CRYOCHREPT L-SK
97	FLHD	NA-T	PSME/SYAL-SYAL	47/45	113/44	55	SW	5200	ARGILLITE	TYPIC EUTROBORALF L-SK
98	FLHD	NA-T	PSME/SYAL-CARU	47/34	113/39	70	SW	5275	ARGILLITE	DYSTRIC EUTROCHREPT L-SK, FRIGID
99	FLHD	NA-T	ABGR/CLUN-ARNU	47/48	113/46	12	SW	3720	ARGILLITE	TYPIC EUTROBORALF F-CL
100	FLHD	NA-T	THPL/CLUN-CLUN	47/42	113/52	30	S	4150	ARGILLITE	ANDEPTIC EUTROBORALF L-SK
101	FLHD	NA-T	THPL/CLUN-CLUN	47/35	113/49	25	E	4720	LIMESTONE	ANDIC DYSTRIC EUTROCHREPT, FRIGID
102	FLHD	NA-T	ABLA/CLUN-ARNU	47/47	113/44	0	FL	3180	ARGILLITE	ANDIC DYSTROCHREPT L-SK, FRIGID
103	FLHD	NA-T	ABLA/CLUN-ARNU	47/35	113/46	0	FL	3560	ARGILLITE	DYSTRIC EUTROCHREPT L-SK, FRIGID
104	FLHD	NA-T	ABLA/CLUN-VACA	47/33	113/50	0	FL	3660	ARGILLITE	ANDIC DYSTROCHREPT L-SK, FRIGID

Table Description: Site = the monitoring site number. N.F. = The National Forest; HEL is the Helena, FLHD is the Flathead, CLW is the Clearwater, NEZ is the Nez Perce, and LOLO is the Lolo. Site Type = the type of monitoring site where Na is natural, CC is a clearcut cutting unit, SW is a shelterwood cutting unit, BR is a brush unit, T is a temperature monitoring site, and M is a moisture monitoring site. Habitat Type = the habitat type at the monitoring site. Latitude = the latitude of the site in degrees and minutes. Longitude = the longitude of the site in degrees and minutes. Slope = the slope of the site in percent slope. Aspect = the primary aspect of the site, where FL denotes flat. Elevation = the elevation of the site in feet. Geology = the bedrock lithology of the site. Soil Classification = the field soil classification of the site.

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 1

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1	1	7	16	83	197	52	~	~	50	~	~	31.8	0.3	18.8	0.4	~	~	13.1	0.6	~
2	1	8	9	83	221	56	~	~	60	~	~	18.7	1.3	11.5	1.6	~	~	11.0	1.0	~
3	1	10	17	83	290	39	~	~	41	~	~	~	~	~	~	~	~	~	~	~
4	1	6	20	84	171	47	~	~	46	~	~	44.6	0.3	24.5	0.3	~	~	17.5	0.3	~
5	1	7	17	84	198	56	~	~	49	~	~	16.0	2.6	14.0	1.0	~	~	12.0	0.8	~
6	1	8	15	84	227	64	~	~	51	~	~	4.0	16.0	7.5	11.2	~	~	5.2	16.0	~
7	1	6	5	85	156	48	~	~	42	~	~	30.5	0.3	20.8	0.3	~	~	14.0	0.3	~
8	1	7	18	86	199	55	~	~	47	~	~	35.0	0.3	21.0	0.3	~	~	15.0	16.0	~
9	1	8	16	86	228	65	~	~	49	~	~	6.3	16.0	12.0	1.5	~	~	11.0	1.0	~
10	1	9	12	86	255	48	~	~	46	~	~	3.5	16.0	8.0	6.0	~	~	9.5	1.8	~
11	1	10	21	86	294	43	~	~	38	~	~	7.0	16.0	11.0	1.7	~	~	8.0	2.8	~
12	2	6	27	83	178	49	~	~	48	~	~	25.7	0.6	16.5	2.7	~	~	15.4	1.6	~
13	2	7	16	83	197	56	~	~	51	~	~	25.4	0.6	23.9	0.8	~	~	18.6	0.6	~
14	2	8	22	83	234	59	~	~	56	~	~	11.7	16.0	8.7	16.0	~	~	8.7	16.0	~
15	2	10	17	83	290	43	~	~	44	~	~	~	~	~	~	~	~	~	~	~
16	2	5	22	84	142	46	~	~	46	~	~	23.4	0.9	19.7	1.8	~	~	14.9	1.7	~
17	2	6	18	84	169	60	~	~	46	~	~	30.0	0.3	30.0	0.3	~	~	20.0	0.3	~
18	2	7	17	84	198	64	~	~	51	~	~	15.0	3.6	25.5	1.3	~	~	16.5	1.0	~
19	2	8	17	84	229	60	~	~	53	~	~	~	16.0	~	16.0	~	~	~	16.0	~
20	2	5	24	85	144	50	~	~	44	~	~	24.0	0.8	27.0	0.5	~	~	19.0	0.5	~
21	2	5	21	86	141	55	~	~	39	~	~	32.0	0.3	32.0	0.3	~	~	21.5	0.3	~
22	2	6	12	86	163	61	~	~	46	~	~	32.0	0.3	31.0	0.3	~	~	21.0	0.3	~
23	2	7	15	86	196	56	~	~	49	~	~	25.0	0.8	23.0	1.1	~	~	17.7	1.8	~
24	2	8	13	86	225	66	~	~	50	~	~	~	16.0	~	16.0	~	~	~	16.0	~
25	2	9	12	86	255	55	~	~	47	~	~	23.0	0.8	19.0	1.8	~	~	10.0	16.0	~
26	2	10	24	86	297	48	~	~	41	~	~	23.5	0.8	21.0	1.5	~	~	11.0	11.6	~
27	3	6	27	83	178	58	~	~	49	~	~	29.9	0.3	20.4	1.5	~	~	11.9	16.0	~
28	3	7	16	83	197	61	~	~	54	~	~	30.6	1.5	24.3	0.8	~	~	16.8	0.9	~
29	3	8	22	83	234	58	~	~	56	~	~	7.1	16.0	7.2	16.0	~	~	6.6	16.0	~
30	3	10	17	83	290	43	~	~	45	~	~	~	~	~	~	~	~	~	~	~
31	3	6	20	84	171	48	~	~	45	~	~	43.6	0.3	32.4	0.3	~	~	21.0	0.3	~
32	3	7	13	84	194	59	~	~	52	~	~	24.5	0.7	32.0	0.3	~	~	22.5	0.3	~
33	3	8	16	84	228	65	~	~	55	~	~	~	16.0	~	16.0	~	~	15.0	1.3	~
34	3	6	17	85	168	57	~	~	48	~	~	~	16.0	19.8	1.8	~	~	17.8	0.8	~
35	3	6	19	86	170	68	~	~	48	~	68	33.0	0.3	35.0	0.3	~	~	23.0	0.3	~
36	3	6	25	86	176	71	~	~	52	~	74	24.0	0.9	34.0	0.3	~	~	23.0	0.3	~
37	3	7	13	86	194	67	~	~	51	~	71	34.0	0.3	33.0	0.3	~	~	23.5	0.3	~
38	3	8	13	86	225	66	~	~	54	~	~	23.0	1.0	32.0	0.3	~	~	23.0	0.3	~
39	3	9	17	86	260	48	~	~	48	~	~	33.0	0.3	29.0	0.5	~	~	20.0	0.5	~
40	3	10	22	86	295	51	~	~	40	~	~	33.0	0.3	34.0	0.3	~	~	23.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 2

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
41	4	6	27	83	178	54	~	~	49	~	~	24.1	0.5	21.2	0.9	~	~	19.0	0.9	~
42	4	7	16	83	197	61	~	~	53	~	~	14.5	3.8	16.0	2.8	~	~	15.7	2.0	~
43	4	8	22	83	234	55	~	~	55	~	~	5.7	16.0	5.8	16.0	~	~	6.0	16.0	~
44	4	10	17	83	290	42	~	~	44	~	~	~	~	~	~	~	~	~	~	~
45	4	6	20	84	171	47	~	~	45	~	~	25.4	0.3	24.0	0.5	~	~	24.2	0.3	~
46	4	7	13	84	194	58	~	~	50	~	~	15.0	3.5	25.0	0.4	~	~	25.0	0.3	~
47	4	8	16	84	228	63	~	~	52	~	~	~	16.0	~	16.0	~	~	~	16.0	~
48	4	6	17	85	168	52	~	~	47	~	~	19.0	1.5	28.0	0.3	~	~	28.0	0.3	~
49	4	6	10	86	161	61	~	~	46	~	61	27.0	0.3	27.0	0.3	~	~	26.0	0.3	~
50	4	6	25	86	176	66	~	~	49	~	~	17.5	2.0	24.7	0.5	~	~	25.0	0.3	~
51	4	7	14	86	195	62	~	~	48	~	~	27.0	0.3	26.0	0.3	~	~	25.0	0.3	~
52	4	8	13	86	225	61	~	~	50	~	~	~	16.0	13.7	16.0	~	~	15.5	2.0	~
53	4	9	17	86	260	44	~	~	43	~	~	31.0	0.3	16.5	2.5	~	~	12.0	14.0	~
54	4	10	22	86	295	44	~	~	39	~	~	26.0	0.3	24.5	0.3	~	~	11.0	16.0	~
55	5	6	27	83	178	50	~	~	50	~	~	36.8	1.0	29.5	0.7	~	~	25.2	1.5	~
56	5	7	16	83	197	66	~	~	56	~	~	28.1	0.7	15.8	16.0	~	~	19.8	16.0	~
57	5	8	22	83	234	63	~	~	60	~	~	11.3	16.0	12.3	16.0	~	~	10.2	16.0	~
58	5	10	17	83	290	40	~	~	46	~	~	~	~	~	~	~	~	~	~	~
59	5	6	20	84	171	65	~	~	50	~	~	10.8	16.0	43.5	0.3	~	~	35.2	0.3	~
60	5	7	13	84	194	78	~	~	52	~	~	33.0	1.5	32.0	0.4	~	~	33.0	0.3	~
61	5	8	16	84	228	64	~	~	55	~	~	~	16.0	~	16.0	~	~	22.5	2.8	~
62	5	6	17	85	168	52	~	~	47	~	~	37.0	0.8	32.0	0.4	~	~	33.0	0.3	~
63	5	6	25	86	176	72	~	~	50	~	82	35.0	1.0	31.5	0.5	~	~	32.0	0.3	~
64	5	7	17	86	198	59	~	~	51	~	~	42.0	0.3	33.0	0.5	~	~	33.0	0.3	~
65	5	8	11	86	223	74	~	~	53	~	~	31.0	1.6	28.0	0.9	~	~	34.0	0.3	~
66	5	9	15	86	258	52	~	~	47	~	~	42.0	0.4	24.0	2.4	~	~	21.0	14.0	~
67	5	10	22	86	295	49	~	~	40	~	~	42.0	0.3	33.0	0.3	~	~	34.0	0.3	~
68	6	6	27	83	178	44	~	~	44	~	~	14.1	2.4	15.3	8.8	~	~	15.6	7.7	~
69	6	7	16	83	197	51	~	~	50	~	~	17.6	1.0	13.4	16.0	~	~	13.8	14.2	~
70	6	8	22	83	234	52	~	~	51	~	~	5.7	16.0	5.7	16.0	~	~	8.2	16.0	~
71	6	10	17	83	290	36	~	~	40	~	~	~	~	~	~	~	~	~	~	~
72	6	5	15	84	135	36	~	~	36	~	~	24.4	0.3	15.1	9.0	~	~	20.6	1.0	~
73	6	6	14	84	165	47	~	~	39	~	~	24.0	0.3	26.5	0.4	~	~	26.0	0.3	~
74	6	7	17	84	198	56	~	~	45	~	~	18.0	1.0	26.0	0.3	~	~	26.5	0.3	~
75	6	8	15	84	227	60	~	~	47	~	~	11.3	9.3	16.5	4.0	~	~	23.0	0.5	~
76	6	6	5	85	156	48	~	~	40	~	~	24.5	0.3	26.8	0.3	~	~	26.5	0.3	~
77	6	5	20	86	140	43	~	~	36	~	~	25.0	0.3	27.0	0.3	~	~	27.0	0.3	~
78	6	6	20	86	171	53	~	~	43	~	60	19.5	0.8	26.5	0.3	~	~	26.5	0.3	~
79	6	7	18	86	199	56	~	~	44	~	~	16.0	1.3	25.0	0.3	~	~	26.5	0.3	~
80	6	8	15	86	227	57	~	~	46	~	~	9.7	15.0	15.5	6.8	~	~	22.5	0.6	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 3

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20	
81		6	9	12	86	255	45	~	~	43	~	~	9.0	16.0	21.0	1.0	~	~	26.0	0.3	~
82		6	10	24	86	297	40	~	~	37	~	~	14.0	2.5	19.0	1.5	~	~	23.5	0.5	~
83		7	6	27	83	178	48	~	~	48	~	~	8.2	16.0	6.4	16.0	~	~	3.6	16.0	~
84		7	7	16	83	197	53	~	~	52	~	~	9.1	16.0	11.1	16.0	~	~	9.7	16.0	~
85		7	8	22	83	234	56	~	~	56	~	~	4.1	16.0	3.8	16.0	~	~	~	~	~
86		7	10	17	83	290	35	~	~	43	~	~	~	~	~	~	~	~	~	~	~
87		7	5	15	84	135	47	~	~	45	~	~	16.1	0.6	10.3	16.0	~	~	10.6	14.1	~
88		7	6	14	84	165	48	~	~	44	~	~	18.5	0.3	18.5	0.3	~	~	18.5	0.3	~
89		7	7	17	84	198	61	~	~	54	~	~	13.0	2.0	17.0	0.3	~	~	18.5	0.3	~
90		7	8	15	84	227	70	~	~	56	~	~	~	16.0	10.2	16.0	~	~	15.2	0.6	~
91		7	6	5	85	156	50	~	~	46	~	~	18.2	0.3	18.3	0.3	~	~	18.3	0.3	~
92		7	5	20	86	140	48	~	~	40	~	~	18.5	0.4	18.8	0.4	~	~	18.0	0.3	~
93		7	6	20	86	171	53	~	~	50	~	66	14.3	1.1	16.5	0.5	~	~	16.2	0.6	~
94		7	7	18	86	199	53	~	~	50	~	~	12.0	2.5	11.2	5.5	~	~	11.0	8.0	~
95		7	8	16	86	228	62	~	~	55	~	~	~	16.0	~	16.0	~	~	~	16.0	~
96		7	9	12	86	255	55	~	~	51	~	~	~	16.0	~	16.0	~	~	~	16.0	~
97		7	10	24	86	297	47	~	~	45	~	~	10.0	16.0	~	16.0	~	~	~	16.0	~
98		8	6	27	83	178	58	~	~	56	~	~	11.9	16.0	12.0	16.0	~	~	6.4	16.0	~
99		8	7	16	83	197	57	~	~	55	~	~	18.4	0.7	13.3	9.5	~	~	7.0	16.0	~
100		8	8	22	83	234	54	~	~	56	~	~	6.0	16.0	4.9	16.0	~	~	5.4	16.0	~
101		8	10	17	83	290	38	~	~	43	~	~	~	~	~	~	~	~	~	~	~
102		8	3	3	84	62	36	~	~	42	~	~	15.4	2.6	15.1	1.5	~	~	10.3	13.0	~
103		8	4	23	84	113	36	~	~	34	~	~	22.8	0.3	30.3	0.3	~	~	20.4	0.3	~
104		8	5	17	84	137	42	~	~	39	~	~	20.0	0.5	21.2	0.3	~	~	21.0	0.3	~
105		8	6	13	84	164	58	~	~	42	~	~	20.5	0.3	20.5	0.3	~	~	20.5	0.3	~
106		8	7	13	84	194	62	~	~	50	~	~	~	~	18.3	0.5	~	~	18.0	0.6	~
107		8	8	16	84	228	68	~	~	52	~	~	~	16.0	~	16.0	~	~	~	16.0	~
108		8	5	24	85	144	50	~	~	42	~	~	15.5	1.5	15.2	1.5	~	~	14.2	2.5	~
109		8	6	17	85	168	63	~	~	46	~	~	11.0	16.0	~	16.0	~	~	~	16.0	~
110		8	5	2	86	122	48	~	~	33	~	~	20.5	0.5	20.5	0.3	~	~	20.7	0.3	~
111		8	6	3	86	154	57	~	~	46	~	58	20.5	0.5	21.0	0.3	~	~	20.5	0.3	~
112		8	6	26	86	177	60	~	~	51	~	74	18.0	0.8	16.0	1.2	~	~	16.7	0.8	~
113		8	7	14	86	195	58	~	~	48	~	~	19.0	0.6	19.5	0.5	~	~	20.5	0.3	~
114		8	8	13	86	225	58	~	~	50	~	~	~	16.0	~	16.0	~	~	~	16.0	~
115		8	9	17	86	260	46	~	~	44	~	~	19.0	0.5	12.0	16.0	~	~	15.0	1.5	~
116		8	10	23	86	296	40	~	~	38	~	~	19.0	0.5	17.0	0.8	~	~	13.0	12.0	~
117		9	6	27	83	178	71	~	~	65	~	~	14.2	0.6	13.5	16.0	~	~	12.6	9.0	~
118		9	7	16	83	197	67	~	~	62	~	~	14.4	1.1	16.6	1.5	~	~	17.0	0.8	~
119		9	8	22	83	234	63	~	~	64	~	~	14.7	1.0	8.6	16.0	~	~	8.4	16.0	~
120		9	10	17	83	290	40	~	~	48	~	~	~	~	~	~	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 4

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
121	9	3	21	84	80	36	~	~	42	~	~	10.3	15.0	15.1	4.0	~	~	15.4	1.3	~
122	9	4	23	84	113	47	~	~	46	~	~	17.1	0.6	11.9	16.0	~	~	12.6	8.7	~
123	9	5	17	84	137	56	~	~	47	~	~	20.0	0.5	17.0	4.0	~	~	13.5	3.5	~
124	9	6	13	84	164	65	~	~	50	~	~	21.0	0.3	23.0	0.3	~	~	17.0	0.9	~
125	9	7	14	84	195	98	~	~	63	~	~	~	~	16.0	1.7	~	~	15.0	1.5	~
126	9	8	16	84	228	100	~	~	66	~	~	~	16.0	~	16.0	~	~	~	16.0	~
127	9	5	24	85	144	74	~	~	56	~	~	~	16.0	~	16.0	~	~	10.8	16.0	~
128	9	6	17	85	168	80	~	~	59	~	~	~	16.0	~	16.0	~	~	~	16.0	~
129	9	5	2	86	122	68	~	~	42	~	~	20.0	0.3	22.5	0.3	~	~	21.5	0.3	~
130	9	6	3	86	154	68	~	~	57	~	61	11.0	16.0	19.5	0.5	~	~	19.0	0.5	~
131	9	6	26	86	177	75	~	~	60	~	82	~	16.0	~	16.0	~	~	~	16.0	~
132	9	7	13	86	194	87	~	~	58	~	~	17.0	2.2	11.0	12.0	~	~	~	16.0	~
133	9	8	13	86	225	70	~	~	62	~	~	~	16.0	~	16.0	~	~	~	16.0	~
134	9	9	17	86	260	61	~	~	52	~	~	11.5	15.0	~	16.0	~	~	11.0	16.0	~
135	9	10	23	86	296	62	~	~	46	~	~	12.5	8.6	~	16.0	~	~	~	16.0	~
136	10	6	27	83	178	52	~	~	50	~	~	23.3	0.5	9.4	16.0	~	~	9.7	16.0	~
137	10	7	16	83	197	57	~	~	50	~	~	14.7	9.0	16.2	0.5	~	~	14.5	1.0	~
138	10	8	22	83	234	58	~	~	54	~	~	5.0	16.0	7.7	16.0	~	~	4.9	16.0	~
139	10	10	17	83	290	38	~	~	42	~	~	~	~	~	~	~	~	~	~	~
140	10	5	15	84	135	45	~	~	41	~	~	24.7	0.3	12.0	3.0	~	~	10.4	6.8	~
141	10	6	13	84	164	49	~	~	39	~	~	25.0	0.3	17.0	0.3	~	~	17.0	0.3	~
142	10	7	13	84	194	60	~	~	49	~	~	17.0	0.6	12.3	2.8	~	~	17.0	0.3	~
143	10	8	16	84	228	66	~	~	52	~	~	~	16.0	10.0	16.0	~	~	13.6	1.5	~
144	10	5	24	85	144	50	~	~	43	~	~	22.8	0.5	17.0	0.3	~	~	16.8	0.3	~
145	10	6	17	85	168	53	~	~	45	~	~	15.0	8.5	12.3	2.7	~	~	15.5	0.6	~
146	10	6	3	86	154	55	~	~	45	~	57	25.0	0.3	17.3	0.3	~	~	17.3	0.3	~
147	10	6	26	86	177	66	~	~	48	~	75	14.5	9.8	12.5	2.5	~	~	16.0	0.5	~
148	10	7	14	86	195	60	~	~	46	~	~	17.0	2.1	12.0	2.8	~	~	12.3	2.3	~
149	10	8	13	86	225	58	~	~	50	~	~	~	16.0	~	16.0	~	~	~	16.0	~
150	10	9	17	86	260	47	~	~	44	~	~	~	16.0	~	16.0	~	~	~	16.0	~
151	10	10	4	86	277	54	~	~	41	~	~	15.0	8.0	10.0	16.0	~	~	13.0	2.0	~
152	11	6	27	83	178	46	~	~	44	~	~	36.6	0.3	19.0	2.1	~	~	19.8	1.8	~
153	11	7	16	83	197	50	~	~	46	~	~	46.7	0.3	38.5	0.3	~	~	33.1	0.3	~
154	11	8	22	83	234	51	~	~	51	~	~	28.8	0.7	16.9	5.8	~	~	20.5	1.7	~
155	11	10	17	83	290	36	~	~	37	~	~	~	~	~	~	~	~	~	~	~
156	11	6	20	84	171	50	~	~	40	~	~	38.5	0.3	55.2	0.3	~	~	37.4	0.3	~
157	11	7	17	84	198	52	~	~	45	~	~	33.0	0.3	31.0	0.5	~	~	33.0	0.3	~
158	11	8	17	84	229	54	~	~	48	~	~	18.0	14.2	19.0	2.1	~	~	23.0	1.1	~
159	11	6	10	85	161	48	~	~	39	~	~	35.5	0.3	34.0	0.5	~	~	36.0	0.3	~
160	11	5	28	86	148	50	~	~	32	~	~	35.0	0.3	33.0	0.3	~	~	35.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 5

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
161	11	6	19	86	170	48	~	~	37	~	54	24.0	1.5	22.0	1.5	~	~	23.0	1.3	~
162	11	7	15	86	196	56	~	~	42	~	~	36.0	0.3	35.0	0.4	~	~	35.0	0.4	~
163	11	8	15	86	227	62	~	~	46	~	~	30.0	0.3	29.0	0.6	~	~	30.0	0.5	~
164	11	9	17	86	260	45	~	~	40	~	~	35.0	0.3	33.0	0.4	~	~	35.0	0.3	~
165	11	10	21	86	294	44	~	~	37	~	~	35.0	0.3	33.0	0.3	~	~	35.0	0.3	~
166	12	6	27	83	178	50	~	~	47	~	~	29.9	0.9	27.5	0.6	~	~	18.5	3.0	~
167	12	7	16	83	197	56	~	~	51	~	~	28.4	1.0	31.5	0.4	~	~	22.9	1.2	~
168	12	8	22	83	234	57	~	~	53	~	~	20.6	8.6	20.2	1.5	~	~	17.2	3.6	~
169	12	10	17	83	290	37	~	~	40	~	~	~	~	~	~	~	~	~	~	~
170	12	6	20	84	171	65	~	~	45	~	~	30.3	0.9	34.8	0.4	~	~	25.7	0.8	~
171	12	7	17	84	198	58	~	~	47	~	~	33.0	0.6	33.0	0.5	~	~	33.0	0.5	~
172	12	8	17	84	229	58	~	~	50	~	~	19.0	16.0	18.3	2.3	~	~	17.0	4.0	~
173	12	6	10	85	161	58	~	~	41	~	~	41.0	0.3	39.0	0.3	~	~	38.8	0.3	~
174	12	5	28	86	148	67	~	~	38	~	~	41.0	0.4	39.0	0.3	~	~	39.0	0.3	~
175	12	6	19	86	170	53	~	~	38	~	58	43.0	0.3	42.0	0.3	~	~	41.0	0.3	~
176	12	7	15	86	196	58	~	~	46	~	~	42.0	0.3	40.0	0.3	~	~	40.0	0.3	~
177	12	8	15	86	227	65	~	~	48	~	~	30.0	0.9	31.0	0.5	~	~	29.5	0.6	~
178	12	9	17	86	260	48	~	~	42	~	~	37.0	0.3	31.0	0.5	~	~	35.0	0.4	~
179	12	10	21	86	294	44	~	~	39	~	~	40.0	0.5	39.0	0.3	~	~	38.0	0.3	~
180	13	3	21	84	80	52	~	~	47	~	~	25.7	0.8	26.3	0.9	~	~	23.2	0.8	~
181	13	5	17	84	137	61	~	~	46	~	~	32.0	0.3	28.0	0.6	~	~	23.5	0.8	~
182	13	6	19	84	170	87	~	~	52	~	~	33.0	0.3	32.0	0.3	~	~	21.0	1.4	~
183	13	7	13	84	194	88	~	~	58	~	~	15.0	16.0	29.0	0.5	~	~	23.5	0.8	~
184	13	8	16	84	228	82	~	~	60	~	~	~	16.0	18.5	16.0	~	~	~	16.0	~
185	13	5	24	85	144	74	~	~	52	~	~	~	~	~	~	~	~	~	~	~
186	14	3	21	84	80	~	~	~	~	~	~	26.4	0.4	30.5	0.3	~	~	20.5	0.4	~
187	14	5	17	84	137	55	~	~	47	~	~	31.0	0.3	30.0	0.3	~	~	30.0	0.3	~
188	14	6	19	84	170	67	~	~	53	~	~	31.0	0.3	30.5	0.3	~	~	23.0	2.5	~
189	14	7	13	84	194	80	~	~	60	~	~	~	~	22.0	1.1	~	~	22.7	2.7	~
190	14	8	16	84	228	76	~	~	62	~	~	~	16.0	~	16.0	~	~	~	16.0	~
191	15	3	21	84	80	46	~	~	43	~	~	29.1	0.3	28.9	0.3	~	~	24.5	0.5	~
192	15	5	17	84	137	51	~	~	43	~	~	23.0	0.3	23.0	0.3	~	~	19.5	1.0	~
193	15	6	19	84	170	65	~	~	49	~	~	24.0	0.3	24.0	0.3	~	~	26.0	0.3	~
194	15	7	13	84	194	69	~	~	55	~	~	20.0	0.6	23.0	0.3	~	~	25.5	0.3	~
195	15	8	16	84	228	66	~	~	58	~	~	19.0	0.8	22.5	0.3	~	~	24.5	0.5	~
196	15	5	24	85	144	65	~	~	47	~	~	12.0	12.6	~	16.0	~	~	~	16.0	~
197	16	5	22	84	142	48	~	~	50	~	~	8.7	1.0	9.3	0.8	~	~	8.9	0.3	~
198	16	6	18	84	169	68	~	~	51	~	~	12.3	0.3	12.2	0.3	~	~	~	~	~
199	16	7	16	84	197	72	~	~	61	~	~	9.0	0.9	9.7	0.6	~	~	8.0	4.0	~
200	16	8	17	84	229	67	~	~	63	~	~	6.3	11.0	~	16.0	~	~	6.0	9.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 6

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
201	16	5	24	85	144	53	~	~	51	~	~	10.0	0.6	10.9	0.5	~	~	9.5	0.3	~
202	16	5	21	86	141	58	~	~	44	~	~	12.7	0.3	12.4	0.3	~	~	9.7	0.3	~
203	16	6	12	86	163	67	~	~	52	~	69	12.5	0.3	11.5	0.4	~	~	9.7	0.3	~
204	16	7	15	86	196	59	~	~	56	~	~	10.5	0.5	6.8	1.6	~	~	8.0	0.4	~
205	16	8	13	86	225	72	~	~	59	~	~	~	16.0	~	16.0	~	~	~	16.0	~
206	16	9	12	86	255	58	~	~	52	~	~	~	16.0	~	16.0	~	~	6.5	0.7	~
207	16	10	24	86	297	53	~	~	44	~	~	12.0	0.3	11.0	0.5	~	~	6.7	0.7	~
208	17	6	20	84	171	58	~	~	55	~	~	21.6	0.3	7.6	16.0	~	~	9.1	16.0	~
209	17	7	14	84	195	72	~	~	54	~	~	16.0	1.3	21.0	0.3	~	~	22.0	0.3	~
210	17	8	16	84	228	76	~	~	56	~	~	~	16.0	~	16.0	~	~	15.3	1.6	~
211	17	5	24	85	144	64	~	~	~	~	~	17.3	1.0	~	~	~	~	21.5	0.3	~
212	17	6	17	85	168	65	~	~	51	~	~	15.3	1.6	21.7	0.3	~	~	21.7	0.3	~
213	17	5	2	86	122	56	~	~	38	~	~	21.5	0.3	21.5	0.3	~	~	22.0	0.3	~
214	17	6	3	86	154	61	~	~	50	~	57	18.5	0.8	16.5	0.9	~	~	21.0	0.3	~
215	17	6	26	86	177	76	~	~	53	~	84	~	~	16.0	~	16.0	~	~	16.0	~
216	17	7	13	86	194	74	~	~	53	~	~	11.0	16.0	20.0	0.3	~	~	~	16.0	~
217	17	8	13	86	225	62	~	~	55	~	~	~	16.0	~	16.0	~	~	~	16.0	~
218	17	9	17	86	260	55	~	~	46	~	~	~	16.0	~	16.0	~	~	~	16.0	~
219	18	5	29	84	149	71	~	59	~	~	~	9.9	0.5	~	~	~	~	~	~	~
220	18	7	9	84	190	84	~	63	~	118	~	13.0	0.3	17.0	0.3	~	~	~	~	~
221	18	8	6	84	218	80	~	65	~	117	81	~	16.0	~	16.0	~	~	~	~	~
222	18	5	28	86	148	97	~	57	0	155	79	15.5	0.3	18.0	0.3	~	~	~	~	~
223	18	6	12	86	163	95	~	59	~	122	79	6.0	16.0	~	16.0	~	~	~	~	~
224	18	6	26	86	177	97	~	63	~	115	~	~	16.0	~	16.0	~	~	~	~	~
225	19	5	29	84	149	71	~	58	~	~	~	11.2	0.3	9.2	0.7	~	~	~	~	~
226	19	7	9	84	190	72	~	60	~	85	~	14.5	0.3	17.0	0.3	~	~	~	~	~
227	19	8	6	84	218	68	~	64	~	76	81	~	16.0	~	16.0	~	~	~	~	~
228	19	5	28	86	148	83	~	55	0	95	79	17.0	0.3	18.0	0.3	~	~	~	~	~
229	19	6	12	86	163	~	~	57	~	86	79	6.0	15.0	8.2	1.3	~	~	~	0.0	~
230	19	6	26	86	177	87	~	60	~	94	~	~	16.0	~	16.0	~	~	~	~	~
231	20	5	29	84	149	60	~	52	~	~	~	7.3	1.5	7.1	1.5	~	~	~	~	~
232	20	7	9	84	190	62	~	55	~	93	79	16.5	0.3	16.5	0.3	~	~	~	~	~
233	20	8	6	84	218	66	~	57	~	74	74	~	16.0	6.5	2.0	~	~	~	~	~
234	20	5	28	86	148	60	~	~	~	73	79	18.0	0.3	~	~	~	~	~	~	~
235	20	6	12	86	163	64	~	55	~	72	70	17.0	0.3	~	~	~	~	~	~	~
236	20	6	26	86	177	70	~	54	~	76	76	13.0	0.5	16.0	0.3	~	~	~	~	~
237	21	5	29	84	149	54	~	49	~	~	~	21.6	2.7	15.7	3.0	~	~	~	~	~
238	21	7	9	84	190	82	~	56	~	123	~	21.0	0.6	24.5	1.0	~	~	~	~	~
239	21	8	3	84	215	91	~	60	~	151	90	~	16.0	16.7	14.3	~	~	~	~	~
240	21	5	27	86	147	88	~	51	0	112	79	26.5	0.3	26.0	0.3	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 7

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
241	21	6	22	86	173	~	~	57	~	68	~	~	~	28.0	0.5	~	~	~	~	~
242	22	5	29	84	149	54	~	48	~	~	~	17.6	2.0	19.2	1.3	~	~	~	~	~
243	22	7	9	84	190	79	~	56	~	83	~	24.0	0.4	25.0	1.0	~	~	~	~	~
244	22	8	3	84	215	81	~	60	~	92	90	12.6	16.0	20.3	1.3	~	~	~	~	~
245	22	5	27	86	147	73	~	51	0	92	79	35.0	0.3	26.5	0.3	~	~	~	~	~
246	22	6	22	86	173	71	~	54	~	64	~	23.0	0.5	31.0	0.3	~	~	~	~	~
247	23	5	29	84	149	48	~	42	~	~	~	24.6	0.7	19.5	1.3	~	~	~	~	~
248	23	7	9	84	190	58	~	48	~	68	~	22.0	0.3	23.5	1.3	~	~	~	~	~
249	23	8	3	84	215	63	~	51	~	77	86	6.5	16.0	17.0	1.6	~	~	~	~	~
250	23	5	27	86	147	58	~	42	0	75	79	26.0	0.3	25.0	0.3	~	~	~	~	~
251	23	6	22	86	173	58	~	~	~	~	~	25.0	0.3	~	~	~	~	~	~	~
252	24	11	27	79	331	36	~	~	~	~	~	27.0	0.7	7.0	5.0	~	~	5.0	6.0	~
253	24	12	6	79	340	34	~	~	36	~	~	31.0	0.5	15.0	0.8	~	~	17.0	0.5	~
254	24	12	17	79	351	34	~	~	~	~	~	32.0	0.5	15.0	0.8	~	~	19.0	0.4	~
255	24	12	27	79	361	34	~	~	~	~	~	32.0	0.5	15.0	0.8	~	~	19.0	0.4	~
256	24	1	7	80	7	20	~	~	~	~	~	32.0	0.5	15.0	0.8	~	~	19.0	0.4	~
257	24	1	24	80	24	29	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
258	24	2	6	80	37	31	~	~	~	~	~	32.0	0.5	15.0	0.8	~	~	19.0	0.4	~
259	24	2	22	80	53	30	~	~	~	~	~	32.0	0.5	15.0	0.8	~	~	18.0	0.4	~
260	24	3	6	80	65	34	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
261	24	3	19	80	78	~	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
262	24	4	3	80	93	32	~	~	~	~	~	32.0	0.5	15.0	0.8	~	~	19.0	0.4	~
263	24	4	18	80	108	48	~	~	~	~	~	33.0	0.4	16.0	0.7	~	~	20.0	0.3	~
264	24	5	2	80	122	60	~	~	~	~	~	33.0	0.4	16.0	0.7	~	~	20.0	0.3	~
265	24	5	23	80	143	48	~	~	~	~	~	33.0	0.4	17.0	0.6	~	~	19.0	0.4	~
266	24	7	11	80	192	49	~	~	~	~	~	26.0	0.7	11.0	1.8	~	~	12.0	1.1	~
267	24	7	18	80	199	75	~	~	~	~	~	26.0	0.7	10.0	2.1	~	~	11.0	1.5	~
268	24	7	29	80	210	87	~	~	~	~	~	19.0	2.0	6.0	7.0	~	~	7.0	4.0	~
269	24	8	6	80	218	75	~	~	~	~	~	19.0	1.9	6.0	7.0	~	~	13.0	0.9	~
270	24	8	13	80	225	79	~	~	~	~	~	17.0	2.3	5.0	10.0	~	~	5.0	6.0	~
271	24	8	14	80	226	51	~	~	50	~	~	27.0	0.7	7.0	5.0	~	~	7.0	4.0	~
272	24	8	21	80	233	68	~	~	~	~	~	31.0	0.5	8.0	3.3	~	~	5.0	6.0	~
273	24	8	27	80	239	58	~	~	~	~	~	25.0	0.8	8.0	5.0	~	~	6.0	4.8	~
274	24	9	4	80	247	60	~	~	~	~	~	29.0	0.6	7.0	5.0	~	~	6.0	4.8	~
275	24	9	11	80	254	69	~	~	~	~	~	25.0	0.8	7.0	5.0	~	~	6.0	4.8	~
276	24	9	18	80	261	55	~	~	52	~	~	22.0	1.0	6.0	7.0	~	~	5.0	6.0	~
277	24	10	1	80	274	64	~	~	51	~	~	25.0	0.8	7.0	5.0	~	~	7.0	4.0	~
278	24	10	9	80	282	54	~	~	51	~	~	21.0	1.3	6.0	7.0	~	~	5.0	6.0	~
279	24	10	16	80	289	51	~	~	48	~	~	20.0	1.6	6.0	7.0	~	~	5.0	6.0	~
280	24	10	23	80	296	38	~	~	47	~	~	23.0	0.9	6.0	7.0	~	~	5.0	6.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 8

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
281	24	11	4	80	308	43	~	~	45	~	~	27.0	0.7	7.0	5.0	~	~	6.0	4.8	~
282	24	11	18	80	322	29	~	~	41	~	~	29.0	0.6	12.0	1.5	~	~	11.0	1.5	~
283	24	1	5	81	5	29	~	~	37	~	~	32.0	0.5	15.0	0.8	~	~	18.0	0.4	~
284	24	1	30	81	30	29	~	~	36	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
285	24	3	3	81	62	34	~	~	36	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
286	24	4	1	81	91	35	~	~	39	~	~	32.0	0.5	16.0	0.7	~	~	20.0	0.3	~
287	24	4	29	81	119	50	~	~	44	~	~	34.0	0.3	16.0	0.7	~	~	20.0	0.3	~
288	24	6	3	81	154	54	~	~	50	~	~	34.0	0.3	21.0	0.3	~	~	21.0	0.3	~
289	24	6	30	81	181	74	~	~	52	~	~	34.0	0.3	21.0	0.3	~	~	21.0	0.3	~
290	24	7	9	81	190	52	~	~	~	~	~	30.0	0.6	14.0	1.0	~	~	18.0	0.4	~
291	24	7	14	81	195	~	~	~	54	~	~	24.0	0.9	11.0	1.8	~	~	13.0	0.9	~
292	24	8	20	81	232	60	~	~	53	~	~	7.0	16.0	4.0	16.0	~	~	4.0	8.5	~
293	24	9	9	81	252	62	~	~	53	~	~	7.0	16.0	4.0	16.0	~	~	3.0	11.0	~
294	24	9	22	81	265	49	~	~	52	~	~	6.0	16.0	3.0	16.0	~	~	3.0	11.0	~
295	24	10	8	81	281	42	~	~	48	~	~	23.0	0.9	6.0	7.0	~	~	4.0	8.5	~
296	24	10	21	81	294	26	~	~	46	~	~	20.0	1.6	5.0	10.0	~	~	3.0	11.0	~
297	24	11	5	81	309	31	~	~	45	~	~	18.0	2.2	5.0	10.0	~	~	3.0	11.0	~
298	24	12	4	81	338	38	~	~	39	~	~	30.0	0.6	12.0	1.5	~	~	13.0	0.9	~
299	24	5	26	82	146	43	~	~	46	~	~	33.0	0.4	15.0	0.8	~	~	19.0	0.4	~
300	24	7	2	82	183	80	~	~	53	~	~	20.0	1.6	7.0	5.0	~	~	7.0	4.0	~
301	24	8	5	82	217	73	~	~	54	~	~	6.0	16.0	4.0	16.0	~	~	4.0	8.5	~
302	24	9	14	82	257	62	~	~	50	~	~	19.0	1.9	5.0	10.0	~	~	4.0	8.5	~
303	24	10	17	82	290	36	~	~	47	~	~	24.0	0.9	6.0	7.0	~	~	4.0	8.5	~
304	24	11	16	82	320	29	~	~	41	~	~	27.0	0.7	8.0	3.3	~	~	7.0	4.0	~
305	24	2	4	83	35	29	~	~	37	~	~	32.0	0.5	15.0	0.8	~	~	19.0	0.4	~
306	24	7	27	83	208	65	~	~	53	~	~	22.0	1.0	7.0	5.0	~	~	7.0	4.0	~
307	24	8	15	83	227	58	~	~	56	~	~	13.0	14.0	5.0	10.0	~	~	5.0	6.0	~
308	24	11	3	83	307	46	~	~	46	~	~	29.0	0.6	6.0	7.0	~	~	6.0	4.8	~
309	24	11	9	83	313	33	~	~	44	~	~	27.0	0.7	10.0	2.1	~	~	11.0	1.5	~
310	24	11	21	83	325	29	~	~	42	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
311	24	11	28	83	332	30	~	~	40	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
312	24	1	19	84	19	25	~	~	37	~	~	33.0	0.4	16.0	0.7	~	~	19.0	0.4	~
313	24	2	10	84	41	30	~	~	36	~	~	31.0	0.5	15.0	0.8	~	~	19.0	0.4	~
314	25	11	27	79	331	36	~	~	~	~	~	28.0	0.7	13.0	1.3	~	~	11.0	1.5	~
315	25	12	6	79	340	35	~	~	35	~	~	31.0	0.5	15.0	0.8	~	~	17.0	0.5	~
316	25	12	17	79	351	34	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
317	25	12	27	79	361	35	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
318	25	1	5	80	5	32	~	~	37	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
319	25	1	7	80	7	30	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
320	25	1	24	80	24	32	~	~	~	~	~	33.0	0.4	16.0	0.7	~	~	19.0	0.4	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 9

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
321	25	2	6	80	37	29	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	20.0	0.3	~
322	25	2	22	80	53	28	~	~	~	~	~	33.0	0.4	16.0	0.7	~	~	19.0	0.4	~
323	25	3	6	80	65	~	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
324	25	3	19	80	78	~	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
325	25	4	3	80	93	31	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
326	25	4	18	80	108	46	~	~	~	~	~	33.0	0.4	17.0	0.6	~	~	20.0	0.3	~
327	25	5	2	80	122	60	~	~	~	~	~	33.0	0.4	17.0	0.6	~	~	20.0	0.3	~
328	25	5	23	80	143	46	~	~	~	~	~	34.0	0.3	17.0	0.6	~	~	20.0	0.3	~
329	25	6	17	80	168	56	~	~	~	~	~	34.0	0.3	18.0	0.5	~	~	20.0	0.3	~
330	25	7	11	80	192	54	~	~	~	~	~	34.0	0.3	18.0	0.5	~	~	20.0	0.3	~
331	25	7	18	80	199	77	~	~	~	~	~	34.0	0.3	17.0	0.6	~	~	20.0	0.3	~
332	25	7	29	80	210	108	~	~	~	~	~	32.0	0.3	17.0	0.6	~	~	20.0	0.3	~
333	25	8	6	80	218	74	~	~	~	~	~	30.0	0.6	15.0	0.8	~	~	17.0	0.5	~
334	25	8	13	80	225	89	~	~	~	~	~	28.0	0.7	14.0	1.0	~	~	14.0	0.8	~
335	25	8	21	80	233	76	~	~	~	~	~	33.0	0.4	16.0	0.7	~	~	18.0	0.4	~
336	25	8	27	80	239	58	~	~	~	~	~	31.0	0.5	15.0	0.8	~	~	17.0	0.5	~
337	25	9	4	80	247	59	~	~	~	~	~	33.0	0.4	16.0	0.7	~	~	18.0	0.4	~
338	25	9	11	80	254	71	~	~	~	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
339	25	9	18	80	261	54	~	~	52	~	~	31.0	0.5	16.0	0.7	~	~	17.0	0.5	~
340	25	9	25	80	268	53	~	~	50	~	~	33.0	0.4	16.0	0.7	~	~	18.0	0.4	~
341	25	10	1	80	274	58	~	~	51	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
342	25	10	9	80	282	51	~	~	50	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
343	25	10	16	80	289	59	~	~	49	~	~	31.0	0.5	16.0	0.7	~	~	18.0	0.4	~
344	25	10	23	80	296	45	~	~	46	~	0	31.0	0.5	16.0	0.7	~	~	18.0	0.4	~
345	25	11	4	80	308	43	~	~	44	~	~	32.0	0.5	16.0	0.7	~	~	18.0	0.4	~
346	25	11	18	80	322	30	~	~	40	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
347	25	1	30	81	30	30	~	~	36	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
348	25	3	3	81	62	31	~	~	36	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
349	25	4	1	81	91	35	~	~	39	~	~	33.0	0.4	16.0	0.7	~	~	20.0	0.3	~
350	25	4	29	81	119	49	~	~	45	~	~	33.0	0.4	17.0	0.6	~	~	20.0	0.3	~
351	25	6	3	81	154	60	~	~	51	~	~	33.0	0.4	18.0	0.5	~	~	21.0	0.3	~
352	25	6	30	81	181	78	~	~	53	~	~	33.0	0.4	17.0	0.6	~	~	20.0	0.3	~
353	25	7	9	81	190	52	~	~	~	~	~	34.0	0.3	17.0	0.6	~	~	20.0	0.3	~
354	25	7	14	81	195	~	~	~	55	~	~	33.0	0.4	17.0	0.6	~	~	20.0	0.3	~
355	25	8	20	81	232	66	~	~	53	~	~	20.0	1.6	7.0	5.0	~	~	6.0	4.8	~
356	25	9	9	81	252	81	~	~	54	~	~	18.0	2.2	5.0	10.0	~	~	4.0	8.5	~
357	25	9	22	81	265	51	~	~	52	~	~	16.0	3.8	5.0	10.0	~	~	4.0	8.5	~
358	25	10	8	81	281	43	~	~	48	~	~	23.0	0.9	8.0	3.3	~	~	6.0	4.8	~
359	25	10	21	81	294	28	~	~	46	~	~	22.0	1.0	8.0	3.3	~	~	7.0	4.0	~
360	25	11	5	81	309	36	~	~	45	~	~	21.0	1.2	8.0	3.3	~	~	7.0	4.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 10

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
361	25	12	4	81	338	34	~	~	39	~	~	30.0	0.6	14.0	1.0	~	~	14.0	0.8	~
362	25	5	26	82	146	46	~	~	49	~	~	32.0	0.5	22.0	0.3	~	~	19.0	0.4	~
363	25	7	2	82	183	88	~	~	55	~	~	29.0	0.6	13.0	1.3	~	~	13.0	0.9	~
364	25	8	5	82	217	80	~	~	55	~	~	23.0	0.9	9.0	2.6	~	~	8.0	3.0	~
365	25	9	14	82	257	~	~	~	52	~	~	17.0	2.3	6.0	7.0	~	~	6.0	4.8	~
366	25	10	16	82	289	37	~	~	47	~	~	24.0	0.9	11.0	1.8	~	~	12.0	1.1	~
367	25	11	16	82	320	31	~	~	40	~	~	31.0	0.5	15.0	0.8	~	~	16.0	0.6	~
368	25	2	4	83	35	29	~	~	37	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
369	25	7	27	83	208	67	~	~	56	~	~	33.0	0.4	18.0	0.5	~	~	23.0	0.3	~
370	25	8	15	83	227	78	~	~	54	~	~	27.0	0.7	14.0	1.0	~	~	17.0	0.5	~
371	25	11	3	83	307	45	~	~	46	~	~	29.0	0.6	14.0	1.0	~	~	13.0	0.9	~
372	25	11	9	83	313	35	~	~	44	~	~	31.0	0.5	16.0	0.7	~	~	19.0	0.4	~
373	25	11	21	83	325	31	~	~	41	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
374	25	11	28	83	332	29	~	~	40	~	~	32.0	0.5	16.0	0.7	~	~	19.0	0.4	~
375	26	11	27	79	331	36	~	~	~	~	~	28.0	0.7	12.0	1.5	~	~	10.0	1.8	~
376	26	12	6	79	340	34	~	~	36	~	~	29.0	0.6	16.0	0.7	~	~	17.0	0.5	~
377	26	12	17	79	351	32	~	~	~	~	~	29.0	0.6	16.0	0.7	~	~	18.0	0.4	~
378	26	12	27	79	361	35	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	18.0	0.4	~
379	26	1	7	80	7	32	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
380	26	1	24	80	24	32	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
381	26	2	6	80	37	31	~	~	~	~	~	30.0	0.5	16.0	0.7	~	~	18.0	0.4	~
382	26	2	22	80	53	28	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	18.0	0.4	~
383	26	3	6	80	65	~	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
384	26	3	19	80	78	~	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	18.0	0.4	~
385	26	4	3	80	93	31	~	~	~	~	~	30.0	0.6	16.0	0.7	~	~	18.0	0.4	~
386	26	4	18	80	108	40	~	~	~	~	~	31.0	0.6	16.0	0.7	~	~	18.0	0.4	~
387	26	5	2	80	122	52	~	~	~	~	~	31.0	0.5	16.0	0.7	~	~	19.0	0.4	~
388	26	5	23	80	143	44	~	~	~	~	~	31.0	0.5	17.0	0.6	~	~	18.0	0.4	~
389	26	6	17	80	168	50	~	~	~	~	~	31.0	0.5	17.0	0.6	~	~	19.0	0.4	~
390	26	7	11	80	192	49	~	~	~	~	~	31.0	0.5	17.0	0.6	~	~	20.0	0.3	~
391	26	7	29	80	210	68	~	~	~	~	~	31.0	0.5	16.0	0.7	~	~	18.0	0.4	~
392	26	8	6	80	218	55	~	~	~	~	~	31.0	0.5	15.0	0.8	~	~	16.0	0.6	~
393	26	8	13	80	225	61	~	~	~	~	~	31.0	0.5	13.0	1.3	~	~	14.0	0.8	~
394	26	8	21	80	233	55	~	~	~	~	~	31.0	0.5	17.0	0.6	~	~	17.0	0.5	~
395	26	8	27	80	239	54	~	~	~	~	~	31.0	0.5	15.0	0.8	~	~	16.0	0.6	~
396	26	9	4	80	247	49	~	~	~	~	~	31.0	0.5	16.0	0.7	~	~	17.0	0.5	~
397	26	9	11	80	254	60	~	~	~	~	~	31.0	0.5	15.0	0.8	~	~	16.0	0.6	~
398	26	9	18	80	261	49	~	~	50	~	~	31.0	0.5	15.0	0.8	~	~	16.0	0.6	~
399	26	9	25	80	268	45	~	~	48	~	~	31.0	0.5	16.0	0.7	~	~	16.0	0.6	~
400	26	10	1	80	274	47	~	~	49	~	~	31.0	0.5	15.0	0.8	~	~	16.0	0.6	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 11

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
401	26	10	9	80	282	46	~	~	49	~	~	31.0	0.5	8.0	3.3	~	~	15.0	0.7	~
402	26	10	16	80	289	41	~	~	47	~	~	30.0	0.6	7.0	5.0	~	~	14.0	0.8	~
403	26	10	23	80	296	31	~	~	45	~	~	30.0	0.6	7.0	5.0	~	~	14.0	0.8	~
404	26	11	4	80	308	40	~	~	44	~	~	30.0	0.6	14.0	1.0	~	~	15.0	0.7	~
405	26	11	18	80	322	29	~	~	40	~	~	30.0	0.6	15.0	0.8	~	~	18.0	0.4	~
406	26	1	5	81	5	30	~	~	37	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
407	26	1	30	81	30	29	~	~	36	~	~	30.0	0.6	16.0	0.7	~	~	18.0	0.4	~
408	26	3	3	81	62	29	~	~	36	~	~	30.0	0.6	16.0	0.7	~	~	18.0	0.4	~
409	26	4	1	81	91	35	~	~	37	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
410	26	4	29	81	119	45	~	~	42	~	~	31.0	0.5	16.0	0.7	~	~	19.0	0.4	~
411	26	6	3	81	154	51	~	~	47	~	~	32.0	0.5	17.0	0.6	~	~	20.0	0.3	~
412	26	6	30	81	181	60	~	~	48	~	~	32.0	0.5	17.0	0.6	~	~	20.0	0.3	~
413	26	7	9	81	190	50	~	~	~	~	~	32.0	0.5	17.0	0.6	~	~	20.0	0.3	~
414	26	7	14	81	195	~	~	~	50	~	~	32.0	0.5	17.0	0.6	~	~	20.0	0.3	~
415	26	8	20	81	232	60	~	~	53	~	~	25.0	0.8	7.0	5.0	~	~	7.0	4.0	~
416	26	9	9	81	252	62	~	~	51	~	~	18.0	2.2	6.0	7.0	~	~	5.0	6.0	~
417	26	9	22	81	265	41	~	~	50	~	~	17.0	2.3	6.0	7.0	~	~	4.0	8.5	~
418	26	10	8	81	281	39	~	~	47	~	~	28.0	0.7	11.0	1.8	~	~	8.0	3.0	~
419	26	10	21	81	294	27	~	~	45	~	~	26.0	0.7	9.0	2.6	~	~	7.0	4.0	~
420	26	11	5	81	309	37	~	~	44	~	~	24.0	0.9	7.0	5.0	~	~	6.0	4.8	~
421	26	12	4	81	338	32	~	~	39	~	~	28.0	0.7	15.0	0.8	~	~	16.0	0.6	~
422	26	5	26	82	146	41	~	~	44	~	~	31.0	0.5	16.0	0.7	~	~	19.0	0.4	~
423	26	7	2	82	183	63	~	~	50	~	~	31.0	0.5	15.0	0.8	~	~	14.0	0.8	~
424	26	8	5	82	217	63	~	~	51	~	~	25.0	0.8	8.0	3.3	~	~	8.0	3.0	~
425	26	9	14	82	257	~	~	~	49	~	~	14.0	7.0	9.0	2.6	~	~	5.0	6.0	~
426	26	10	17	82	290	35	~	~	45	~	~	25.0	0.8	12.0	1.5	~	~	9.0	2.2	~
427	26	11	16	82	320	31	~	~	40	~	~	28.0	0.7	14.0	1.0	~	~	12.0	1.1	~
428	26	2	4	83	35	29	~	~	37	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
429	26	7	27	83	208	59	~	~	54	~	~	32.0	0.5	17.0	0.6	~	~	20.0	0.3	~
430	26	8	15	83	227	60	~	~	53	~	~	30.0	0.6	11.0	1.8	~	~	14.0	0.8	~
431	26	11	3	83	307	43	~	~	45	~	~	27.0	0.7	12.0	1.5	~	~	10.0	1.8	~
432	26	11	9	83	313	31	~	~	43	~	~	30.0	0.6	16.0	0.7	~	~	17.0	0.5	~
433	26	11	21	83	325	29	~	~	42	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
434	26	11	28	83	332	29	~	~	40	~	~	30.0	0.5	16.0	0.7	~	~	17.0	0.5	~
435	26	1	19	84	19	28	~	~	37	~	~	30.0	0.6	16.0	0.7	~	~	17.0	0.5	~
436	26	2	10	84	41	30	~	~	36	~	~	30.0	0.6	16.0	0.7	~	~	19.0	0.4	~
437	27	12	6	79	340	39	~	~	36	~	~	27.5	0.7	16.0	0.8	~	~	16.0	1.4	~
438	27	12	17	79	351	36	~	~	~	~	~	27.0	0.8	16.0	0.8	~	~	15.5	1.5	~
439	27	12	27	79	361	38	~	~	~	~	~	27.5	0.7	16.5	0.8	~	~	16.5	1.3	~
440	27	1	24	80	24	32	~	~	~	~	~	28.0	0.7	16.5	0.8	~	~	17.0	1.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 12

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
441	27	2	6	80	37	29	~	~	~	~	~	26.5	0.9	16.0	0.8	~	~	16.0	1.4	~
442	27	2	22	80	53	30	~	~	~	~	~	26.5	0.9	16.0	0.8	~	~	16.0	1.4	~
443	27	3	6	80	65	~	~	~	~	~	~	28.0	0.7	16.5	0.8	~	~	17.0	1.3	~
444	27	3	19	80	78	~	~	~	~	~	~	28.0	0.7	16.5	0.8	~	~	17.0	1.3	~
445	27	4	3	80	93	34	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
446	27	4	18	80	108	39	~	~	~	~	~	29.0	0.6	17.0	0.7	~	~	17.0	1.3	~
447	27	5	23	80	143	48	~	~	~	~	~	29.0	0.6	17.0	0.7	~	~	17.0	1.3	~
448	27	6	17	80	168	50	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	18.0	0.9	~
449	27	7	11	80	192	60	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
450	27	7	18	80	199	62	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
451	27	7	29	80	210	72	~	~	~	~	~	26.0	1.0	15.0	1.3	~	~	16.0	1.4	~
452	27	8	6	80	218	51	~	~	~	~	~	25.0	1.3	13.0	2.5	~	~	12.0	2.6	~
453	27	8	13	80	225	53	~	~	~	~	~	21.0	2.2	10.0	4.0	~	~	10.0	3.3	~
454	27	8	21	80	233	49	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
455	27	8	27	80	239	49	~	~	~	~	~	25.0	1.3	13.0	2.5	~	~	13.0	2.2	~
456	27	9	4	80	247	51	~	~	~	~	~	27.0	0.8	10.0	4.0	~	~	11.0	2.9	~
457	27	9	11	80	254	54	~	~	~	~	~	22.0	1.8	9.0	5.8	~	~	10.0	3.3	~
458	27	9	18	80	261	45	~	~	52	~	~	19.0	3.0	9.0	5.8	~	~	9.0	4.2	~
459	27	9	25	80	268	44	~	~	50	~	~	25.0	1.3	9.0	5.8	~	~	9.0	4.2	~
460	27	10	1	80	274	46	~	~	51	~	~	22.0	1.8	9.0	5.8	~	~	8.0	5.0	~
461	27	10	9	80	282	44	~	~	51	~	~	18.0	3.5	8.0	6.5	~	~	8.0	5.0	~
462	27	10	16	80	289	39	~	~	49	~	~	18.0	3.5	8.0	6.5	~	~	8.0	5.0	~
463	27	10	23	80	296	34	~	~	47	~	~	21.0	2.2	8.0	6.5	~	~	7.0	6.0	~
464	27	11	4	80	308	46	~	~	46	~	~	23.0	1.7	9.0	5.8	~	~	8.0	5.0	~
465	27	11	18	80	322	30	~	~	41	~	~	23.0	1.7	9.0	5.8	~	~	9.0	4.2	~
466	27	1	5	81	5	30	~	~	38	~	~	28.0	0.7	16.0	0.8	~	~	16.0	1.4	~
467	27	1	30	81	30	29	~	~	36	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
468	27	3	3	81	62	30	~	~	36	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
469	27	4	1	81	91	41	~	~	38	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
470	27	4	29	81	119	46	~	~	42	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
471	27	6	3	81	154	53	~	~	48	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
472	27	6	30	81	181	65	~	~	49	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
473	27	7	9	81	190	50	~	~	56	~	~	22.0	1.8	17.0	0.7	~	~	17.0	1.3	~
474	27	7	14	81	195	~	~	~	50	~	~	22.0	1.8	16.0	0.8	~	~	17.0	1.3	~
475	27	8	20	81	232	66	~	~	55	~	~	18.0	3.5	12.0	2.8	~	~	15.0	1.6	~
476	27	9	9	81	252	54	~	~	54	~	~	13.0	12.0	5.0	15.0	~	~	6.0	7.5	~
477	27	9	22	81	265	43	~	~	53	~	~	13.0	12.0	5.0	15.0	~	~	5.0	9.0	~
478	27	10	8	81	281	43	~	~	49	~	~	12.0	16.0	5.0	15.0	~	~	5.0	9.0	~
479	27	10	21	81	294	37	~	~	47	~	~	12.0	16.0	5.0	15.0	~	~	5.0	9.0	~
480	27	11	5	81	309	32	~	~	46	~	~	12.0	16.0	5.0	15.0	~	~	5.0	9.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 13

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
481	27	12	4	81	338	36	~	~	40	~	~	17.0	4.2	6.0	12.0	~	~	6.0	7.5	~
482	27	5	26	82	146	44	~	~	45	~	~	26.0	1.0	17.0	0.7	~	~	27.0	1.3	~
483	27	7	2	82	183	63	~	~	52	~	~	26.0	1.0	10.0	4.0	~	~	10.0	3.3	~
484	27	8	5	82	217	57	~	~	53	~	~	13.0	12.0	7.0	8.3	~	~	7.0	6.0	~
485	27	9	14	82	257	~	~	~	53	~	~	13.0	12.0	5.0	15.0	~	~	5.0	9.0	~
486	27	10	15	82	288	47	~	~	51	~	~	19.0	3.0	6.0	12.0	~	~	6.0	7.5	~
487	27	11	16	82	320	31	~	~	41	~	~	22.0	1.8	8.0	6.5	~	~	7.0	6.0	~
488	27	7	27	83	208	62	~	~	52	~	~	24.0	1.6	14.0	1.8	~	~	15.0	1.6	~
489	27	8	15	83	227	58	~	~	55	~	~	20.0	2.6	8.0	6.5	~	~	9.0	4.2	~
490	27	11	3	83	307	40	~	~	46	~	~	19.0	3.0	8.0	6.5	~	~	7.0	6.0	~
491	27	11	9	83	313	31	~	~	45	~	~	22.0	1.8	9.0	5.8	~	~	10.0	3.3	~
492	27	11	21	83	325	29	~	~	41	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
493	27	11	28	83	332	30	~	~	40	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
494	27	1	19	84	19	19	~	~	35	~	~	27.0	0.8	17.0	0.7	~	~	16.0	1.4	~
495	27	2	10	84	41	28	~	~	34	~	~	27.0	0.8	17.0	0.7	~	~	16.0	1.4	~
496	28	12	6	79	340	37	~	~	36	~	~	28.0	0.7	15.5	1.0	~	~	14.5	1.7	~
497	28	12	17	79	351	32	~	~	~	~	~	27.0	0.8	16.0	0.8	~	~	15.0	1.6	~
498	28	12	27	79	361	36	~	~	~	~	~	28.5	0.6	16.5	0.8	~	~	15.5	1.5	~
499	28	1	24	80	24	30	~	~	~	~	~	28.5	0.6	16.5	0.8	~	~	16.0	1.4	~
500	28	2	6	80	37	29	~	~	~	~	~	27.0	0.8	16.5	0.8	~	~	15.5	1.5	~
501	28	2	22	80	53	32	~	~	~	~	~	27.0	0.8	16.0	0.8	~	~	15.0	1.6	~
502	28	3	6	80	65	~	~	~	~	~	~	28.5	0.6	17.0	0.7	~	~	15.5	1.5	~
503	28	3	19	80	78	~	~	~	~	~	~	28.5	0.6	17.0	0.7	~	~	16.0	1.4	~
504	28	4	3	80	93	33	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
505	28	4	18	80	108	40	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	16.0	1.4	~
506	28	5	23	80	143	45	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
507	28	6	17	80	168	50	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
508	28	7	11	80	192	57	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
509	28	7	18	80	199	50	~	~	~	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
510	28	7	29	80	210	71	~	~	~	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
511	28	8	6	80	218	50	~	~	~	~	~	24.0	1.6	15.0	1.3	~	~	14.0	1.9	~
512	28	8	13	80	225	53	~	~	~	~	~	21.0	2.2	12.0	2.8	~	~	11.0	2.9	~
513	28	8	21	80	233	49	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
514	28	8	27	80	239	48	~	~	~	~	~	26.0	1.0	15.0	1.3	~	~	14.0	1.9	~
515	28	9	4	80	247	48	~	~	~	~	~	25.0	1.3	13.0	2.5	~	~	12.0	2.6	~
516	28	9	11	80	254	54	~	~	~	~	~	23.0	1.7	12.0	2.8	~	~	11.0	2.9	~
517	28	9	18	80	261	45	~	~	51	~	~	21.0	2.2	10.0	4.0	~	~	10.0	3.3	~
518	28	9	25	80	268	42	~	~	49	~	~	24.0	1.6	10.0	4.0	~	~	10.0	3.3	~
519	28	10	1	80	274	46	~	~	50	~	~	22.0	1.8	10.0	4.0	~	~	9.0	4.2	~
520	28	10	9	80	282	44	~	~	50	~	~	20.0	2.6	9.0	5.8	~	~	8.0	5.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 14

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
521	28	10	16	80	289	35	~	~	48	~	~	20.0	2.6	9.0	5.8	~	~	8.0	5.0	~
522	28	10	23	80	296	32	~	~	46	~	~	24.0	1.6	9.0	5.8	~	~	8.0	5.0	~
523	28	11	4	80	308	43	~	~	44	~	~	22.0	1.8	9.0	5.8	~	~	9.0	4.2	~
524	28	11	18	80	322	29	~	~	40	~	~	24.0	1.6	10.0	4.0	~	~	10.0	3.3	~
525	28	1	5	81	5	29	~	~	37	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
526	28	1	30	81	30	29	~	~	35	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
527	28	3	3	81	62	28	~	~	35	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
528	28	4	1	81	91	32	~	~	37	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
529	28	4	29	81	119	47	~	~	41	~	~	29.0	0.6	17.0	0.7	~	~	17.0	1.3	~
530	28	6	3	81	154	51	~	~	46	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
531	28	6	30	81	181	57	~	~	48	~	~	29.0	0.6	18.0	0.6	~	~	17.0	1.3	~
532	28	7	9	81	190	49	~	~	53	~	~	30.0	0.6	18.0	0.6	~	~	17.0	1.3	~
533	28	7	14	81	195	~	~	~	50	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
534	28	8	20	81	232	60	~	~	56	~	~	13.0	12.0	7.0	8.3	~	~	6.0	7.5	~
535	28	9	9	81	252	56	~	~	52	~	~	17.0	4.2	5.0	15.0	~	~	5.0	9.0	~
536	28	9	22	81	265	41	~	~	52	~	~	13.0	12.0	5.0	15.0	~	~	4.0	12.0	~
537	28	10	8	81	281	40	~	~	48	~	~	11.0	16.0	5.0	15.0	~	~	4.0	12.0	~
538	28	10	21	81	294	32	~	~	46	~	~	11.0	16.0	5.0	15.0	~	~	4.0	12.0	~
539	28	11	5	81	309	29	~	~	45	~	~	11.0	16.0	4.0	16.0	~	~	4.0	12.0	~
540	28	12	4	81	338	32	~	~	38	~	~	22.0	1.8	7.0	8.3	~	~	7.0	6.0	~
541	28	5	26	82	146	43	~	~	44	~	~	29.0	0.6	18.0	0.6	~	~	16.0	1.4	~
542	28	7	2	82	183	58	~	~	50	~	~	20.0	2.6	11.0	3.2	~	~	11.0	2.9	~
543	28	8	5	82	217	59	~	~	52	~	~	13.0	12.0	8.0	6.5	~	~	7.0	6.0	~
544	28	9	14	82	257	~	~	~	50	~	~	9.0	16.0	5.0	15.0	~	~	4.0	12.0	~
545	28	10	15	82	288	46	~	~	48	~	~	15.0	6.5	8.0	6.5	~	~	6.0	7.5	~
546	28	11	16	82	320	29	~	~	40	~	~	25.0	1.3	12.0	2.8	~	~	10.0	3.3	~
547	28	7	27	83	208	62	~	~	51	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
548	28	8	15	83	227	58	~	~	54	~	~	14.0	8.0	10.0	4.0	~	~	9.0	4.2	~
549	28	11	3	83	307	39	~	~	46	~	~	20.0	2.6	8.0	6.5	~	~	7.0	6.0	~
550	28	11	9	83	313	31	~	~	43	~	~	25.0	1.3	11.0	3.2	~	~	9.0	4.2	~
551	28	11	21	83	325	29	~	~	44	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
552	28	11	28	83	332	30	~	~	39	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
553	28	1	19	84	19	15	~	~	34	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
554	28	2	10	84	41	28	~	~	33	~	~	28.0	0.7	17.0	0.7	~	~	16.0	1.4	~
555	29	12	6	79	340	37	~	~	37	~	~	27.0	0.8	17.0	0.7	~	~	16.0	1.4	~
556	29	12	17	79	351	36	~	~	~	~	~	27.0	0.8	16.0	0.8	~	~	16.0	1.4	~
557	29	12	27	79	361	36	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	16.5	1.3	~
558	29	1	24	80	24	32	~	~	~	~	~	28.0	0.7	17.5	0.7	~	~	17.0	1.3	~
559	29	2	6	80	37	32	~	~	~	~	~	27.0	0.8	17.0	0.7	~	~	17.0	1.3	~
560	29	2	22	80	53	~	~	~	~	~	~	27.0	0.8	17.0	0.7	~	~	17.0	1.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 15

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
561	29	3	6	80	65	~	~	~	~	~	~	28.0	0.7	17.5	0.7	~	~	17.0	1.3	~
562	29	3	19	80	78	~	~	~	~	~	~	28.0	0.7	17.5	0.7	~	~	17.0	1.3	~
563	29	4	3	80	93	32	~	~	~	~	~	28.0	0.7	18.0	0.6	~	~	16.0	1.4	~
564	29	4	18	80	108	40	~	~	~	~	~	34.0	0.4	17.0	0.7	~	~	16.0	1.4	~
565	29	5	23	80	143	44	~	~	~	~	~	35.0	0.3	19.0	0.5	~	~	18.0	0.9	~
566	29	6	17	80	168	50	~	~	~	~	~	35.0	0.3	19.0	0.5	~	~	18.0	0.9	~
567	29	7	11	80	192	58	~	~	~	~	~	35.0	0.3	19.0	0.5	~	~	18.0	0.9	~
568	29	7	18	80	199	55	~	~	~	~	~	35.0	0.3	19.0	0.5	~	~	18.0	0.9	~
569	29	7	29	80	210	62	~	~	~	~	~	35.0	0.3	18.0	0.6	~	~	18.0	0.9	~
570	29	8	6	80	218	50	~	~	~	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
571	29	8	13	80	225	54	~	~	~	~	~	27.0	0.8	17.0	0.7	~	~	17.0	1.3	~
572	29	8	21	80	233	49	~	~	~	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
573	29	8	27	80	239	48	~	~	~	~	~	27.0	0.8	17.0	0.7	~	~	17.0	1.3	~
574	29	9	4	80	247	49	~	~	~	~	~	27.0	0.8	16.0	0.8	~	~	17.0	1.3	~
575	29	9	11	80	254	53	~	~	~	~	~	26.0	1.0	16.0	0.8	~	~	16.0	1.4	~
576	29	9	18	80	261	45	~	~	53	~	~	25.0	1.3	15.0	1.3	~	~	15.0	1.6	~
577	29	9	25	80	268	43	~	~	52	~	~	27.0	0.8	~	~	~	~	16.0	1.4	~
578	29	10	1	80	274	46	~	~	52	~	~	27.0	0.8	~	~	~	~	16.0	1.4	~
579	29	10	9	80	282	43	~	~	52	~	~	26.0	1.0	15.0	1.3	~	~	15.0	1.6	~
580	29	10	16	80	289	35	~	~	51	~	~	25.0	1.3	15.0	1.3	~	~	15.0	1.6	~
581	29	10	23	80	296	33	~	~	49	~	~	25.0	1.3	15.0	1.3	~	~	15.0	1.6	~
582	29	11	4	80	308	43	~	~	44	~	~	26.0	1.0	16.0	0.8	~	~	16.0	1.4	~
583	29	11	18	80	322	29	~	~	43	~	~	27.0	0.8	17.0	0.7	~	~	17.0	1.3	~
584	29	1	5	81	5	29	~	~	41	~	~	28.0	0.7	18.0	0.6	~	~	18.0	0.9	~
585	29	1	30	81	30	29	~	~	39	~	~	28.0	0.7	18.0	0.6	~	~	18.0	0.9	~
586	29	3	3	81	62	29	~	~	39	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
587	29	4	1	81	91	36	~	~	40	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
588	29	4	29	81	119	46	~	~	44	~	~	29.0	0.6	17.0	0.7	~	~	17.0	1.3	~
589	29	6	3	81	154	50	~	~	50	~	~	29.0	0.6	19.0	0.5	~	~	18.0	0.9	~
590	29	6	30	81	181	57	~	~	51	~	~	29.0	0.6	19.0	0.5	~	~	18.0	0.9	~
591	29	7	9	81	190	52	~	~	56	~	~	29.0	0.6	19.0	0.5	~	~	18.0	0.9	~
592	29	7	14	81	195	~	~	~	55	~	~	29.0	0.6	20.0	0.4	~	~	10.0	3.3	~
593	29	8	20	81	232	62	~	~	57	~	~	14.0	8.0	8.0	6.5	~	~	8.0	5.0	~
594	29	9	9	81	252	52	~	~	55	~	~	13.0	12.0	6.0	12.0	~	~	6.0	7.5	~
595	29	9	22	81	265	41	~	~	54	~	~	14.0	8.0	6.0	12.0	~	~	5.0	9.0	~
596	29	10	8	81	281	39	~	~	51	~	~	13.0	12.0	6.0	12.0	~	~	5.0	9.0	~
597	29	10	21	81	294	31	~	~	48	~	~	13.0	12.0	6.0	12.0	~	~	5.0	9.0	~
598	29	11	5	81	309	29	~	~	48	~	~	13.0	12.0	6.0	12.0	~	~	5.0	9.0	~
599	29	12	4	81	338	32	~	~	42	~	~	21.0	2.2	7.0	8.3	~	~	6.0	7.5	~
600	29	5	26	82	146	42	~	~	47	~	~	29.0	0.6	19.0	0.5	~	~	18.0	0.9	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 16

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
601	29	7	2	82	183	62	~	~	53	~	~	21.0	2.2	15.0	1.3	~	~	16.0	1.4	~
602	29	8	5	82	217	59	~	~	55	~	~	17.0	4.2	10.0	4.0	~	~	11.0	2.9	~
603	29	9	14	82	257	~	~	~	52	~	~	12.0	16.0	7.0	8.3	~	~	6.0	7.5	~
604	29	10	15	82	288	49	~	~	48	~	~	12.0	16.0	4.0	16.0	~	~	7.0	6.0	~
605	29	11	16	82	320	30	~	~	43	~	~	25.0	1.3	14.0	1.8	~	~	13.0	2.2	~
606	29	7	27	83	208	60	~	~	54	~	~	30.0	0.6	19.0	0.5	~	~	18.0	0.9	~
607	29	8	15	83	227	57	~	~	57	~	~	23.0	1.7	16.0	0.8	~	~	16.0	1.4	~
608	29	11	3	83	307	39	~	~	48	~	~	18.0	3.5	12.0	2.8	~	~	12.0	2.6	~
609	29	11	9	83	313	36	~	~	47	~	~	27.0	0.8	16.0	0.8	~	~	16.0	1.4	~
610	29	11	21	83	325	30	~	~	40	~	~	24.0	1.6	21.0	0.3	~	~	19.0	0.7	~
611	29	11	28	83	332	28	~	~	43	~	~	28.0	0.7	14.0	1.8	~	~	17.0	1.3	~
612	29	1	19	84	19	15	~	~	38	~	~	28.0	0.7	17.0	0.7	~	~	17.0	1.3	~
613	29	2	10	84	41	28	~	~	34	~	~	28.0	0.7	18.0	0.6	~	~	17.0	1.3	~
614	30	11	27	79	331	36	~	~	~	~	~	23.0	0.6	19.0	0.6	~	~	16.0	0.8	~
615	30	12	6	79	340	42	~	0	36	~	~	23.0	0.6	19.0	0.6	~	~	17.0	0.6	~
616	30	12	17	79	351	34	~	~	~	~	~	23.0	0.6	19.0	0.6	~	~	18.0	0.5	~
617	30	12	27	79	361	36	~	~	~	~	~	24.0	0.5	20.0	0.5	~	~	18.0	0.5	~
618	30	4	18	80	108	56	~	~	~	~	~	25.0	0.3	21.0	0.3	~	~	19.0	0.3	~
619	30	5	2	80	122	68	~	~	~	~	~	26.0	0.3	21.0	0.3	~	~	20.0	0.3	~
620	30	5	23	80	143	49	~	~	~	~	~	26.0	0.3	21.0	0.3	~	~	18.0	0.5	~
621	30	6	17	80	168	72	~	~	~	~	~	26.0	0.3	22.0	0.3	~	~	21.0	0.3	~
622	30	7	11	80	192	50	~	~	~	~	~	26.0	0.3	22.0	0.3	~	~	21.0	0.3	~
623	30	7	18	80	199	81	~	~	~	~	~	26.0	0.3	22.0	0.3	~	~	20.0	0.3	~
624	30	7	29	80	210	91	~	~	~	~	~	19.0	1.0	21.0	0.3	~	~	19.0	0.3	~
625	30	8	6	80	218	73	~	~	~	~	~	16.0	1.7	18.0	0.7	~	~	17.0	0.6	~
626	30	8	13	80	225	83	~	~	~	~	~	16.0	1.7	16.0	1.0	~	~	14.0	1.2	~
627	30	8	21	80	233	65	~	~	~	~	~	20.0	0.9	17.0	0.8	~	~	15.0	0.9	~
628	30	8	27	80	239	57	~	~	~	~	~	19.0	1.0	17.0	0.8	~	~	15.0	0.9	~
629	30	9	4	80	247	71	~	~	~	~	~	19.0	1.0	17.0	0.8	~	~	14.0	1.2	~
630	30	9	11	80	254	73	~	~	~	~	~	19.0	1.0	17.0	0.8	~	~	14.0	1.2	~
631	30	9	18	80	261	56	~	~	56	~	~	18.0	1.2	17.0	0.8	~	~	14.0	1.2	~
632	30	9	25	80	268	66	~	~	52	~	~	23.0	0.6	19.0	0.6	~	~	14.0	1.2	~
633	30	10	1	80	274	60	~	~	54	~	~	23.0	0.6	19.0	0.6	~	~	15.0	0.9	~
634	30	10	9	80	282	60	~	~	53	~	~	21.0	0.8	19.0	0.6	~	~	15.0	0.9	~
635	30	10	16	80	289	52	~	~	49	~	~	21.0	0.8	18.0	0.7	~	~	15.0	0.9	~
636	30	10	23	80	296	33	~	~	47	~	~	23.0	0.6	19.0	0.6	~	~	15.0	0.9	~
637	30	11	4	80	308	44	~	~	44	~	~	24.0	0.5	20.0	0.5	~	~	17.0	0.6	~
638	30	11	18	80	322	29	~	~	38	~	~	24.0	0.5	21.0	0.3	~	~	19.0	0.3	~
639	30	1	5	81	5	31	~	~	35	~	~	24.0	0.5	20.0	0.5	~	~	19.0	0.3	~
640	30	1	30	81	30	29	~	~	34	~	~	24.0	0.5	20.0	0.5	~	~	19.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 17

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
641	30	3	3	81	62	33	~	~	35	~	~	24.0	0.5	21.0	0.3	~	~	19.0	0.3	~
642	30	4	1	81	91	43	~	~	38	~	~	25.0	0.3	21.0	0.3	~	~	19.0	0.3	~
643	30	4	29	81	119	47	~	~	46	~	~	25.0	0.3	21.0	0.3	~	~	20.0	0.3	~
644	30	6	3	81	154	58	~	~	56	~	~	26.0	0.3	22.0	0.3	~	~	21.0	0.3	~
645	30	6	30	81	181	82	~	~	57	~	~	26.0	0.3	22.0	0.3	~	~	21.0	0.3	~
646	30	7	9	81	190	~	~	~	56	~	~	24.0	0.5	22.0	0.3	~	~	20.0	0.3	~
647	30	7	14	81	195	~	~	~	60	~	~	22.0	0.7	22.0	0.3	~	~	20.0	0.3	~
648	30	8	20	81	232	63	~	~	63	~	~	7.0	16.0	8.0	12.0	~	~	6.0	15.0	~
649	30	9	9	81	252	86	~	~	60	~	~	13.0	7.3	12.0	3.0	~	~	10.0	4.3	~
650	30	9	22	81	265	49	~	~	57	~	~	11.0	12.0	10.0	5.7	~	~	8.0	8.5	~
651	30	10	8	81	281	45	~	~	50	~	~	13.0	7.3	12.0	0.3	~	~	10.0	4.3	~
652	30	10	21	81	294	29	~	~	46	~	~	13.0	7.3	12.0	3.0	~	~	9.0	6.3	~
653	30	11	5	81	309	41	~	~	44	~	~	13.0	7.3	12.0	3.0	~	~	9.0	6.3	~
654	30	12	4	81	338	32	~	~	39	~	~	20.0	0.9	17.0	0.8	~	~	13.0	1.5	~
655	30	5	26	82	146	48	~	~	50	~	~	26.0	0.3	21.0	0.3	~	~	21.0	0.3	~
656	30	7	2	82	183	69	~	~	59	~	~	23.0	0.6	22.0	0.3	~	~	21.0	0.3	~
657	30	8	5	82	217	68	~	~	59	~	~	15.0	2.6	17.0	0.8	~	~	15.0	0.9	~
658	30	9	14	82	257	~	~	~	54	~	~	15.0	2.6	12.0	3.0	~	~	10.0	4.3	~
659	30	10	16	82	289	51	~	~	48	~	~	20.0	0.9	18.0	0.7	~	~	13.0	1.5	~
660	30	11	16	82	320	31	~	~	39	~	~	24.0	0.5	20.0	0.5	~	~	18.0	0.5	~
661	30	5	27	83	147	64	~	~	53	~	~	27.0	0.3	24.0	0.3	~	~	28.0	0.3	~
662	30	7	27	83	208	70	~	~	51	~	~	27.0	0.3	23.0	0.3	~	~	21.0	0.3	~
663	30	8	15	83	227	66	~	~	63	~	~	13.0	7.3	21.0	0.3	~	~	20.0	0.3	~
664	30	11	3	83	307	46	~	~	45	~	~	23.0	0.6	20.0	0.5	~	~	16.0	0.8	~
665	30	11	9	83	313	33	~	~	43	~	~	24.0	0.5	21.0	0.3	~	~	18.0	0.5	~
666	30	11	21	83	325	30	~	~	40	~	~	24.0	0.5	21.0	0.3	~	~	19.0	0.3	~
667	30	11	28	83	332	30	~	~	39	~	~	24.0	0.5	21.0	0.3	~	~	19.0	0.3	~
668	30	1	19	84	19	29	~	~	35	~	~	24.0	0.5	21.0	0.3	~	~	19.0	0.3	~
669	30	2	10	84	41	28	~	~	34	~	~	24.0	0.5	21.0	0.3	~	~	19.0	0.3	~
670	31	11	27	79	331	36	~	~	~	~	~	18.5	1.1	15.0	1.2	~	~	10.5	3.9	~
671	31	12	6	79	340	36	~	~	35	~	~	24.5	0.3	20.0	0.5	~	~	10.0	4.3	~
672	31	12	17	79	351	32	~	~	~	~	~	24.5	0.3	20.0	0.5	~	~	17.0	0.6	~
673	31	12	27	79	361	34	~	~	~	~	~	24.5	0.3	20.0	0.5	~	~	17.0	0.6	~
674	31	1	24	80	24	32	~	~	~	~	~	24.5	0.3	20.5	0.4	~	~	17.5	0.6	~
675	31	2	6	80	37	30	~	~	~	~	~	25.0	0.3	20.5	0.4	~	~	18.0	0.5	~
676	31	2	22	80	53	30	~	~	~	~	~	24.0	0.5	20.0	0.5	~	~	16.5	0.7	~
677	31	3	6	80	65	~	~	~	~	~	~	25.0	0.3	20.5	0.4	~	~	18.0	0.5	~
678	31	3	19	80	78	~	~	~	~	~	~	25.0	0.3	20.5	0.4	~	~	18.0	0.5	~
679	31	4	3	80	93	35	~	~	~	~	~	25.0	0.3	21.0	0.3	~	~	18.0	0.5	~
680	31	4	18	80	108	40	~	~	~	~	~	25.0	0.3	20.0	0.5	~	~	18.0	0.5	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 18

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
681	31	5	2	80	122	52	~	~	~	~	~	26.0	0.3	21.0	0.3	~	~	18.5	0.4	~
682	31	5	23	80	143	41	~	~	~	~	~	23.0	0.6	21.0	3.0	~	~	18.0	0.5	~
683	31	6	17	80	168	54	~	~	~	~	~	26.0	0.3	22.0	0.3	~	~	18.0	0.5	~
684	31	7	11	80	192	48	~	~	~	~	~	23.0	0.6	21.0	0.3	~	~	18.0	0.5	~
685	31	7	18	80	199	63	~	~	~	~	~	19.0	1.0	18.0	0.7	~	~	17.0	0.6	~
686	31	7	29	80	210	67	~	~	~	~	~	15.0	2.6	13.0	2.0	~	~	12.0	2.0	~
687	31	8	6	80	218	57	~	~	~	~	~	11.0	12.0	11.0	4.5	~	~	9.0	6.3	~
688	31	8	13	80	225	60	~	~	~	~	~	10.0	13.0	10.0	5.7	~	~	8.0	8.5	~
689	31	8	21	80	233	50	~	~	~	~	~	20.0	0.9	13.0	0.2	~	~	8.0	8.5	~
690	31	8	27	80	239	53	~	~	~	~	~	14.0	0.5	12.0	0.3	~	~	8.0	8.5	~
691	31	9	4	80	247	54	~	~	~	~	~	14.0	5.0	9.0	9.0	~	~	7.0	12.0	~
692	31	9	11	80	254	59	~	~	~	~	~	9.0	15.0	8.0	12.0	~	~	7.0	12.0	~
693	31	9	18	80	261	49	~	~	52	~	~	9.0	15.0	8.0	12.0	~	~	6.0	15.0	~
694	31	9	25	80	268	50	~	~	49	~	~	18.0	1.2	8.0	12.0	~	~	6.0	15.0	~
695	31	10	1	80	274	51	~	~	51	~	~	17.0	1.5	7.0	15.0	~	~	6.0	15.0	~
696	31	10	9	80	282	45	~	~	51	~	~	9.0	15.0	7.0	15.0	~	~	6.0	15.0	~
697	31	10	16	80	289	42	~	~	46	~	~	8.0	16.0	7.0	15.0	~	~	6.0	15.0	~
698	31	10	23	80	296	30	~	~	42	~	~	8.0	16.0	7.0	15.0	~	~	5.0	16.0	~
699	31	11	4	80	308	43	~	~	44	~	~	9.0	15.0	7.0	15.0	~	~	5.0	16.0	~
700	31	11	18	80	322	30	~	~	37	~	~	16.0	1.7	11.0	4.5	~	~	6.0	15.0	~
701	31	1	5	81	5	29	~	~	36	~	~	25.0	0.3	20.0	0.5	~	~	17.0	0.6	~
702	31	1	30	81	30	29	~	~	34	~	~	25.0	0.3	20.0	0.5	~	~	17.0	0.6	~
703	31	3	3	81	62	30	~	~	34	~	~	25.0	0.3	21.0	0.3	~	~	18.0	0.5	~
704	31	4	1	81	91	35	~	~	36	~	~	25.0	0.3	21.0	0.3	~	~	18.0	0.5	~
705	31	4	29	81	119	47	~	~	44	~	~	26.0	0.3	22.0	0.3	~	~	18.0	0.5	~
706	31	6	3	81	154	48	~	~	50	~	~	27.0	0.3	22.0	0.3	~	~	20.0	0.3	~
707	31	6	30	81	181	59	~	~	52	~	~	26.0	0.3	22.0	0.3	~	~	19.0	0.3	~
708	31	7	9	81	190	~	~	~	56	~	~	28.0	0.3	21.0	0.3	~	~	14.0	1.2	~
709	31	7	14	81	195	~	~	~	54	~	~	17.0	1.5	17.0	0.8	~	~	17.0	0.6	~
710	31	8	20	81	232	58	~	~	60	~	~	8.0	16.0	7.0	15.0	~	~	6.0	15.0	~
711	31	9	9	81	252	68	~	~	52	~	~	8.0	16.0	7.0	15.0	~	~	5.0	16.0	~
712	31	9	22	81	265	44	~	~	50	~	~	8.0	16.0	7.0	15.0	~	~	5.0	16.0	~
713	31	10	8	81	281	40	~	~	47	~	~	9.0	15.0	9.0	9.0	~	~	5.0	16.0	~
714	31	10	21	81	294	27	~	~	42	~	~	8.0	16.0	9.0	9.0	~	~	5.0	16.0	~
715	31	11	5	81	309	35	~	~	42	~	~	12.0	9.0	12.0	3.0	~	~	8.0	8.5	~
716	31	12	4	81	338	34	~	~	39	~	~	17.0	1.5	13.0	2.0	~	~	6.0	15.0	~
717	31	5	26	82	146	42	~	~	42	~	~	25.0	0.3	21.0	0.3	~	~	19.0	0.3	~
718	31	7	2	82	183	64	~	~	54	~	~	11.0	12.0	12.0	3.0	~	~	11.0	3.5	~
719	31	8	5	82	217	62	~	~	52	~	~	8.0	16.0	8.0	12.0	~	~	6.0	15.0	~
720	31	9	14	82	257	~	~	~	45	~	~	5.0	16.0	7.0	15.0	~	~	5.0	16.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 19

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
721	31	10	15	82	288	42	~	~	42	~	~	10.0	13.0	10.0	5.7	~	~	7.0	12.0	~
722	31	11	16	82	320	29	~	~	37	~	~	17.0	1.5	12.0	3.0	~	~	8.0	8.5	~
723	31	5	27	83	147	55	~	~	49	~	~	26.0	0.3	22.0	0.3	~	~	19.0	0.3	~
724	31	7	27	83	208	57	~	~	63	~	~	18.0	1.2	16.0	1.0	~	~	12.0	2.0	~
725	31	8	15	83	227	60	~	~	57	~	~	9.0	15.0	11.0	4.5	~	~	10.0	4.3	~
726	31	11	3	83	307	41	~	~	42	~	~	11.0	12.0	9.0	9.0	~	~	6.0	15.0	~
727	31	11	9	83	313	30	~	~	41	~	~	13.0	7.3	10.0	5.7	~	~	6.0	15.0	~
728	31	11	21	83	325	29	~	~	38	~	~	25.0	0.3	20.0	0.5	~	~	11.0	3.5	~
729	31	11	28	83	332	29	~	~	37	~	~	25.0	0.3	20.0	0.5	~	~	15.0	0.9	~
730	31	1	19	84	19	28	~	~	35	~	~	24.0	0.5	21.0	0.3	~	~	17.0	0.6	~
731	31	2	10	84	41	28	~	~	33	~	~	25.0	0.3	21.0	0.3	~	~	17.0	0.6	~
732	32	11	27	79	331	36	~	~	~	~	~	21.5	0.9	12.0	3.4	~	~	8.5	10.0	~
733	32	12	6	79	340	34	~	~	35	~	~	25.0	0.7	17.0	1.0	~	~	8.0	11.0	~
734	32	12	17	79	351	36	~	~	~	~	~	25.0	0.7	17.0	1.0	~	~	18.0	0.7	~
735	32	12	27	79	361	34	~	~	~	~	~	25.0	0.7	18.0	0.8	~	~	18.5	0.7	~
736	32	1	24	80	24	31	~	~	~	~	~	26.0	0.6	17.5	0.9	~	~	18.5	0.7	~
737	32	2	6	80	37	31	~	~	~	~	~	24.5	0.7	17.5	0.9	~	~	19.0	0.6	~
738	32	2	22	80	53	32	~	~	~	~	~	24.5	0.7	17.5	0.9	~	~	18.0	0.7	~
739	32	3	6	80	65	~	~	~	~	~	~	25.0	0.7	18.0	0.8	~	~	19.0	0.6	~
740	32	3	19	80	78	~	~	~	~	~	~	25.0	0.7	18.0	0.8	~	~	19.0	0.6	~
741	32	4	3	80	93	~	~	~	~	~	~	25.0	0.7	18.0	0.8	~	~	19.0	0.6	~
742	32	4	18	80	108	43	~	~	~	~	~	26.0	0.6	19.0	0.7	~	~	20.0	0.6	~
743	32	5	2	80	122	70	~	~	~	~	~	26.0	0.6	20.0	0.6	~	~	21.0	0.5	~
744	32	5	23	80	143	54	~	~	~	~	~	27.0	0.5	20.0	0.6	~	~	22.0	0.5	~
745	32	6	17	80	168	64	~	~	~	~	~	26.0	0.6	20.0	0.6	~	~	22.0	0.5	~
746	32	7	11	80	192	49	~	~	~	~	~	25.0	0.7	21.0	0.5	~	~	22.0	0.5	~
747	32	7	18	80	199	84	~	~	~	~	~	24.0	0.7	19.0	0.7	~	~	21.0	0.5	~
748	32	7	29	80	210	98	~	~	~	~	~	15.0	7.0	17.0	1.0	~	~	20.0	0.6	~
749	32	8	6	80	218	80	~	~	~	~	~	12.0	15.0	13.0	3.4	~	~	18.0	0.7	~
750	32	8	13	80	225	70	~	~	~	~	~	11.0	16.0	12.0	4.3	~	~	15.0	1.5	~
751	32	8	21	80	233	63	~	~	~	~	~	22.0	0.9	18.0	0.8	~	~	20.0	0.6	~
752	32	8	27	80	239	60	~	~	~	~	~	19.0	1.9	15.0	1.8	~	~	16.0	1.2	~
753	32	9	4	80	247	74	~	~	~	~	~	19.0	1.9	13.0	3.4	~	~	15.0	1.5	~
754	32	9	11	80	254	76	~	~	~	~	~	18.0	2.6	13.0	3.4	~	~	14.0	2.0	~
755	32	9	18	80	261	52	~	~	55	~	~	17.0	3.7	13.0	3.4	~	~	14.0	2.0	~
756	32	9	25	80	268	63	~	~	52	~	~	22.0	0.9	13.0	3.4	~	~	14.0	2.0	~
757	32	10	1	80	274	62	~	~	52	~	~	21.0	1.0	13.0	3.4	~	~	14.0	2.0	~
758	32	10	9	80	282	78	~	~	51	~	~	20.0	1.3	13.0	3.4	~	~	14.0	2.0	~
759	32	10	16	80	289	53	~	~	48	~	~	19.0	1.9	13.0	3.4	~	~	13.0	2.5	~
760	32	10	23	80	296	34	~	~	46	~	~	20.0	1.3	13.0	3.4	~	~	13.0	2.5	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 20

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
761	32	11	4	80	308	45	~	~	44	~	~	22.0	0.9	14.0	2.4	~	~	13.0	2.5	~
762	32	11	18	80	322	34	~	~	38	~	~	25.0	0.7	18.0	0.8	~	~	19.0	0.6	~
763	32	1	5	81	5	29	~	~	35	~	~	25.0	0.7	18.0	0.8	~	~	19.0	0.6	~
764	32	1	30	81	30	29	~	~	34	~	~	25.0	0.7	19.0	0.7	~	~	19.0	0.6	~
765	32	3	3	81	62	31	~	~	34	~	~	25.0	0.7	19.0	0.7	~	~	20.0	0.6	~
766	32	4	1	81	91	50	~	~	38	~	~	25.0	0.7	19.0	0.7	~	~	20.0	0.6	~
767	32	4	29	81	119	50	~	~	45	~	~	27.0	0.5	20.0	0.6	~	~	21.0	0.5	~
768	32	6	3	81	154	57	~	~	54	~	~	28.0	0.4	21.0	0.5	~	~	23.0	0.5	~
769	32	6	30	81	181	96	~	~	55	~	~	27.0	0.5	21.0	0.5	~	~	22.0	0.5	~
770	32	7	9	81	190	~	~	~	57	~	~	20.0	1.3	19.0	0.7	~	~	21.0	0.5	~
771	32	7	14	81	195	~	~	~	59	~	~	18.0	2.6	19.0	0.7	~	~	21.0	0.5	~
772	32	8	20	81	232	78	~	~	61	~	~	4.0	16.0	5.0	16.0	~	~	5.0	16.0	~
773	32	9	9	81	252	74	~	~	58	~	~	5.0	16.0	4.0	16.0	~	~	5.0	16.0	~
774	32	9	22	81	265	53	~	~	55	~	~	5.0	16.0	4.0	16.0	~	~	11.0	5.0	~
775	32	10	8	81	281	45	~	~	49	~	~	13.0	12.0	6.0	16.0	~	~	5.0	16.0	~
776	32	10	21	81	294	29	~	~	45	~	~	14.0	11.0	6.0	16.0	~	~	5.0	16.0	~
777	32	11	5	81	309	29	~	~	43	~	~	14.0	11.0	6.0	16.0	~	~	5.0	16.0	~
778	32	12	4	81	338	36	~	~	37	~	~	24.0	0.7	14.0	2.4	~	~	6.0	15.0	~
779	32	5	26	82	146	46	~	~	50	~	~	25.0	0.7	20.0	0.6	~	~	22.0	0.5	~
780	32	7	2	82	183	80	~	~	58	~	~	16.0	5.5	16.0	1.3	~	~	19.0	0.6	~
781	32	8	5	82	217	82	~	~	60	~	~	9.0	16.0	9.0	11.0	~	~	11.0	5.0	~
782	32	9	14	82	257	~	~	~	54	~	~	10.0	16.0	6.0	16.0	~	~	6.0	15.0	~
783	32	10	16	82	289	55	~	~	47	~	~	21.0	1.0	12.0	4.3	~	~	10.0	6.0	~
784	32	11	16	82	320	29	~	~	38	~	~	24.0	0.7	23.0	0.3	~	~	13.0	2.5	~
785	32	5	27	83	147	69	~	~	52	~	~	27.0	0.5	21.0	0.5	~	~	23.0	0.5	~
786	32	7	27	83	208	79	~	~	59	~	~	27.0	0.5	22.0	0.4	~	~	24.0	0.4	~
787	32	8	15	83	227	88	~	~	60	~	~	19.0	1.9	18.0	0.8	~	~	21.0	0.5	~
788	32	11	3	83	307	44	~	~	43	~	~	24.0	0.7	17.0	1.0	~	~	16.0	1.2	~
789	32	11	9	83	313	31	~	~	43	~	~	26.0	0.6	19.0	0.7	~	~	20.0	0.6	~
790	32	11	21	83	325	29	~	~	39	~	~	26.0	0.6	19.0	0.7	~	~	20.0	0.6	~
791	32	11	28	83	332	29	~	~	38	~	~	15.0	7.0	19.0	0.7	~	~	20.0	0.6	~
792	32	1	19	84	19	29	~	~	35	~	~	25.0	0.7	19.0	0.7	~	~	20.0	0.6	~
793	32	2	10	84	41	28	~	~	34	~	~	25.0	0.7	19.0	0.7	~	~	19.0	0.6	~
794	33	11	27	79	331	36	~	~	~	~	~	17.0	3.7	9.0	11.0	~	~	7.0	13.0	~
795	33	12	6	79	340	34	~	~	35	~	~	23.0	0.8	11.0	2.4	~	~	13.0	2.5	~
796	33	12	17	79	351	32	~	~	~	~	~	23.5	0.7	17.0	1.0	~	~	17.0	0.8	~
797	33	12	27	79	361	34	~	~	~	~	~	24.0	0.7	17.0	1.0	~	~	17.0	0.8	~
798	33	1	24	80	24	29	~	~	~	~	~	24.0	0.7	17.0	1.0	~	~	18.0	0.7	~
799	33	1	30	80	30	28	~	~	34	~	~	25.0	0.7	23.0	0.3	~	~	19.0	0.6	~
800	33	2	6	80	37	30	~	~	~	~	~	24.0	0.7	17.0	1.0	~	~	18.0	0.7	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 21

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
801	33	2	22	80	53	32	~	~	~	~	~	24.0	0.7	17.0	1.0	~	~	18.0	0.7	~
802	33	3	6	80	65	~	~	~	~	~	~	24.0	0.7	17.0	1.0	~	~	18.5	0.7	~
803	33	3	19	80	78	~	~	~	~	~	~	25.0	0.7	18.0	0.8	~	~	19.0	0.6	~
804	33	4	3	80	93	24	~	~	~	~	~	24.0	0.7	18.0	0.8	~	~	19.0	0.6	~
805	33	4	18	80	108	35	~	~	~	~	~	24.0	0.7	18.0	0.8	~	~	19.0	0.6	~
806	33	5	2	80	122	48	~	~	~	~	~	26.0	0.6	19.0	0.7	~	~	20.0	0.6	~
807	33	5	23	80	143	50	~	~	~	~	~	25.0	0.7	19.0	0.7	~	~	21.0	0.5	~
808	33	6	17	80	168	55	~	~	~	~	~	26.0	0.6	19.0	0.7	~	~	21.0	0.5	~
809	33	7	11	80	192	47	~	~	~	~	~	26.0	0.6	20.0	0.6	~	~	21.0	0.5	~
810	33	7	18	80	199	63	~	~	~	~	~	26.0	0.7	20.0	0.6	~	~	21.0	0.5	~
811	33	7	29	80	210	71	~	~	~	~	~	26.0	0.6	20.0	0.6	~	~	21.0	0.5	~
812	33	8	6	80	218	59	~	~	~	~	~	25.0	0.7	20.0	0.6	~	~	21.0	0.5	~
813	33	8	13	80	225	60	~	~	~	~	~	23.0	0.8	19.0	0.7	~	~	20.0	0.6	~
814	33	8	21	80	233	51	~	~	~	~	~	24.0	0.7	20.0	0.6	~	~	22.0	0.5	~
815	33	8	27	80	239	54	~	~	~	~	~	24.0	0.7	20.0	0.6	~	~	22.0	0.5	~
816	33	9	4	80	247	53	~	~	~	~	~	23.0	0.8	19.0	0.7	~	~	22.0	0.5	~
817	33	9	11	80	254	60	~	~	~	~	~	22.0	0.9	20.0	0.6	~	~	22.0	0.5	~
818	33	9	18	80	261	45	~	~	50	~	~	21.0	1.0	18.0	0.8	~	~	20.0	0.5	~
819	33	9	25	80	268	45	~	~	48	~	~	22.0	0.9	19.0	0.7	~	~	21.0	0.5	~
820	33	10	1	80	274	50	~	~	48	~	~	22.0	0.9	19.0	0.7	~	~	20.0	0.6	~
821	33	10	9	80	282	44	~	~	47	~	~	20.0	1.3	13.0	3.4	~	~	14.0	2.0	~
822	33	10	16	80	289	38	~	~	46	~	~	18.0	2.6	17.0	1.0	~	~	18.0	0.7	~
823	33	10	23	80	296	28	~	~	43	~	~	18.0	2.6	16.0	1.3	~	~	19.0	0.6	~
824	33	11	4	80	308	41	~	~	42	~	~	21.0	1.0	17.0	1.0	~	~	19.0	0.6	~
825	33	11	18	80	322	31	~	~	37	~	~	23.0	0.8	18.0	0.8	~	~	20.0	0.6	~
826	33	1	5	81	5	29	~	~	35	~	~	25.0	0.7	23.0	0.3	~	~	20.0	0.6	~
827	33	3	3	81	62	29	~	~	33	~	~	25.0	0.7	18.0	0.8	~	~	20.0	0.6	~
828	33	4	1	81	91	36	~	~	33	~	~	25.0	0.7	32.0	0.3	~	~	32.0	0.3	~
829	33	4	29	81	119	47	~	~	39	~	~	26.0	0.6	19.0	0.7	~	~	20.0	0.5	~
830	33	6	3	81	154	51	~	~	46	~	~	27.0	0.5	19.0	0.7	~	~	21.0	0.5	~
831	33	6	30	81	181	61	~	~	48	~	~	27.0	0.5	19.0	0.7	~	~	21.0	0.5	~
832	33	7	9	81	190	~	~	~	50	~	~	27.0	0.5	20.0	0.6	~	~	23.0	0.5	~
833	33	7	14	81	195	~	~	~	50	~	~	27.0	0.5	20.0	0.6	~	~	23.0	0.5	~
834	33	8	20	81	232	61	~	~	53	~	~	12.0	15.0	10.0	8.0	~	~	12.0	3.3	~
835	33	9	9	81	252	54	~	~	50	~	~	11.0	16.0	4.0	16.0	~	~	10.0	6.0	~
836	33	9	22	81	265	46	~	~	49	~	~	8.0	16.0	5.0	16.0	~	~	8.0	11.0	~
837	33	10	8	81	281	40	~	~	44	~	~	10.0	16.0	9.0	11.0	~	~	14.0	2.0	~
838	33	10	21	81	294	26	~	~	42	~	~	10.0	16.0	8.0	13.0	~	~	11.0	5.0	~
839	33	11	5	81	309	34	~	~	41	~	~	9.0	16.0	6.0	16.0	~	~	8.0	11.0	~
840	33	12	4	81	338	32	~	~	36	~	~	18.0	2.6	17.0	1.0	~	~	19.0	0.6	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 22

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
841	34	11	27	79	331	~	~	~	38	~	~	16.5	0.5	10.5	1.4	~	~	6.5	12.0	~
842	34	12	6	79	340	34	~	~	37	~	~	16.5	0.5	13.0	0.7	~	~	16.0	0.4	~
843	34	12	17	79	351	34	~	~	37	~	~	17.0	0.5	14.0	0.6	~	~	16.5	0.4	~
844	34	12	27	79	361	36	~	~	38	~	~	17.0	0.5	14.0	0.6	~	~	16.5	0.4	~
845	34	1	7	80	7	32	~	~	37	~	~	17.0	0.5	14.0	0.6	~	~	16.5	0.4	~
846	34	1	24	80	24	31	~	~	37	~	~	17.0	0.5	14.0	0.6	~	~	16.5	0.4	~
847	34	2	6	80	37	29	~	~	35	~	~	16.5	0.5	14.0	0.6	~	~	16.5	0.4	~
848	34	2	22	80	53	30	~	~	35	~	~	16.5	0.5	13.0	0.7	~	~	16.0	0.4	~
849	34	3	6	80	65	~	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	16.5	0.4	~
850	34	3	19	80	78	~	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	16.5	0.4	~
851	34	4	3	80	93	~	~	~	~	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
852	34	4	18	80	108	37	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
853	34	5	2	80	122	52	~	~	41	~	~	18.0	0.3	14.0	0.6	~	~	17.0	0.4	~
854	34	5	23	80	143	45	~	~	43	~	~	19.0	0.3	15.0	0.4	~	~	18.0	0.3	~
855	34	7	11	80	192	51	~	~	53	~	~	19.0	0.3	14.0	0.6	~	~	17.0	0.4	~
856	34	7	18	80	199	63	~	~	48	~	~	19.0	0.3	14.0	0.6	~	~	17.0	0.4	~
857	34	7	29	80	210	70	~	~	50	~	~	10.0	5.0	13.0	0.7	~	~	16.0	0.4	~
858	34	8	6	80	218	53	~	~	53	~	~	17.0	0.5	14.0	0.6	~	~	15.0	0.6	~
859	34	8	13	80	225	53	~	~	60	~	~	14.0	0.9	12.0	0.9	~	~	13.0	0.8	~
860	34	8	21	80	233	53	~	~	57	~	~	18.0	0.3	14.0	0.6	~	~	17.0	0.4	~
861	34	8	27	80	239	53	~	~	54	~	~	17.0	0.5	13.0	0.7	~	~	14.0	0.7	~
862	34	9	4	80	247	52	~	~	52	~	~	17.0	0.5	14.0	0.6	~	~	14.0	0.7	~
863	34	9	11	80	254	61	~	~	52	~	~	17.0	0.5	12.0	0.9	~	~	11.0	1.5	~
864	34	9	18	80	261	52	~	~	51	~	~	16.0	0.6	10.0	1.5	~	~	10.0	2.0	~
865	34	9	25	80	268	44	~	~	50	~	~	19.0	0.3	13.0	0.7	~	~	8.0	5.0	~
866	34	10	1	80	274	44	~	~	50	~	~	19.0	0.3	13.0	0.7	~	~	8.0	5.0	~
867	34	10	9	80	282	45	~	~	48	~	~	14.0	0.9	9.0	2.0	~	~	9.0	3.0	~
868	34	10	16	80	289	43	~	~	47	~	~	14.0	0.9	8.0	3.0	~	~	8.0	5.0	~
869	34	10	23	80	296	31	~	~	46	~	~	15.0	0.7	8.0	3.0	~	~	8.0	5.0	~
870	34	11	4	80	308	40	~	~	43	~	~	17.0	0.5	15.0	0.4	~	~	9.0	3.0	~
871	34	11	18	80	322	30	~	~	40	~	~	17.0	0.5	13.0	0.7	~	~	14.0	0.7	~
872	34	1	5	81	5	29	~	~	37	~	~	17.0	0.5	13.0	0.7	~	~	16.0	0.4	~
873	34	1	30	81	30	30	~	~	36	~	~	17.0	0.5	13.0	0.7	~	~	16.0	0.4	~
874	34	3	3	81	62	30	~	~	36	~	~	17.0	0.5	12.0	0.9	~	~	16.0	0.4	~
875	34	4	1	81	91	31	~	~	36	~	~	17.0	0.5	13.0	0.7	~	~	16.0	0.4	~
876	34	4	29	81	119	46	~	~	42	~	~	18.0	0.3	13.0	0.7	~	~	16.0	0.4	~
877	34	6	3	81	154	53	~	~	49	~	~	18.0	0.3	14.0	0.6	~	~	16.0	0.4	~
878	34	6	30	81	181	65	~	~	50	~	~	18.0	0.3	14.0	0.6	~	~	16.0	0.4	~
879	34	7	9	81	190	~	~	~	51	~	~	18.0	0.3	13.0	0.7	~	~	16.0	0.4	~
880	34	7	14	81	195	~	~	~	52	~	~	16.0	0.6	13.0	0.7	~	~	16.0	0.4	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 23

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
881	34	8	20	81	232	56	~	~	54	~	~	14.0	0.9	8.0	3.0	~	~	7.0	10.0	~
882	34	9	9	81	252	58	~	~	52	~	~	7.0	13.0	6.0	8.0	~	~	6.0	15.0	~
883	34	9	22	81	265	47	~	~	51	~	~	14.0	0.9	6.0	8.0	~	~	5.0	16.0	~
884	34	10	8	81	281	43	~	~	47	~	~	24.0	0.3	9.0	2.0	~	~	7.0	10.0	~
885	34	10	21	81	294	23	~	~	45	~	~	11.0	3.0	8.0	3.0	~	~	6.0	15.0	~
886	34	11	5	81	309	37	~	~	47	~	~	26.0	0.3	7.0	5.0	~	~	6.0	15.0	~
887	34	12	4	81	338	33	~	~	38	~	~	16.0	0.6	13.0	0.7	~	~	14.0	7.0	~
888	34	5	26	82	146	44	~	~	44	~	~	18.0	0.3	10.0	1.5	~	~	13.0	0.8	~
889	34	7	2	82	183	66	~	~	51	~	~	17.0	0.5	9.0	2.0	~	~	11.0	1.5	~
890	34	8	5	82	217	62	~	~	50	~	~	9.0	8.0	6.0	8.0	~	~	7.0	10.0	~
891	34	9	14	82	257	~	~	~	51	~	~	10.0	5.0	4.0	15.0	~	~	8.0	5.0	~
892	34	10	15	82	288	47	~	~	38	~	~	17.0	0.5	7.0	5.0	~	~	7.0	10.0	~
893	34	11	16	82	320	29	~	~	36	~	~	17.0	0.5	8.0	0.3	~	~	8.0	5.0	~
894	34	2	4	83	35	29	~	~	36	~	~	17.0	0.5	8.0	3.0	~	~	11.0	1.5	~
895	34	5	27	83	147	51	~	~	45	~	~	17.0	0.5	8.0	3.0	~	~	20.0	0.3	~
896	34	7	27	83	208	62	~	~	54	~	~	19.0	0.3	7.0	5.0	~	~	19.0	0.3	~
897	34	8	15	83	227	70	~	~	54	~	~	11.0	3.0	7.0	5.0	~	~	8.0	5.0	~
898	34	11	3	83	307	45	~	~	44	~	~	13.0	1.3	5.0	12.0	~	~	5.0	16.0	~
899	34	11	9	83	313	34	~	~	43	~	~	17.0	0.5	6.0	8.0	~	~	6.0	15.0	~
900	34	11	21	83	325	31	~	~	41	~	~	17.0	0.5	7.0	5.0	~	~	9.0	3.0	~
901	34	11	28	83	332	31	~	~	40	~	~	17.0	0.5	7.0	5.0	~	~	9.0	3.0	~
902	34	1	19	84	19	28	~	~	35	~	~	17.0	0.5	7.0	5.0	~	~	9.0	3.0	~
903	34	2	10	84	41	28	~	~	35	~	~	17.0	0.5	7.0	5.0	~	~	8.0	5.0	~
904	35	11	27	79	331	~	~	~	37	~	~	16.0	0.6	8.0	3.0	~	~	5.5	16.0	~
905	35	12	6	79	340	34	~	~	36	~	~	16.0	0.6	13.0	0.7	~	~	16.0	0.4	~
906	35	12	17	79	351	34	~	~	37	~	~	16.5	0.5	13.5	0.6	~	~	17.0	0.4	~
907	35	12	27	79	361	34	~	~	37	~	~	16.5	0.5	14.0	0.6	~	~	17.0	0.4	~
908	35	1	7	80	7	34	~	~	36	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
909	35	1	24	80	24	32	~	~	37	~	~	17.0	0.5	14.5	0.5	~	~	17.0	0.4	~
910	35	2	6	80	37	32	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
911	35	2	22	80	53	29	~	~	34	~	~	15.5	0.6	13.5	0.6	~	~	17.0	0.4	~
912	35	3	6	80	65	~	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
913	35	3	19	80	78	~	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
914	35	4	3	80	93	~	~	~	~	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
915	35	4	18	80	108	38	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
916	35	5	2	80	122	56	~	~	39	~	~	17.0	0.5	15.0	0.4	~	~	18.0	0.3	~
917	35	5	23	80	143	49	~	~	45	~	~	18.0	0.3	15.0	0.4	~	~	19.0	0.3	~
918	35	6	17	80	168	57	~	~	48	~	~	18.0	0.3	15.0	0.4	~	~	19.0	0.3	~
919	35	7	11	80	192	62	~	~	56	~	~	17.0	0.5	15.0	0.4	~	~	19.0	0.3	~
920	35	7	18	80	199	65	~	~	50	~	~	17.0	0.5	15.0	0.4	~	~	19.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 24

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
921	35	7	29	80	210	92	~	~	52	~	~	8.0	10.0	14.0	0.6	~	~	17.0	0.4	~
922	35	8	6	80	218	56	~	~	72	~	~	12.0	1.8	12.0	0.8	~	~	13.0	0.8	~
923	35	8	13	80	225	56	~	~	74	~	~	11.0	3.0	11.0	1.2	~	~	12.0	1.2	~
924	35	8	21	80	233	55	~	~	65	~	~	15.0	0.7	10.0	1.5	~	~	11.0	1.5	~
925	35	8	27	80	239	54	~	~	57	~	~	15.0	0.7	10.0	1.5	~	~	11.0	1.5	~
926	35	9	4	80	247	62	~	~	53	~	~	16.0	0.6	10.0	1.5	~	~	11.0	1.5	~
927	35	9	11	80	254	69	~	~	53	~	~	15.0	0.7	10.0	1.5	~	~	11.0	1.5	~
928	35	9	18	80	261	52	~	~	56	~	~	15.0	0.7	10.0	1.5	~	~	11.0	1.5	~
929	35	9	25	80	238	60	~	~	51	~	~	17.0	0.5	10.0	1.5	~	~	11.0	1.5	~
930	35	10	1	80	274	49	~	~	50	~	~	17.0	0.5	11.0	1.2	~	~	11.0	1.5	~
931	35	10	9	80	282	49	~	~	48	~	~	16.0	0.6	11.0	1.2	~	~	11.0	1.5	~
932	35	10	16	80	289	43	~	~	47	~	~	16.0	0.6	11.0	1.2	~	~	11.0	1.5	~
933	35	10	23	80	296	33	~	~	45	~	~	17.0	0.5	11.0	1.2	~	~	11.0	1.5	~
934	35	11	4	80	308	43	~	~	42	~	~	17.0	0.5	13.0	0.7	~	~	14.0	0.4	~
935	35	11	18	80	322	29	~	~	38	~	~	16.0	0.6	14.0	0.6	~	~	17.0	0.4	~
936	35	1	5	81	5	30	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
937	35	1	30	81	30	29	~	~	35	~	~	16.0	0.6	14.0	0.6	~	~	17.0	0.4	~
938	35	3	3	81	62	30	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	17.0	0.4	~
939	35	4	1	81	91	37	~	~	36	~	~	17.0	0.5	14.0	0.6	~	~	18.0	0.3	~
940	35	4	29	81	119	49	~	~	44	~	~	18.0	0.3	15.0	0.4	~	~	18.0	0.3	~
941	35	6	3	81	154	58	~	~	51	~	~	18.0	0.3	15.0	0.4	~	~	19.0	0.3	~
942	35	6	30	81	181	82	~	~	53	~	~	18.0	0.3	15.0	0.4	~	~	19.0	0.3	~
943	35	7	9	81	190	~	~	~	54	~	~	16.0	0.6	16.0	0.3	~	~	19.0	0.3	~
944	35	7	14	81	195	~	~	~	55	~	~	14.0	0.9	15.0	0.4	~	~	20.0	0.3	~
945	35	8	20	81	232	66	~	~	56	~	~	6.0	16.0	6.0	8.0	~	~	12.0	1.2	~
946	35	9	9	81	252	73	~	~	53	~	~	6.0	16.0	5.0	12.0	~	~	4.0	16.0	~
947	35	9	22	81	265	53	~	~	54	~	~	6.0	16.0	4.0	15.0	~	~	~	~	~
948	35	10	8	81	281	44	~	~	47	~	~	10.0	5.0	5.0	12.0	~	~	5.0	16.0	~
949	35	10	21	81	294	22	~	~	44	~	~	11.0	3.0	5.0	12.0	~	~	5.0	16.0	~
950	35	11	5	81	309	37	~	~	46	~	~	12.0	1.8	5.0	12.0	~	~	5.0	16.0	~
951	35	12	4	81	338	37	~	~	37	~	~	16.0	0.6	11.0	1.2	~	~	8.0	5.0	~
952	35	5	26	82	146	45	~	~	47	~	~	18.0	0.3	16.0	0.3	~	~	19.0	0.3	~
953	35	7	2	82	183	70	~	~	55	~	~	12.0	1.8	12.0	0.9	~	~	13.0	0.8	~
954	35	8	5	82	217	68	~	~	55	~	~	8.0	10.0	7.0	5.0	~	~	7.0	10.0	~
955	35	9	14	82	257	~	~	~	52	~	~	7.0	13.0	5.0	12.0	~	~	5.0	16.0	~
956	35	10	15	82	288	35	~	~	46	~	~	17.0	0.5	5.0	12.0	~	~	5.0	16.0	~
957	35	11	16	82	320	27	~	~	36	~	~	17.0	0.5	14.0	0.6	~	~	13.0	0.8	~
958	35	2	4	83	35	27	~	~	36	~	~	18.0	0.7	15.0	0.4	~	~	18.0	0.3	~
959	35	5	27	83	147	59	~	~	48	~	~	18.0	0.7	15.0	0.4	~	~	19.0	0.3	~
960	35	7	27	83	208	71	~	~	56	~	~	18.0	0.7	15.0	0.4	~	~	19.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 25

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
961	35	8	15	83	227	84	~	~	58	~	~	10.0	5.0	12.0	0.9	~	~	13.0	0.8	~
962	35	11	3	83	307	44	~	~	43	~	~	14.0	0.9	7.0	5.0	~	~	7.0	10.0	~
963	35	11	9	83	313	35	~	~	36	~	~	17.0	0.5	13.0	0.7	~	~	7.0	10.0	~
964	35	11	21	83	325	30	~	~	40	~	~	17.0	0.5	14.0	0.6	~	~	18.0	0.3	~
965	35	11	28	83	332	29	~	~	39	~	~	17.0	0.5	14.0	0.6	~	~	18.0	0.3	~
966	35	1	19	84	19	28	~	~	36	~	~	17.0	0.5	14.0	0.6	~	~	18.0	0.3	~
967	35	2	10	84	41	28	~	~	35	~	~	17.0	0.5	14.0	0.6	~	~	18.0	0.3	~
968	36	12	6	79	340	37	~	~	33	~	~	16.5	0.5	13.0	0.7	~	~	16.0	0.4	~
969	36	12	17	79	351	34	~	~	~	~	~	16.0	0.6	13.0	0.7	~	~	17.0	0.4	~
970	36	12	27	79	361	34	~	~	~	~	~	16.5	0.5	13.0	0.7	~	~	17.0	0.4	~
971	36	1	7	80	7	34	~	~	~	~	~	17.0	0.5	13.0	0.7	~	~	17.5	0.3	~
972	36	1	24	80	24	32	~	~	~	~	~	16.5	0.5	13.0	0.7	~	~	17.0	0.4	~
973	36	2	6	80	37	32	~	~	~	~	~	16.5	0.5	13.0	0.7	~	~	17.0	0.4	~
974	36	2	22	80	53	~	~	~	~	~	~	16.0	0.6	13.0	0.7	~	~	17.0	0.4	~
975	36	3	6	80	65	~	~	~	~	~	~	16.5	0.5	13.0	0.7	~	~	18.0	0.3	~
976	36	3	19	80	78	~	~	~	~	~	~	16.5	0.5	13.0	0.7	~	~	17.5	0.3	~
977	36	4	3	80	93	~	~	~	~	~	~	17.0	0.5	13.0	0.7	~	~	18.0	0.3	~
978	36	4	18	80	108	51	~	~	~	~	~	18.0	0.3	14.0	0.6	~	~	18.0	0.3	~
979	36	5	2	80	122	71	~	~	~	~	~	18.0	0.3	14.0	0.6	~	~	19.0	0.3	~
980	36	5	23	80	143	48	~	~	~	~	~	18.0	0.3	14.0	0.6	~	~	19.0	0.3	~
981	36	6	17	80	168	51	~	~	46	~	~	17.0	0.5	15.0	0.4	~	~	20.0	0.3	~
982	36	7	11	80	192	57	~	~	~	~	~	13.0	1.3	15.0	0.4	~	~	20.0	0.3	~
983	36	7	18	80	199	82	~	~	~	~	~	15.0	0.7	14.0	0.6	~	~	20.0	0.3	~
984	36	7	29	80	210	89	~	~	~	~	~	9.0	8.0	11.0	1.2	~	~	19.0	0.3	~
985	36	8	6	80	218	71	~	~	~	~	~	13.0	1.3	9.0	2.0	~	~	18.0	0.3	~
986	36	8	13	80	225	87	~	~	~	~	~	8.0	10.0	8.0	3.0	~	~	17.0	0.4	~
987	36	8	21	80	233	70	~	~	~	~	~	17.0	0.5	11.0	1.2	~	~	17.0	0.4	~
988	36	8	27	80	239	58	~	~	~	~	~	14.0	0.9	10.0	1.5	~	~	17.0	0.4	~
989	36	9	4	80	247	69	~	~	~	~	~	17.0	0.5	11.0	1.2	~	~	16.0	0.4	~
990	36	9	11	80	254	77	~	~	~	~	~	16.0	0.6	11.0	1.2	~	~	16.0	0.4	~
991	36	9	18	80	261	53	~	~	55	~	~	14.0	0.9	10.0	1.5	~	~	13.0	0.8	~
992	36	9	25	80	268	57	~	~	53	~	~	17.0	0.5	11.0	1.2	~	~	16.0	0.4	~
993	36	10	1	80	274	50	~	~	53	~	~	17.0	0.5	11.0	1.2	~	~	16.0	0.4	~
994	36	10	9	80	282	58	~	~	51	~	~	16.0	0.6	11.0	1.2	~	~	17.0	0.4	~
995	36	10	16	80	289	40	~	~	48	~	~	16.0	0.6	11.0	1.2	~	~	16.0	0.4	~
996	36	10	23	80	296	44	~	~	46	~	~	16.0	0.6	11.0	1.2	~	~	16.0	0.4	~
997	36	11	4	80	308	42	~	~	43	~	~	17.0	0.5	16.0	0.3	~	~	16.0	0.4	~
998	36	11	18	80	322	32	~	~	38	~	~	16.0	0.6	13.0	0.7	~	~	18.0	0.3	~
999	36	1	5	81	5	29	~	~	35	~	~	17.0	0.5	13.0	0.7	~	~	18.0	0.3	~
1000	36	1	30	81	30	29	~	~	34	~	~	16.0	0.6	13.0	0.7	~	~	18.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 26

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1001	36	3	3	81	62	36	~	~	34	~	~	17.0	0.5	13.0	0.7	~	~	18.0	0.3	~
1002	36	4	1	81	91	37	~	~	39	~	~	17.0	0.5	14.0	0.6	~	~	18.0	0.3	~
1003	36	4	29	81	119	50	~	~	48	~	~	18.0	0.3	14.0	0.6	~	~	19.0	0.3	~
1004	36	6	3	81	154	57	~	~	56	~	~	18.0	0.3	15.0	0.4	~	~	20.0	0.3	~
1005	36	6	30	81	181	86	~	~	58	~	~	18.0	0.3	15.0	0.4	~	~	19.0	0.3	~
1006	36	7	9	81	190	~	~	~	~	~	~	8.0	10.0	15.0	0.4	~	~	19.0	0.3	~
1007	36	7	14	81	195	~	~	~	62	~	~	12.0	1.8	15.0	0.4	~	~	20.0	0.3	~
1008	36	8	20	81	232	75	~	~	63	~	~	6.0	16.0	5.0	12.0	~	~	11.0	1.5	~
1009	36	9	9	81	252	84	~	~	59	~	~	6.0	16.0	5.0	12.0	~	~	7.0	10.0	~
1010	36	9	22	81	265	47	~	~	56	~	~	6.0	16.0	~	~	~	~	7.0	10.0	~
1011	36	10	8	81	281	42	~	~	49	~	~	13.0	1.3	6.0	8.0	~	~	7.0	10.0	~
1012	36	10	21	81	294	23	~	~	45	~	~	12.0	1.8	6.0	8.0	~	~	7.0	10.0	~
1013	36	11	5	81	309	~	~	~	~	~	~	12.0	1.8	6.0	8.0	~	~	7.0	10.0	~
1014	36	12	4	81	338	31	~	~	36	~	~	16.0	0.6	13.0	0.7	~	~	16.0	0.4	~
1015	36	5	26	82	146	49	~	~	54	~	~	16.0	0.6	14.0	0.6	~	~	19.0	0.3	~
1016	36	7	2	82	183	86	~	~	63	~	~	13.0	1.3	11.0	1.2	~	~	19.0	0.3	~
1017	36	8	5	82	217	72	~	~	63	~	~	8.0	10.0	7.0	5.0	~	~	13.0	0.8	~
1018	36	9	14	82	257	~	~	~	55	~	~	8.0	10.0	5.0	12.0	~	~	8.0	5.0	~
1019	36	10	16	82	289	47	~	~	38	~	~	17.0	0.5	8.0	3.0	~	~	9.0	3.0	~
1020	36	11	16	82	320	~	~	~	~	~	~	17.0	0.5	13.0	0.7	~	~	13.0	0.8	~
1021	36	5	27	83	147	69	~	~	55	~	~	17.0	0.5	14.0	0.6	~	~	19.0	0.3	~
1022	36	7	17	83	198	70	~	~	61	~	~	18.0	0.7	~	~	~	~	19.0	0.3	~
1023	36	8	15	83	227	92	~	~	62	~	~	13.0	1.3	14.0	0.6	~	~	20.0	0.3	~
1024	36	11	3	83	307	43	~	~	41	~	~	16.0	0.6	13.0	0.7	~	~	17.0	0.4	~
1025	36	11	9	83	313	36	~	~	42	~	~	17.0	0.5	14.0	0.6	~	~	20.0	0.3	~
1026	36	11	21	83	325	29	~	~	41	~	~	16.0	0.6	14.0	0.6	~	~	18.0	0.3	~
1027	36	11	28	83	332	29	~	~	38	~	~	16.0	0.6	14.0	0.6	~	~	18.0	0.3	~
1028	36	1	19	84	19	29	~	~	34	~	~	16.0	0.6	13.0	0.7	~	~	18.0	0.3	~
1029	36	2	10	84	41	28	~	~	34	~	~	16.0	0.6	13.0	0.7	~	~	18.0	0.3	~
1030	37	12	6	79	340	36	~	~	39	~	~	29.0	0.6	18.0	0.6	~	~	16.0	0.6	~
1031	37	12	17	79	351	36	~	~	39	~	~	29.0	0.6	18.0	0.6	~	~	16.0	0.6	~
1032	37	12	27	79	361	34	~	~	39	~	~	30.0	0.5	18.0	0.6	~	~	17.0	0.5	~
1033	37	1	7	80	7	34	~	~	37	~	~	30.0	0.5	18.5	0.6	~	~	17.0	0.5	~
1034	37	1	24	80	24	32	~	~	37	~	~	30.0	0.5	18.5	0.6	~	~	17.0	0.5	~
1035	37	2	6	80	37	31	~	~	35	~	~	30.0	0.5	18.5	0.6	~	~	15.5	0.6	~
1036	37	2	22	80	53	30	~	~	36	~	~	29.0	0.6	17.0	0.7	~	~	15.5	0.6	~
1037	37	3	6	80	65	~	~	~	35	~	~	30.0	0.5	18.0	0.6	~	~	16.5	0.6	~
1038	37	3	19	80	78	~	~	~	35	~	~	30.0	0.5	18.0	0.6	~	~	16.5	0.6	~
1039	37	4	3	80	93	~	~	~	~	~	~	30.0	0.5	19.0	0.5	~	~	17.0	0.5	~
1040	37	4	18	80	108	44	~	~	40	~	~	31.0	0.5	19.0	0.5	~	~	17.0	0.5	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 27

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1041	37	5	2	80	122	58	~	~	39	~	~	32.0	0.4	19.0	0.5	~	~	18.0	0.4	~
1042	37	5	23	80	143	43	~	~	42	~	~	33.0	0.3	19.0	0.5	~	~	17.0	0.5	~
1043	37	6	17	80	168	51	~	~	46	~	~	32.0	0.4	19.0	0.5	~	~	19.0	0.3	~
1044	37	7	11	80	192	62	~	~	52	~	~	32.0	0.4	19.0	0.5	~	~	19.0	0.3	~
1045	37	7	18	80	199	58	~	~	47	~	~	32.0	0.4	19.0	0.5	~	~	19.0	0.3	~
1046	37	7	29	80	210	74	~	~	50	~	~	30.0	0.5	15.0	2.5	~	~	17.0	0.5	~
1047	37	8	6	80	218	~	~	~	52	~	~	~	~	13.0	1.6	~	~	14.0	0.9	~
1048	37	8	13	80	225	~	~	~	56	~	~	~	~	10.0	3.0	~	~	11.0	2.0	~
1049	37	8	21	80	233	~	~	~	49	~	~	~	~	18.0	1.3	~	~	15.0	0.7	~
1050	37	8	27	80	239	~	~	~	50	~	~	~	~	15.0	2.5	~	~	12.0	1.5	~
1051	37	9	4	80	247	~	~	~	51	~	~	~	~	16.0	3.0	~	~	11.0	2.0	~
1052	37	9	11	80	254	~	~	~	52	~	~	~	~	11.0	5.3	~	~	9.0	3.5	~
1053	37	9	25	80	268	43	~	~	50	~	~	27.0	0.7	10.0	4.0	~	~	8.0	4.5	~
1054	37	10	1	80	274	42	~	~	51	~	~	25.0	0.8	9.0	5.3	~	~	7.0	6.0	~
1055	37	10	9	80	282	45	~	~	52	~	~	20.0	1.6	7.0	9.0	~	~	12.0	1.5	~
1056	37	10	16	80	289	37	~	~	49	~	~	21.0	1.3	18.0	0.6	~	~	7.0	6.0	~
1057	37	10	23	80	296	31	~	~	47	~	~	29.0	0.6	10.0	4.0	~	~	9.0	3.5	~
1058	37	11	4	80	308	45	~	~	46	~	~	25.0	0.8	18.0	0.6	~	~	7.0	6.0	~
1059	37	11	18	80	322	29	~	~	41	~	~	25.0	0.8	9.0	5.3	~	~	14.0	0.9	~
1060	37	1	5	81	5	28	~	~	36	~	~	30.0	0.5	~	~	~	~	6.0	8.0	~
1061	37	1	30	81	30	29	~	~	34	~	~	30.0	0.5	~	~	~	~	3.5	13.2	~
1062	37	3	3	81	62	30	~	~	35	~	~	30.0	0.5	~	~	~	~	5.0	10.0	~
1063	37	4	1	81	91	31	~	~	36	~	~	30.0	0.5	~	~	~	~	9.0	3.5	~
1064	37	4	29	81	119	47	~	~	45	~	~	32.0	0.4	~	~	~	~	4.0	12.5	~
1065	37	6	3	81	154	52	~	~	50	~	~	32.0	0.4	~	~	~	~	~	~	~
1066	37	6	30	81	181	60	~	~	55	~	~	32.0	0.4	~	~	~	~	~	~	~
1067	37	7	9	81	190	~	~	~	56	~	~	32.0	0.4	4.0	15.0	~	~	~	~	~
1068	37	7	14	81	195	~	~	~	53	~	~	31.0	0.5	~	~	~	~	4.0	12.5	~
1069	37	8	20	81	232	66	~	~	56	~	~	17.0	3.0	5.0	13.0	~	~	5.0	10.0	~
1070	37	9	9	81	252	60	~	~	55	~	~	18.0	2.5	6.0	12.0	~	~	6.0	8.0	~
1071	37	9	22	81	265	41	~	~	54	~	~	12.0	10.0	4.0	15.0	~	~	4.0	12.5	~
1072	37	10	8	81	281	38	~	~	49	~	~	18.0	2.5	6.0	12.0	~	~	5.0	10.0	~
1073	37	10	21	81	294	39	~	~	47	~	~	14.0	6.0	4.0	15.0	~	~	4.0	2.5	~
1074	37	11	5	81	309	37	~	~	47	~	~	16.0	4.0	5.0	13.0	~	~	4.0	12.5	~
1075	37	12	4	81	338	31	~	~	39	~	~	28.0	0.6	16.0	0.9	~	~	13.0	1.2	~
1076	37	5	26	82	146	40	~	~	46	~	~	26.0	0.8	17.0	0.7	~	~	15.0	0.7	~
1077	37	7	2	82	183	62	~	~	53	~	~	26.0	0.8	13.0	1.9	~	~	11.0	2.0	~
1078	37	8	5	82	217	54	~	~	58	~	~	21.0	1.3	8.0	7.0	~	~	7.0	6.0	~
1079	37	9	14	82	257	~	~	~	51	~	~	22.0	1.0	11.0	3.0	~	~	10.0	2.5	~
1080	37	10	15	82	288	49	~	~	48	~	~	17.0	3.0	18.0	0.6	~	~	6.0	8.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 28

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1081	37	11	16	82	320	29	~	~	38	~	~	17.0	3.0	13.0	1.9	~	~	13.0	1.2	~
1082	37	7	27	83	208	59	~	~	53	~	~	28.0	0.6	18.0	0.6	~	~	17.0	0.5	~
1083	37	8	15	83	227	58	~	~	56	~	~	17.0	3.0	8.0	7.0	~	~	16.0	0.6	~
1084	37	11	3	83	307	39	~	~	46	~	~	14.0	6.0	10.0	4.0	~	~	7.0	6.0	~
1085	37	11	9	83	313	31	~	~	34	~	~	29.0	0.6	16.0	0.9	~	~	11.0	2.0	~
1086	37	11	21	83	325	30	~	~	41	~	~	30.0	0.5	18.0	0.6	~	~	15.0	0.7	~
1087	37	11	28	83	332	29	~	~	40	~	~	30.0	0.5	18.0	0.6	~	~	15.0	0.7	~
1088	37	1	19	84	19	23	~	~	34	~	~	30.0	0.5	19.0	0.5	~	~	17.0	0.5	~
1089	37	2	10	84	41	29	~	~	35	~	~	30.0	0.5	19.0	0.5	~	~	17.0	0.5	~
1090	38	12	6	79	340	35	~	~	39	~	~	30.0	0.5	17.5	0.7	~	~	16.0	0.6	~
1091	38	12	17	79	351	36	~	~	39	~	~	31.0	0.5	17.5	0.7	~	~	16.0	0.6	~
1092	38	12	27	79	361	34	~	~	38	~	~	30.5	0.5	17.5	0.7	~	~	16.0	0.6	~
1093	38	1	7	80	7	32	~	~	38	~	~	30.5	0.5	18.0	0.6	~	~	16.5	0.6	~
1094	38	1	24	80	24	32	~	~	38	~	~	30.5	0.5	17.5	0.7	~	~	16.0	0.6	~
1095	38	2	6	80	37	32	~	~	35	~	~	30.0	0.5	18.0	0.6	~	~	16.0	0.6	~
1096	38	2	22	80	53	30	~	~	35	~	~	30.0	0.5	17.0	0.7	~	~	15.5	0.6	~
1097	38	3	6	80	65	~	~	~	35	~	~	31.0	0.5	17.5	0.7	~	~	16.5	0.6	~
1098	38	3	19	80	78	~	~	~	40	~	~	31.0	0.5	17.5	0.7	~	~	16.0	0.6	~
1099	38	4	3	80	93	~	~	~	~	~	~	31.0	0.5	18.0	0.6	~	~	16.0	0.6	~
1100	38	4	18	80	108	48	~	~	42	~	~	32.0	0.4	20.0	0.4	~	~	17.0	0.5	~
1101	38	5	2	80	122	60	~	~	42	~	~	34.0	0.3	20.0	0.4	~	~	18.0	0.4	~
1102	38	5	23	80	143	48	~	~	48	~	~	33.0	0.3	20.0	0.4	~	~	18.0	0.4	~
1103	38	6	17	80	168	57	~	~	51	~	~	34.0	0.3	21.0	0.4	~	~	19.0	0.3	~
1104	38	7	11	80	192	77	~	~	58	~	~	33.0	0.3	20.0	0.4	~	~	18.0	0.4	~
1105	38	7	18	80	199	78	~	~	53	~	~	34.0	0.3	21.0	0.4	~	~	19.0	0.3	~
1106	38	7	29	80	210	97	~	~	56	~	~	28.0	0.6	20.0	0.4	~	~	19.0	0.3	~
1107	38	8	6	80	218	60	~	~	56	~	~	28.0	0.6	18.0	0.6	~	~	18.0	0.4	~
1108	38	8	13	80	225	61	~	~	65	~	~	23.0	0.9	14.0	1.6	~	~	17.0	0.5	~
1109	38	8	21	80	233	58	~	~	48	~	~	33.0	0.3	19.0	0.5	~	~	18.0	0.4	~
1110	38	8	27	80	239	59	~	~	51	~	~	30.0	0.5	18.0	0.6	~	~	18.0	0.4	~
1111	38	9	4	80	247	77	~	~	56	~	~	32.0	0.4	18.0	0.6	~	~	17.0	0.5	~
1112	38	9	11	80	254	68	~	~	58	~	~	30.0	0.5	18.0	0.6	~	~	17.0	0.5	~
1113	38	9	18	80	261	43	~	~	56	~	~	30.0	0.5	17.0	0.7	~	~	17.0	0.5	~
1114	38	9	25	80	268	46	~	~	53	~	~	32.0	0.4	19.0	0.5	~	~	17.0	0.5	~
1115	38	10	1	80	274	42	~	~	55	~	~	32.0	0.4	20.0	0.4	~	~	18.0	0.4	~
1116	38	10	9	80	282	49	~	~	55	~	~	31.0	0.5	19.0	0.5	~	~	18.0	0.4	~
1117	38	10	16	80	289	34	~	~	50	~	~	31.0	0.5	19.0	0.5	~	~	18.0	0.4	~
1118	38	10	23	80	296	33	~	~	48	~	~	31.0	0.5	19.0	0.5	~	~	18.0	0.4	~
1119	38	11	4	80	308	49	~	~	46	~	~	32.0	0.4	19.0	0.5	~	~	17.0	0.5	~
1120	38	11	18	80	322	29	~	~	40	~	~	31.0	0.5	19.0	0.5	~	~	17.0	0.5	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 29

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1121	38	1	5	81	5	30	~	~	37	~	~	31.0	0.5	18.0	0.6	~	~	17.0	0.5	~
1122	38	1	30	81	30	30	~	~	36	~	~	31.0	0.5	18.0	0.6	~	~	16.0	0.6	~
1123	38	3	3	81	62	29	~	~	35	~	~	32.0	0.4	19.0	0.5	~	~	17.0	0.5	~
1124	38	4	1	81	91	32	~	~	39	~	~	32.0	0.4	19.0	0.5	~	~	17.0	0.5	~
1125	38	4	29	81	119	54	~	~	46	~	~	33.0	0.3	20.0	0.4	~	~	17.0	0.5	~
1126	38	6	3	81	154	61	~	~	63	~	~	34.0	0.3	21.0	0.4	~	~	19.0	0.3	~
1127	38	6	30	81	181	81	~	~	55	~	~	34.0	0.3	21.0	0.4	~	~	19.0	0.3	~
1128	38	7	9	81	190	~	~	~	56	~	~	35.0	0.3	19.0	0.5	~	~	18.0	0.4	~
1129	38	7	14	81	195	~	~	~	58	~	~	28.0	0.6	20.0	0.4	~	~	18.0	0.4	~
1130	38	8	20	81	232	74	~	~	61	~	~	21.0	1.3	6.0	12.0	~	~	7.0	6.0	~
1131	38	9	9	81	252	69	~	~	60	~	~	26.0	0.8	7.0	9.0	~	~	8.0	4.5	~
1132	38	9	22	81	265	40	~	~	57	~	~	18.0	2.5	4.0	15.0	~	~	5.0	10.0	~
1133	38	10	8	81	281	39	~	~	50	~	~	21.0	1.3	14.0	1.6	~	~	6.0	8.0	~
1134	38	10	21	81	294	45	~	~	47	~	~	21.0	1.3	14.0	1.6	~	~	7.0	6.0	~
1135	38	11	5	81	309	37	~	~	46	~	~	25.0	0.8	15.0	1.3	~	~	7.0	6.0	~
1136	38	12	4	81	338	38	~	~	39	~	~	33.0	0.3	17.0	0.7	~	~	15.0	0.7	~
1137	38	5	26	82	146	41	~	~	51	~	~	34.0	0.3	21.0	0.4	~	~	18.0	0.4	~
1138	38	7	2	82	183	79	~	~	58	~	~	31.0	0.5	18.0	0.6	~	~	16.0	0.6	~
1139	38	8	5	82	217	59	~	~	58	~	~	26.0	0.8	13.0	1.9	~	~	13.0	1.2	~
1140	38	9	14	82	257	~	~	~	54	~	~	20.0	1.6	12.0	2.5	~	~	11.0	2.0	~
1141	38	10	15	82	288	50	~	~	47	~	~	30.0	0.5	19.0	0.5	~	~	16.0	0.6	~
1142	38	11	16	82	320	29	~	~	40	~	~	24.0	0.8	8.0	7.0	~	~	6.0	8.0	~
1143	38	7	27	83	208	66	~	~	57	~	~	34.0	0.3	21.0	0.4	~	~	17.0	0.5	~
1144	38	8	15	83	227	58	~	~	60	~	~	26.0	0.8	18.0	0.6	~	~	16.0	0.6	~
1145	38	11	3	83	307	39	~	~	47	~	~	31.0	0.5	18.0	0.6	~	~	15.0	0.7	~
1146	38	11	9	83	313	31	~	~	44	~	~	32.0	0.4	20.0	0.4	~	~	16.0	0.6	~
1147	38	11	21	83	325	30	~	~	41	~	~	32.0	0.4	20.0	0.4	~	~	16.0	0.6	~
1148	38	11	28	83	332	29	~	~	40	~	~	32.0	0.4	20.0	0.4	~	~	16.0	0.6	~
1149	38	1	19	84	19	28	~	~	36	~	~	32.0	0.4	19.0	0.5	~	~	15.0	0.7	~
1150	38	2	10	84	41	29	~	~	36	~	~	31.0	0.5	19.0	0.5	~	~	15.0	0.7	~
1151	39	11	1	79	305	~	~	~	~	~	~	30.0	0.7	5.0	7.7	~	~	10.5	8.5	~
1152	39	11	14	79	318	~	~	~	~	~	~	29.0	0.7	6.0	5.9	~	~	12.0	6.5	~
1153	39	11	30	79	334	28	~	~	~	~	~	26.0	1.2	6.0	5.9	~	~	12.0	6.5	~
1154	39	12	11	79	345	~	~	~	~	~	~	34.0	0.6	11.0	2.5	~	~	15.0	3.8	~
1155	39	12	20	79	354	32	~	~	~	~	~	34.0	0.6	13.5	2.0	~	~	20.0	2.0	~
1156	39	1	7	80	7	34	~	~	~	~	~	32.0	0.6	13.0	2.0	~	~	19.5	2.2	~
1157	39	1	22	80	22	34	~	~	~	~	~	34.0	0.6	14.0	1.9	~	~	21.0	1.9	~
1158	39	2	5	80	36	31	~	~	~	~	~	31.0	0.6	12.0	2.3	~	~	19.5	2.2	~
1159	39	2	26	80	57	32	~	~	~	~	~	32.0	0.6	13.0	2.0	~	~	20.0	2.0	~
1160	39	4	16	80	106	34	~	~	~	~	~	41.0	0.4	20.0	1.3	~	~	27.0	0.5	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 30

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1161	39	5	2	80	122	38	~	~	~	~	~	41.0	0.4	21.0	1.2	~	~	28.0	0.3	~
1162	39	5	15	80	135	39	~	~	~	~	~	42.0	0.3	22.0	1.1	~	~	29.0	0.3	~
1163	39	6	4	80	155	39	~	~	~	~	~	42.0	0.3	23.0	1.0	~	~	29.0	0.3	~
1164	39	6	30	80	181	48	~	~	~	~	~	42.0	0.3	23.0	1.0	~	~	30.0	0.3	~
1165	39	7	18	80	199	50	~	~	~	~	~	42.0	0.3	24.0	0.9	~	~	31.0	0.3	~
1166	39	8	6	80	218	48	~	~	~	~	~	40.0	0.4	21.0	1.2	~	~	30.0	0.3	~
1167	39	8	27	80	239	50	~	~	~	~	~	35.0	0.5	16.0	1.7	~	~	25.0	1.0	~
1168	39	9	10	80	253	~	~	~	~	~	~	36.0	0.5	16.0	1.7	~	~	25.0	1.0	~
1169	39	9	22	80	265	42	~	~	~	~	~	33.0	0.6	13.0	2.0	~	~	21.0	1.9	~
1170	39	11	11	80	315	32	~	~	~	~	~	35.0	0.5	12.0	2.3	~	~	20.0	2.0	~
1171	39	1	5	81	5	~	~	~	~	~	~	41.0	0.4	20.0	1.3	~	~	27.0	0.5	~
1172	39	2	3	81	34	~	~	~	~	~	~	42.0	0.3	21.0	1.2	~	~	15.0	3.8	~
1173	39	3	2	81	61	~	~	~	~	~	~	41.0	0.4	21.0	1.2	~	~	28.0	0.3	~
1174	39	4	30	81	120	32	~	~	~	~	~	43.0	0.3	22.0	1.1	~	~	29.0	0.3	~
1175	39	5	29	81	149	43	~	~	~	~	~	43.0	0.3	24.0	0.9	~	~	29.0	0.3	~
1176	39	7	2	81	183	50	~	~	~	~	~	42.0	0.3	24.0	0.9	~	~	29.0	0.3	~
1177	39	7	14	81	195	49	~	~	~	~	~	42.0	0.3	24.0	0.9	~	~	31.0	0.3	~
1178	39	7	21	81	202	49	~	~	~	~	~	42.0	0.3	24.0	0.9	~	~	29.0	0.3	~
1179	39	8	6	81	218	54	~	~	~	~	~	40.0	0.4	19.0	1.4	~	~	26.0	0.7	~
1180	39	8	19	81	231	52	~	~	~	~	~	35.0	0.5	14.0	1.9	~	~	23.0	1.4	~
1181	39	12	3	81	337	~	~	~	~	~	~	28.0	0.8	7.0	5.0	~	~	14.0	4.5	~
1182	39	9	9	82	252	~	~	~	~	~	~	26.0	1.2	8.0	4.0	~	~	15.0	3.8	~
1183	39	8	24	83	236	~	~	~	~	~	~	35.0	0.5	13.0	2.0	~	~	22.0	1.6	~
1184	39	10	20	83	293	~	~	~	~	~	~	27.0	1.0	8.0	4.0	~	~	15.0	3.8	~
1185	39	11	1	83	305	~	~	~	~	~	~	27.0	1.0	8.0	4.0	~	~	15.0	3.8	~
1186	39	11	13	83	317	37	~	~	~	~	~	40.0	0.4	17.0	1.6	~	~	25.0	1.0	~
1187	39	11	21	83	325	35	~	~	~	~	~	40.0	0.4	18.0	1.5	~	~	25.0	1.0	~
1188	39	11	29	83	333	35	~	~	~	~	~	40.0	0.4	18.0	1.5	~	~	25.0	1.0	~
1189	39	1	10	84	10	32	~	~	~	~	~	40.0	0.4	20.0	1.3	~	~	27.0	0.5	~
1190	40	11	1	79	305	~	~	~	40	~	~	26.0	1.2	6.0	5.9	~	~	10.5	8.5	~
1191	40	11	14	79	318	~	~	~	39	~	~	23.5	2.3	5.0	7.7	~	~	10.0	9.0	~
1192	40	11	30	79	334	25	~	~	36	~	~	15.0	10.0	4.0	11.0	~	~	10.0	9.0	~
1193	40	12	11	79	345	~	~	~	36	~	~	37.0	0.5	9.0	3.3	~	~	13.0	5.6	~
1194	40	12	20	79	354	32	~	~	35	~	~	33.0	0.6	10.0	2.9	~	~	16.0	3.5	~
1195	40	1	7	80	7	38	~	~	34	~	~	30.0	0.7	9.5	3.1	~	~	18.0	2.7	~
1196	40	1	22	80	22	32	~	~	34	~	~	31.0	0.6	15.0	1.8	~	~	18.0	2.7	~
1197	40	2	5	80	36	31	~	~	34	~	~	15.0	10.0	6.0	5.9	~	~	13.0	5.6	~
1198	40	2	26	80	57	32	~	~	33	~	~	25.0	1.6	6.5	5.4	~	~	14.0	4.5	~
1199	40	4	16	80	106	32	~	~	34	~	~	24.0	2.0	14.0	1.9	~	~	21.0	1.9	~
1200	40	5	2	80	122	36	~	~	34	~	~	41.0	0.4	21.0	1.2	~	~	28.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 31

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1201	40	5	15	80	135	37	~	~	38	~	~	42.0	0.3	22.0	1.1	~	~	29.0	0.3	~
1202	40	6	4	80	155	38	~	~	40	~	~	42.0	0.3	23.0	1.0	~	~	29.0	0.3	~
1203	40	6	30	80	181	48	~	~	44	~	~	42.0	0.3	23.0	1.0	~	~	31.0	0.3	~
1204	40	7	18	80	199	50	~	~	46	~	~	42.0	0.3	24.0	0.9	~	~	31.0	0.3	~
1205	40	8	6	80	218	48	~	~	48	~	~	39.0	0.4	18.0	1.5	~	~	29.0	0.3	~
1206	40	8	27	80	239	50	~	~	48	~	~	32.0	0.6	12.0	2.3	~	~	22.0	1.6	~
1207	40	9	10	80	253	50	~	~	48	~	~	31.0	0.6	11.0	2.5	~	~	22.0	1.6	~
1208	40	9	22	80	265	42	~	~	45	~	~	28.0	0.8	9.0	3.3	~	~	17.0	3.0	~
1209	40	11	11	80	315	~	~	~	38	~	~	36.0	0.5	13.0	2.0	~	~	19.0	2.4	~
1210	40	1	5	81	5	~	~	~	36	~	~	40.0	0.4	20.0	1.3	~	~	27.0	0.5	~
1211	40	2	3	81	34	~	~	~	34	~	~	19.0	5.3	12.0	2.3	~	~	21.0	1.9	~
1212	40	3	2	81	61	~	~	~	34	~	~	~	~	19.0	1.4	~	~	27.0	0.5	~
1213	40	4	30	81	120	34	~	~	34	~	~	42.0	0.3	22.0	1.1	~	~	29.0	0.3	~
1214	40	5	29	81	149	52	~	~	38	~	~	41.0	0.4	22.0	1.1	~	~	29.0	0.3	~
1215	40	7	2	81	183	48	~	~	44	~	~	42.0	0.3	24.0	0.9	~	~	31.0	0.3	~
1216	40	7	14	81	195	49	~	~	46	~	~	42.0	0.3	24.0	0.9	~	~	31.0	0.3	~
1217	40	7	21	81	202	49	~	~	46	~	~	42.0	0.3	24.0	0.9	~	~	32.0	0.3	~
1218	40	8	5	81	217	54	~	~	48	~	~	37.0	0.5	13.0	2.0	~	~	27.0	0.5	~
1219	40	8	19	81	231	52	~	~	52	~	~	32.0	0.6	12.0	2.3	~	~	22.0	1.6	~
1220	40	12	3	81	337	~	~	~	40	~	~	27.0	1.0	7.0	5.0	~	~	15.0	3.8	~
1221	40	9	9	82	252	~	~	~	49	~	~	24.0	2.0	8.0	4.0	~	~	15.0	3.8	~
1222	40	8	24	83	236	~	~	~	50	~	~	29.0	0.7	11.0	2.5	~	~	20.0	2.0	~
1223	40	10	20	83	293	~	~	~	43	~	~	26.0	1.2	18.0	1.5	~	~	15.0	3.8	~
1224	40	11	2	83	306	~	~	~	43	~	~	26.0	1.2	8.0	4.0	~	~	15.0	3.8	~
1225	40	11	13	83	317	40	~	~	40	~	~	30.0	0.7	15.0	1.8	~	~	24.0	1.3	~
1226	40	11	21	83	325	34	~	~	40	~	~	35.0	0.5	17.0	1.6	~	~	26.0	0.7	~
1227	40	11	29	83	333	34	~	~	38	~	~	36.0	0.5	16.0	1.7	~	~	26.0	0.7	~
1228	40	1	10	84	10	32	~	~	36	~	~	33.0	0.6	14.0	1.9	~	~	23.0	1.4	~
1229	41	11	1	79	305	~	~	~	39	~	~	31.0	0.6	4.5	9.5	~	~	13.5	5.0	~
1230	41	11	14	79	318	~	~	~	~	~	~	28.0	0.8	9.5	3.1	~	~	12.0	6.5	~
1231	41	11	30	79	334	27	~	~	35	~	~	10.0	16.0	8.0	4.0	~	~	11.0	8.0	~
1232	41	12	11	79	345	~	~	~	35	~	~	32.5	0.6	8.0	4.0	~	~	11.0	8.0	~
1233	41	12	20	79	354	32	~	~	35	~	~	31.0	0.6	10.5	2.7	~	~	13.0	5.6	~
1234	41	1	7	80	7	34	~	~	34	~	~	31.0	0.6	12.5	2.2	~	~	17.0	3.0	~
1235	41	1	22	80	22	32	~	~	34	~	~	32.0	0.6	13.5	2.0	~	~	18.0	2.7	~
1236	41	2	5	80	36	31	~	~	34	~	~	24.0	2.0	12.0	2.3	~	~	16.0	3.5	~
1237	41	2	26	80	57	32	~	~	34	~	~	32.5	0.6	12.5	2.2	~	~	17.0	3.0	~
1238	41	4	16	80	106	~	~	~	34	~	~	41.0	0.4	18.0	1.5	~	~	27.0	0.5	~
1239	41	5	2	80	122	39	~	~	34	~	~	41.0	0.4	19.0	1.4	~	~	30.0	0.3	~
1240	41	5	15	80	135	39	~	~	38	~	~	42.0	0.3	20.0	1.3	~	~	30.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 32

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1241	41	6	4	80	155	37	~	~	39	~	~	42.0	0.3	21.0	1.2	~	~	31.0	0.3	~
1242	41	6	30	80	181	48	~	~	44	~	~	43.0	0.3	22.0	1.1	~	~	31.0	0.3	~
1243	41	7	18	80	199	50	~	~	46	~	~	43.0	0.3	23.0	1.0	~	~	33.0	0.3	~
1244	41	8	6	80	218	48	~	~	46	~	~	41.0	0.4	22.0	1.1	~	~	30.0	0.3	~
1245	41	8	27	80	239	50	~	~	46	~	~	39.0	0.4	20.0	1.3	~	~	28.0	0.3	~
1246	41	9	10	80	253	47	~	~	42	~	~	39.0	0.4	20.0	1.3	~	~	26.0	0.7	~
1247	41	9	22	80	265	42	~	~	44	~	~	35.0	0.5	19.0	1.4	~	~	12.0	6.5	~
1248	41	11	11	80	315	32	~	~	40	~	~	35.0	0.5	15.0	1.8	~	~	20.0	2.0	~
1249	41	1	5	81	5	~	~	~	35	~	~	40.0	0.4	19.0	1.4	~	~	30.0	0.3	~
1250	41	2	3	81	34	~	~	~	34	~	~	41.0	0.4	19.0	1.4	~	~	29.0	0.3	~
1251	41	3	2	81	61	~	~	~	34	~	~	41.0	0.4	20.0	1.3	~	~	30.0	0.3	~
1252	41	4	30	81	120	32	~	~	33	~	~	42.0	0.3	20.0	1.3	~	~	30.0	0.3	~
1253	41	5	29	81	149	43	~	~	39	~	~	42.0	0.3	21.0	1.2	~	~	30.0	0.3	~
1254	41	7	2	81	183	54	~	~	43	~	~	42.0	0.3	23.0	1.0	~	~	32.0	0.3	~
1255	41	7	14	81	195	49	~	~	44	~	~	44.0	0.3	23.0	1.0	~	~	31.0	0.3	~
1256	41	7	21	81	202	49	~	~	44	~	~	54.0	0.3	23.0	1.0	~	~	32.0	0.3	~
1257	41	8	5	81	217	54	~	~	46	~	~	41.0	0.4	23.0	1.0	~	~	30.0	0.3	~
1258	41	8	19	81	231	52	~	~	50	~	~	36.0	0.5	21.0	1.2	~	~	24.0	1.3	~
1259	41	12	3	81	337	~	~	~	38	~	~	30.0	0.7	12.0	2.3	~	~	15.0	3.8	~
1260	41	9	9	82	252	~	~	~	47	~	~	28.0	0.8	14.0	1.9	~	~	17.0	3.0	~
1261	41	8	24	83	236	~	~	~	48	~	~	36.0	0.5	22.0	1.1	~	~	25.0	1.0	~
1262	41	10	20	83	293	~	~	~	41	~	~	30.0	0.7	14.0	1.9	~	~	17.0	3.0	~
1263	41	11	2	83	306	~	~	~	~	~	~	30.0	0.7	14.0	1.9	~	~	17.0	3.0	~
1264	41	11	13	83	317	35	~	~	39	~	~	40.0	0.4	19.0	1.4	~	~	29.0	0.3	~
1265	41	11	21	83	325	35	~	~	39	~	~	40.0	0.4	20.0	1.3	~	~	30.0	0.3	~
1266	41	11	29	83	333	54	~	~	38	~	~	40.0	0.4	20.0	1.3	~	~	29.0	0.3	~
1267	41	1	10	84	10	32	~	~	36	~	~	40.0	0.4	20.0	1.3	~	~	28.0	0.3	~
1268	42	11	1	79	305	~	~	~	~	~	~	43.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1269	42	11	14	79	318	~	~	~	~	~	~	44.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1270	42	11	30	79	334	28	~	~	~	~	~	43.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1271	42	12	11	79	345	~	~	~	~	~	~	42.0	0.3	22.5	0.5	~	~	29.0	0.3	~
1272	42	12	20	79	354	32	~	~	~	~	~	44.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1273	42	1	7	80	7	34	~	~	33	~	~	44.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1274	42	1	22	80	22	32	~	~	~	~	~	44.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1275	42	2	5	80	36	32	~	~	~	~	~	44.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1276	42	2	26	80	57	32	~	~	~	~	~	45.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1277	42	4	16	80	106	~	~	~	~	~	~	45.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1278	42	5	2	80	122	32	~	~	~	~	~	45.0	0.3	23.0	0.5	~	~	29.0	0.3	~
1279	42	5	15	80	135	43	~	~	~	~	~	44.0	0.3	25.0	0.4	~	~	29.0	0.3	~
1280	42	6	4	80	155	43	~	~	~	~	~	44.0	0.3	26.0	0.3	~	~	31.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 33

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1281	42	6	30	80	181	48	~	~	~	~	~	50.0	0.3	25.0	0.4	~	~	31.0	0.3	~
1282	42	7	18	80	199	54	~	~	~	~	~	50.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1283	42	8	6	80	218	48	~	~	~	~	~	50.0	0.3	27.0	0.3	~	~	33.0	0.3	~
1284	42	8	27	80	239	50	~	~	~	~	~	50.0	0.3	26.0	0.3	~	~	32.0	0.3	~
1285	42	9	10	80	253	49	~	~	~	~	~	48.0	0.3	26.0	0.3	~	~	30.0	0.3	~
1286	42	9	22	80	265	42	~	~	~	~	~	48.0	0.3	26.0	0.3	~	~	30.0	0.3	~
1287	42	11	11	80	315	32	~	~	~	~	~	49.0	0.3	25.0	0.4	~	~	29.0	0.3	~
1288	42	1	5	81	5	~	~	~	~	~	~	44.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1289	42	2	3	81	34	~	~	~	~	~	~	45.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1290	42	3	2	81	61	~	~	~	~	~	~	42.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1291	42	4	30	81	120	32	~	~	~	~	~	44.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1292	42	5	29	81	149	47	~	~	56	~	~	44.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1293	42	7	2	81	183	50	~	~	~	~	~	50.0	0.3	28.0	0.3	~	~	33.0	0.3	~
1294	42	7	14	81	195	50	~	~	54	~	~	46.0	0.3	25.0	0.4	~	~	31.0	0.3	~
1295	42	7	21	81	202	50	~	~	~	~	~	46.0	0.3	25.0	0.4	~	~	31.0	0.3	~
1296	42	8	6	81	218	54	~	~	~	~	~	50.0	0.3	28.0	0.3	~	~	33.0	0.3	~
1297	42	8	19	81	231	52	~	~	~	~	~	43.0	0.3	28.0	0.3	~	~	33.0	0.3	~
1298	42	12	3	81	337	~	~	~	~	~	~	42.0	0.3	23.0	0.5	~	~	31.0	0.3	~
1299	42	11	1	83	305	~	~	~	~	~	~	23.0	2.3	13.0	1.0	~	~	35.0	0.3	~
1300	42	11	21	83	325	~	~	~	37	~	~	30.0	0.8	25.0	0.4	~	~	30.0	0.3	~
1301	42	11	29	83	333	35	~	~	~	~	~	18.0	4.4	10.0	1.7	~	~	32.0	0.3	~
1302	42	1	10	84	10	~	~	~	37	~	~	19.0	3.6	11.0	1.5	~	~	46.0	0.3	~
1303	43	11	1	79	305	~	~	~	38	~	~	42.0	0.3	24.5	0.4	~	~	27.0	0.4	~
1304	43	11	14	79	318	~	~	~	37	~	~	42.0	0.3	24.0	0.4	~	~	27.0	0.4	~
1305	43	11	30	79	334	32	~	~	34	~	~	41.0	0.4	24.0	0.4	~	~	27.0	0.4	~
1306	43	12	11	79	345	~	~	~	34	~	~	42.0	0.3	24.5	0.4	~	~	27.0	0.3	~
1307	43	12	20	79	354	34	~	~	33	~	~	44.0	0.3	24.5	0.4	~	~	27.0	0.3	~
1308	43	1	7	80	7	32	~	~	~	~	~	44.0	0.3	24.5	0.4	~	~	28.0	0.3	~
1309	43	1	22	80	22	32	~	~	33	~	~	44.0	0.3	24.5	0.4	~	~	28.0	0.3	~
1310	43	2	5	80	36	31	~	~	33	~	~	44.0	0.3	24.0	0.4	~	~	28.0	0.3	~
1311	43	2	26	80	57	32	~	~	33	~	~	38.0	0.5	21.0	0.7	~	~	24.0	0.5	~
1312	43	4	16	80	106	32	~	~	32	~	~	44.0	0.3	25.0	0.4	~	~	29.0	0.3	~
1313	43	5	2	80	122	39	~	~	33	~	~	41.0	0.4	25.0	0.4	~	~	29.0	0.3	~
1314	43	5	15	80	135	39	~	~	38	~	~	44.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1315	43	6	4	80	155	43	~	~	40	~	~	44.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1316	43	6	30	80	181	48	~	~	46	~	~	50.0	0.3	28.0	0.3	~	~	33.0	0.3	~
1317	43	7	18	80	199	54	~	~	50	~	~	50.0	0.3	28.0	0.3	~	~	34.0	0.3	~
1318	43	8	6	80	218	50	~	~	50	~	~	50.0	0.3	28.0	0.3	~	~	34.0	0.3	~
1319	43	8	27	80	239	50	~	~	48	~	~	50.0	0.3	28.0	0.3	~	~	34.0	0.3	~
1320	43	9	10	80	253	49	~	~	48	~	~	50.0	0.3	28.0	0.3	~	~	34.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 34

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1321	43	9	22	80	265	42	~	~	44	~	~	47.0	0.3	28.0	0.3	~	~	34.0	0.3	~
1322	43	11	11	80	315	32	~	~	38	~	~	49.0	0.3	28.0	0.3	~	~	31.0	0.3	~
1323	43	1	5	81	5	~	~	~	33	~	~	44.0	0.3	24.0	0.4	~	~	31.0	0.3	~
1324	43	2	3	81	34	~	~	~	32	~	~	44.0	0.3	25.0	0.4	~	~	29.0	0.3	~
1325	43	3	2	81	61	~	~	~	33	~	~	43.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1326	43	4	30	81	120	32	~	~	32	~	~	44.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1327	43	5	29	81	149	47	~	~	39	~	~	44.0	0.3	26.0	0.3	~	~	29.0	0.3	~
1328	43	7	2	81	183	50	~	~	~	~	~	50.0	0.3	28.0	0.3	~	~	34.0	0.3	~
1329	43	7	14	81	195	50	~	~	44	~	~	46.0	0.3	25.0	0.4	~	~	31.0	0.3	~
1330	43	7	21	81	202	50	~	~	~	~	~	46.0	0.3	25.0	0.4	~	~	32.0	0.3	~
1331	43	8	5	81	217	54	~	~	48	~	~	50.0	0.3	38.0	0.3	~	~	34.0	0.3	~
1332	43	8	19	81	231	52	~	~	50	~	~	50.0	0.3	38.0	0.3	~	~	34.0	0.3	~
1333	43	12	3	81	337	~	~	~	36	~	~	43.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1334	43	11	2	83	306	~	~	~	38	~	~	20.0	3.3	28.0	0.3	~	~	34.0	0.3	~
1335	43	11	21	83	325	35	~	~	37	~	~	39.0	0.4	30.0	0.3	~	~	35.0	0.3	~
1336	43	11	29	83	333	34	~	~	36	~	~	20.0	3.3	28.0	0.3	~	~	34.0	0.3	~
1337	43	1	10	84	10	~	~	~	34	~	~	24.0	2.0	35.0	0.3	~	~	45.0	0.3	~
1338	44	11	1	79	305	~	~	~	~	~	~	43.0	0.3	23.0	0.5	~	~	28.0	0.3	~
1339	44	11	14	79	318	~	~	~	37	~	~	43.0	0.3	24.0	0.4	~	~	28.0	0.3	~
1340	44	11	30	79	334	32	~	~	36	~	~	42.0	0.3	23.0	0.5	~	~	28.0	0.3	~
1341	44	12	11	79	345	~	~	~	36	~	~	41.0	0.4	23.0	0.5	~	~	27.0	0.3	~
1342	44	12	20	79	354	32	~	~	35	~	~	44.0	0.3	24.0	0.4	~	~	28.0	0.3	~
1343	44	1	7	80	7	36	~	~	34	~	~	43.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1344	44	1	22	80	22	34	~	~	34	~	~	43.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1345	44	2	5	80	36	31	~	~	34	~	~	44.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1346	44	2	26	80	57	34	~	~	34	~	~	44.0	0.3	24.5	0.4	~	~	29.0	0.3	~
1347	44	4	16	80	106	~	~	~	~	~	~	45.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1348	44	5	2	80	122	36	~	~	~	~	~	43.0	0.3	23.0	0.5	~	~	27.0	0.4	~
1349	44	5	15	80	135	43	~	~	40	~	~	44.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1350	44	6	4	80	155	43	~	~	40	~	~	44.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1351	44	6	30	80	181	54	~	~	48	~	~	50.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1352	44	7	18	80	199	54	~	~	50	~	~	51.0	0.3	27.0	0.3	~	~	31.0	0.3	~
1353	44	8	6	80	218	48	~	~	~	~	~	45.0	0.3	28.0	0.3	~	~	33.0	0.3	~
1354	44	8	27	80	239	~	~	~	50	~	~	5.0	0.3	27.0	0.3	~	~	31.0	0.3	~
1355	44	9	10	80	253	49	~	~	48	~	~	49.0	0.3	26.0	0.3	~	~	30.0	0.3	~
1356	44	9	22	80	265	42	~	~	44	~	~	49.0	0.3	26.0	0.3	~	~	30.0	0.3	~
1357	44	11	11	80	315	32	~	~	40	~	~	43.0	0.3	25.0	0.4	~	~	29.0	0.3	~
1358	44	1	5	81	5	~	~	~	36	~	~	45.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1359	44	2	3	81	34	~	~	~	32	~	~	43.0	0.3	24.0	0.4	~	~	29.0	0.3	~
1360	44	3	2	81	61	~	~	~	34	~	~	43.0	0.3	24.0	0.4	~	~	29.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 35

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1361	44	4	30	81	120	32	~	~	32	~	~	48.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1362	44	5	29	81	149	47	~	~	40	~	~	45.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1363	44	7	2	81	183	50	~	~	~	~	~	50.0	0.3	27.0	0.3	~	~	32.0	0.3	~
1364	44	7	14	81	195	50	~	~	44	~	~	46.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1365	44	7	21	81	202	50	~	~	~	~	~	46.0	0.3	26.0	0.3	~	~	31.0	0.3	~
1366	44	8	5	81	217	54	~	~	50	~	~	50.0	0.3	28.0	0.3	~	~	33.0	0.3	~
1367	44	8	19	81	231	52	~	~	52	~	~	43.0	0.3	26.0	0.3	~	~	30.0	0.3	~
1368	44	12	3	81	337	~	~	~	38	~	~	41.0	0.4	25.0	0.4	~	~	28.0	0.3	~
1369	44	11	21	83	325	~	~	~	38	~	~	37.0	0.5	35.0	0.3	~	~	35.0	0.3	~
1370	44	11	29	83	333	34	~	~	36	~	~	23.0	2.3	13.0	1.0	~	~	33.0	0.3	~
1371	44	1	10	84	10	~	~	~	~	~	~	23.0	2.3	35.0	0.3	~	~	24.0	0.5	~
1372	45	11	1	79	305	~	~	~	~	~	~	28.5	0.5	14.5	1.8	~	~	12.5	2.9	~
1373	45	11	14	79	318	~	~	~	~	~	~	22.0	0.8	16.0	1.5	~	~	10.0	4.3	~
1374	45	11	30	79	334	30	~	~	34	~	~	18.0	1.6	14.5	1.8	~	~	5.0	16.0	~
1375	45	1	7	80	7	34	~	~	~	~	~	30.0	0.4	27.0	0.3	~	~	13.0	2.6	~
1376	45	1	22	80	22	34	~	~	~	~	~	18.5	1.5	14.0	1.9	~	~	26.0	0.3	~
1377	45	2	5	80	36	32	~	~	~	~	~	19.0	1.3	15.5	1.6	~	~	9.0	6.5	~
1378	45	2	26	80	57	34	~	~	~	~	~	31.0	0.4	28.0	0.3	~	~	16.5	1.7	~
1379	45	5	2	80	122	38	~	~	~	~	~	33.0	0.3	28.0	0.3	~	~	23.0	0.4	~
1380	45	5	15	80	135	50	~	~	~	~	~	33.0	0.3	31.0	0.3	~	~	25.0	0.3	~
1381	45	6	4	80	155	43	~	~	~	~	~	33.0	0.3	31.0	0.3	~	~	25.0	0.3	~
1382	45	6	30	80	181	54	~	~	~	~	~	33.0	0.3	32.0	0.3	~	~	26.0	0.3	~
1383	45	7	18	80	199	61	~	~	~	~	~	32.0	0.4	32.0	0.3	~	~	26.0	0.3	~
1384	45	8	6	80	218	57	~	~	~	~	~	18.0	1.6	21.0	0.5	~	~	24.0	0.3	~
1385	45	8	27	80	239	50	~	~	~	~	~	21.0	1.0	16.0	1.5	~	~	16.0	1.5	~
1386	45	9	10	80	253	50	~	~	~	~	~	20.0	1.0	18.0	0.9	~	~	13.0	2.6	~
1387	45	9	22	80	265	42	~	~	~	~	~	18.0	1.6	29.0	0.3	~	~	12.0	3.2	~
1388	45	11	11	80	315	32	~	~	~	~	~	27.0	0.5	20.0	0.6	~	~	11.0	3.7	~
1389	45	1	5	81	5	~	~	~	~	~	~	30.0	0.4	28.0	0.3	~	~	23.0	0.4	~
1390	45	2	3	81	34	~	~	~	~	~	~	29.0	0.5	27.0	0.3	~	~	22.0	0.5	~
1391	45	3	2	81	61	~	~	~	~	~	~	29.0	0.5	27.0	0.3	~	~	23.0	0.4	~
1392	45	4	30	81	120	36	~	~	~	~	~	32.0	0.4	30.0	0.3	~	~	24.0	0.3	~
1393	45	5	29	81	149	50	~	~	~	~	~	32.0	0.4	32.0	0.3	~	~	24.0	0.3	~
1394	45	7	2	81	183	54	~	~	~	~	~	32.0	0.4	32.0	0.3	~	~	26.0	0.3	~
1395	45	7	14	81	195	52	~	~	~	~	~	31.0	0.4	31.0	0.3	~	~	25.0	0.3	~
1396	45	7	21	81	202	52	~	~	~	~	~	31.0	0.4	31.0	0.3	~	~	25.0	0.3	~
1397	45	8	6	81	218	54	~	~	~	~	~	27.0	0.5	20.0	0.6	~	~	23.0	0.4	~
1398	45	8	19	81	231	52	~	~	52	~	~	15.0	2.7	16.0	1.5	~	~	14.0	2.2	~
1399	45	9	9	82	252	~	~	~	~	~	~	16.0	2.3	14.0	1.9	~	~	12.0	3.2	~
1400	46	11	1	79	305	~	~	~	39	~	~	28.0	0.5	7.0	10.0	~	~	6.0	16.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 36

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1401	46	11	14	79	318	~	~	~	36	~	~	23.0	0.7	9.5	4.5	~	~	6.0	16.0	~
1402	46	11	30	79	334	28	~	~	34	~	~	19.0	1.3	10.0	4.0	~	~	6.5	14.0	~
1403	46	1	7	80	7	34	~	~	34	~	~	30.0	0.4	17.0	1.3	~	~	11.5	3.5	~
1404	46	1	22	80	22	36	~	~	34	~	~	17.5	1.8	8.5	6.0	~	~	25.0	0.3	~
1405	46	2	5	80	36	31	~	~	34	~	~	29.0	0.5	16.5	1.4	~	~	12.0	3.2	~
1406	46	2	26	80	57	34	~	~	34	~	~	29.0	0.5	17.5	1.1	~	~	12.5	2.9	~
1407	46	5	2	80	122	40	~	~	38	~	~	32.0	0.4	30.0	0.3	~	~	23.0	0.4	~
1408	46	5	15	80	135	43	~	~	38	~	~	32.0	0.4	31.0	0.3	~	~	25.0	0.3	~
1409	46	6	4	80	155	39	~	~	40	~	~	32.0	0.4	31.0	0.3	~	~	25.0	0.3	~
1410	46	6	30	80	181	48	~	~	44	~	~	33.0	0.3	32.0	0.3	~	~	26.0	0.3	~
1411	46	7	18	80	199	54	~	~	46	~	~	32.0	0.4	33.0	0.3	~	~	26.0	0.3	~
1412	46	8	6	80	218	50	~	~	46	~	~	20.0	1.0	26.0	0.3	~	~	20.0	0.3	~
1413	46	8	27	80	239	50	~	~	46	~	~	20.0	1.0	18.0	0.9	~	~	14.0	2.2	~
1414	46	9	10	80	253	50	~	~	46	~	~	20.0	1.0	15.0	1.6	~	~	12.0	3.2	~
1415	46	9	22	80	265	42	~	~	44	~	~	19.0	1.6	12.0	2.8	~	~	11.0	3.7	~
1416	46	11	11	80	315	32	~	~	38	~	~	30.0	0.4	19.0	0.7	~	~	11.0	3.7	~
1417	46	1	5	81	5	~	~	~	34	~	~	30.0	0.4	28.0	0.3	~	~	21.0	0.6	~
1418	46	2	3	81	34	~	~	~	34	~	~	29.0	0.5	27.0	0.3	~	~	22.0	0.5	~
1419	46	3	2	81	61	~	~	~	34	~	~	29.0	0.5	28.0	0.3	~	~	23.0	0.4	~
1420	46	4	30	81	120	36	~	~	34	~	~	32.0	0.4	31.0	0.3	~	~	24.0	0.3	~
1421	46	5	29	81	149	50	~	~	40	~	~	33.0	0.3	31.0	0.3	~	~	25.0	0.3	~
1422	46	7	2	81	183	54	~	~	~	~	~	31.0	0.4	31.0	0.3	~	~	25.0	0.3	~
1423	46	7	14	81	195	52	~	~	45	~	~	31.0	0.4	31.0	0.3	~	~	26.0	0.3	~
1424	46	7	21	81	202	52	~	~	45	~	~	31.0	0.4	31.0	0.3	~	~	26.0	0.3	~
1425	46	8	5	81	217	54	~	~	48	~	~	19.0	1.3	28.0	0.3	~	~	21.0	0.6	~
1426	46	8	19	81	231	50	~	~	50	~	~	19.0	1.6	19.0	0.7	~	~	15.0	1.8	~
1427	46	9	9	82	252	~	~	~	50	~	~	12.0	16.0	10.0	4.0	~	~	10.0	4.5	~
1428	46	8	24	83	236	~	~	~	52	~	~	23.0	0.6	13.0	2.3	~	~	13.0	1.5	~
1429	46	10	20	83	293	~	~	~	44	~	~	14.0	3.3	11.0	3.4	~	~	10.0	4.5	~
1430	46	11	2	83	306	~	~	~	43	~	~	14.0	3.3	11.0	3.4	~	~	10.0	4.5	~
1431	46	11	13	83	317	38	~	~	40	~	~	26.0	0.6	18.0	0.9	~	~	12.0	2.0	~
1432	46	11	21	83	325	34	~	~	40	~	~	27.0	0.5	17.0	1.3	~	~	12.0	3.2	~
1433	46	11	29	83	333	33	~	~	40	~	~	27.0	0.5	17.0	1.3	~	~	12.0	3.2	~
1434	47	11	1	79	305	~	~	~	39	~	~	28.0	0.5	16.0	1.5	~	~	13.0	2.6	~
1435	47	11	14	79	318	~	~	~	38	~	~	25.0	0.6	13.0	2.3	~	~	10.0	4.3	~
1436	47	11	30	79	334	28	~	~	36	~	~	19.0	1.3	11.5	3.1	~	~	9.5	5.4	~
1437	47	1	22	80	22	34	~	~	34	~	~	30.0	0.4	27.0	0.3	~	~	17.5	1.2	~
1438	47	2	5	80	36	33	~	~	35	~	~	20.0	1.0	16.0	1.5	~	~	18.0	1.1	~
1439	47	2	26	80	57	34	~	~	35	~	~	30.0	0.4	29.0	0.3	~	~	19.0	0.8	~
1440	47	5	2	80	122	36	~	~	~	~	~	31.0	0.4	28.0	0.3	~	~	24.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 37

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1441	47	5	15	80	135	46	~	~	40	~	~	32.0	0.4	30.0	0.3	~	~	25.0	0.3	~
1442	47	6	4	80	155	39	~	~	42	~	~	32.0	0.4	30.0	0.3	~	~	25.0	0.3	~
1443	47	6	30	80	181	50	~	~	46	~	~	34.0	0.3	30.0	0.3	~	~	26.0	0.3	~
1444	47	7	18	80	199	57	~	~	46	~	~	32.0	0.4	32.0	0.3	~	~	27.0	0.3	~
1445	47	8	6	80	218	50	~	~	48	~	~	25.0	0.6	31.0	0.3	~	~	27.0	0.3	~
1446	47	8	27	80	239	48	~	~	48	~	~	26.0	0.6	30.0	0.3	~	~	26.0	0.3	~
1447	47	9	10	80	253	50	~	~	48	~	~	30.0	0.4	30.0	0.3	~	~	26.0	0.3	~
1448	47	9	22	80	265	42	~	~	46	~	~	26.0	0.6	30.0	0.3	~	~	26.0	0.3	~
1449	47	11	11	80	315	32	~	~	40	~	~	29.0	0.5	27.0	0.3	~	~	24.0	0.3	~
1450	47	1	5	81	5	~	~	~	36	~	~	30.0	0.4	29.0	0.3	~	~	25.0	0.3	~
1451	47	2	3	81	34	~	~	~	34	~	~	31.0	0.4	28.0	0.3	~	~	25.0	0.3	~
1452	47	3	2	81	61	~	~	~	34	~	~	30.0	0.4	27.0	0.3	~	~	23.0	0.4	~
1453	47	4	30	81	120	38	~	~	36	~	~	31.0	0.4	29.0	0.3	~	~	25.0	0.3	~
1454	47	5	29	81	149	52	~	~	44	~	~	32.0	0.4	30.0	0.3	~	~	26.0	0.3	~
1455	47	7	2	81	183	54	~	~	~	~	~	32.0	0.4	30.0	0.3	~	~	26.0	0.3	~
1456	47	7	14	81	195	52	~	~	46	~	~	31.0	0.4	31.0	0.3	~	~	26.0	0.3	~
1457	47	7	21	81	202	52	~	~	47	~	~	31.0	0.4	31.0	0.3	~	~	27.0	0.3	~
1458	47	8	5	81	217	54	~	~	48	~	~	34.0	0.3	30.0	0.3	~	~	26.0	0.3	~
1459	47	8	19	81	231	50	~	~	50	~	~	18.0	1.6	28.0	0.3	~	~	26.0	0.3	~
1460	47	9	9	82	252	~	~	~	49	~	~	14.0	3.3	14.0	1.9	~	~	23.0	0.4	~
1461	47	8	24	83	236	~	~	~	50	~	~	20.0	1.0	26.0	0.3	~	~	22.0	0.3	~
1462	47	10	20	83	293	~	~	~	44	~	~	18.0	1.6	22.0	0.4	~	~	23.0	0.4	~
1463	47	11	2	83	306	~	~	~	44	~	~	18.0	1.6	20.0	0.6	~	~	22.0	0.3	~
1464	47	11	13	83	317	38	~	~	42	~	~	30.0	0.4	26.0	0.3	~	~	24.0	0.3	~
1465	47	11	21	83	325	38	~	~	41	~	~	31.0	0.4	28.0	0.3	~	~	24.0	0.3	~
1466	47	11	29	83	333	34	~	~	40	~	~	30.0	0.4	28.0	0.3	~	~	24.0	0.3	~
1467	48	11	1	79	305	~	~	~	39	~	~	30.0	0.6	8.5	6.8	~	~	4.0	16.0	~
1468	48	11	14	79	318	~	~	~	~	~	~	26.0	0.7	8.5	6.8	~	~	5.0	15.0	~
1469	48	11	30	79	334	27	~	~	34	~	~	21.5	1.6	8.5	6.8	~	~	5.0	15.0	~
1470	48	12	11	79	345	~	~	~	34	~	~	30.0	0.6	29.5	0.3	~	~	5.5	16.0	~
1471	48	12	20	79	354	32	~	~	33	~	~	29.0	0.6	14.0	2.5	~	~	9.0	10.0	~
1472	48	1	7	80	7	34	~	~	33	~	~	30.0	0.6	17.0	1.5	~	~	12.5	5.5	~
1473	48	1	22	80	22	32	~	~	34	~	~	30.0	0.6	17.0	1.5	~	~	12.5	5.5	~
1474	48	2	5	80	36	32	~	~	~	~	~	27.0	0.7	15.5	1.9	~	~	12.0	6.0	~
1475	48	2	26	80	57	32	~	~	32	~	~	29.0	0.6	16.5	1.7	~	~	12.5	5.5	~
1476	48	4	16	80	106	32	~	~	33	~	~	35.0	0.4	25.0	0.3	~	~	22.0	0.9	~
1477	48	5	2	80	122	38	~	~	35	~	~	36.0	0.4	26.0	0.3	~	~	23.0	0.6	~
1478	48	5	15	80	135	41	~	~	38	~	~	36.0	0.4	26.0	0.3	~	~	23.0	0.6	~
1479	48	6	4	80	155	39	~	~	40	~	~	37.0	0.3	26.0	0.3	~	~	23.0	0.6	~
1480	48	6	30	80	181	54	~	~	44	~	~	27.0	0.3	27.0	0.3	~	~	24.0	0.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 38

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1481	48	7	18	80	199	54	~	~	46	~	~	38.0	0.3	28.0	0.3	~	~	25.0	0.3	~
1482	48	8	6	80	218	49	~	~	48	~	~	33.0	0.5	19.0	0.3	~	~	17.0	2.4	~
1483	48	8	27	80	239	50	~	~	46	~	~	29.0	0.6	16.0	1.8	~	~	12.0	6.0	~
1484	48	9	10	80	253	50	~	~	~	~	~	20.0	2.3	18.0	1.1	~	~	13.0	5.0	~
1485	48	9	22	80	265	42	~	~	44	~	~	28.0	0.7	13.0	3.0	~	~	10.0	8.5	~
1486	48	11	11	80	315	32	~	~	38	~	~	32.0	0.5	16.0	1.8	~	~	12.0	6.0	~
1487	48	1	5	81	5	~	~	~	34	~	~	35.0	0.4	25.0	0.3	~	~	21.0	1.2	~
1488	48	2	3	81	34	~	~	~	33	~	~	35.0	0.4	24.0	0.3	~	~	23.0	0.6	~
1489	48	3	2	81	61	~	~	~	33	~	~	35.0	0.4	25.0	0.3	~	~	23.0	0.6	~
1490	48	4	30	81	120	34	~	~	34	~	~	35.0	0.4	26.0	0.3	~	~	23.0	0.6	~
1491	48	5	29	81	149	50	~	~	42	~	~	38.0	0.3	28.0	0.3	~	~	24.0	0.3	~
1492	48	7	2	81	183	52	~	~	~	~	~	36.0	0.4	27.0	0.3	~	~	25.0	0.3	~
1493	48	7	14	81	195	50	~	~	46	~	~	37.0	0.3	27.0	0.3	~	~	27.0	0.3	~
1494	48	7	21	81	202	50	~	~	46	~	~	37.0	0.3	27.0	0.3	~	~	27.0	0.3	~
1495	48	8	5	81	217	58	~	~	48	~	~	33.0	0.5	19.0	0.3	~	~	14.0	4.5	~
1496	48	8	19	81	231	52	~	~	50	~	~	23.0	1.2	12.0	3.6	~	~	8.0	12.0	~
1497	48	12	3	81	337	~	~	~	37	~	~	27.0	0.7	10.0	5.0	~	~	7.0	13.0	~
1498	48	9	9	82	252	~	~	~	47	~	~	17.0	4.9	9.0	6.0	~	~	6.0	14.0	~
1499	48	8	24	83	236	~	~	~	50	~	~	20.0	2.3	11.0	4.3	~	~	8.0	12.0	~
1500	48	10	20	83	293	~	~	~	42	~	~	24.0	0.9	10.0	5.0	~	~	7.0	13.0	~
1501	48	11	2	83	306	~	~	~	41	~	~	25.0	0.8	11.0	4.3	~	~	7.0	13.0	~
1502	48	11	13	83	317	37	~	~	39	~	~	33.0	0.5	24.0	0.3	~	~	20.0	1.5	~
1503	48	11	21	83	325	35	~	~	38	~	~	33.0	0.5	24.0	0.3	~	~	22.0	0.9	~
1504	48	11	29	83	333	33	~	~	38	~	~	32.0	0.5	24.0	0.3	~	~	22.0	0.9	~
1505	48	1	10	84	10	~	~	~	35	~	~	31.0	0.6	22.0	0.3	~	~	20.0	1.5	~
1506	49	11	1	79	305	~	~	~	~	~	~	27.0	0.7	6.0	11.0	~	~	4.0	16.0	~
1507	49	11	14	79	318	~	~	~	~	~	~	24.0	0.9	7.0	9.0	~	~	4.0	16.0	~
1508	49	11	30	79	334	27	~	~	~	~	~	15.0	7.5	6.5	10.0	~	~	4.0	16.0	~
1509	49	12	11	79	345	~	~	~	~	~	~	30.0	0.6	7.0	9.0	~	~	4.0	16.0	~
1510	49	12	20	79	354	32	~	~	~	~	~	28.0	0.7	27.5	0.3	~	~	4.0	16.0	~
1511	49	1	7	80	7	32	~	~	~	~	~	26.0	0.7	12.0	3.6	~	~	6.0	14.0	~
1512	49	1	22	80	22	32	~	~	~	~	~	29.0	0.6	17.0	1.5	~	~	7.5	12.5	~
1513	49	2	5	80	36	31	~	~	~	~	~	15.0	7.5	11.0	4.3	~	~	6.0	14.0	~
1514	49	2	26	80	57	32	~	~	~	~	~	19.5	2.5	11.0	4.3	~	~	6.0	14.0	~
1515	49	4	16	80	106	~	~	~	~	~	~	25.0	0.8	12.0	3.6	~	~	4.0	16.0	~
1516	49	5	2	80	122	38	~	~	~	~	~	35.0	0.4	24.0	0.3	~	~	18.0	2.0	~
1517	49	5	15	80	135	41	~	~	~	~	~	36.0	0.4	24.0	0.3	~	~	19.0	1.7	~
1518	49	6	4	80	155	39	~	~	40	~	~	36.0	0.4	25.0	0.3	~	~	21.0	1.2	~
1519	49	6	30	80	181	48	~	~	~	~	~	37.0	0.3	26.0	0.3	~	~	21.0	1.2	~
1520	49	7	18	80	199	50	~	~	~	~	~	37.0	0.3	26.0	0.3	~	~	22.0	0.9	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 39

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1521	49	8	6	80	218	50	~	~	~	~	~	28.0	0.7	23.0	0.3	~	~	20.0	1.5	~
1522	49	8	27	80	239	48	~	~	~	~	~	30.0	0.6	17.0	1.5	~	~	13.0	5.0	~
1523	49	9	10	80	253	50	~	~	~	~	~	30.0	0.6	18.0	1.1	~	~	13.0	5.0	~
1524	49	9	22	80	265	42	~	~	~	~	~	25.0	0.8	12.0	3.6	~	~	9.0	10.0	~
1525	49	11	11	80	315	32	~	~	~	~	~	28.0	0.7	12.0	3.6	~	~	9.0	10.0	~
1526	49	1	5	81	5	~	~	~	~	~	~	34.0	0.5	23.0	0.3	~	~	16.0	2.8	~
1527	49	2	3	81	34	~	~	~	~	~	~	32.0	0.5	20.0	0.3	~	~	16.0	2.8	~
1528	49	3	2	81	61	~	~	~	~	~	~	34.0	0.5	22.0	0.3	~	~	18.0	2.0	~
1529	49	4	30	81	120	~	~	~	~	~	~	35.0	0.4	24.0	0.3	~	~	20.0	1.5	~
1530	49	5	29	81	149	47	~	~	~	~	~	38.0	0.3	26.0	0.3	~	~	21.0	1.2	~
1531	49	7	2	81	183	48	~	~	~	~	~	37.0	0.3	25.0	0.3	~	~	21.0	1.2	~
1532	49	7	14	81	195	50	~	~	~	~	~	27.0	0.7	26.0	0.3	~	~	23.0	0.6	~
1533	49	7	21	81	202	50	~	~	~	~	~	37.0	0.3	26.0	0.3	~	~	22.0	0.9	~
1534	49	8	6	81	218	58	~	~	~	~	~	35.0	0.4	23.0	0.3	~	~	20.0	1.5	~
1535	49	8	19	81	231	52	~	~	~	~	~	27.0	0.7	14.0	2.5	~	~	10.0	8.5	~
1536	49	12	3	81	337	~	~	~	~	~	~	25.0	0.8	9.0	6.0	~	~	6.0	14.0	~
1537	49	9	9	82	252	~	~	~	~	~	~	24.0	0.9	10.0	5.0	~	~	7.0	13.0	~
1538	49	8	24	83	236	~	~	~	~	~	~	26.0	0.7	13.0	3.0	~	~	10.0	8.5	~
1539	49	10	20	83	293	~	~	~	~	~	~	23.0	1.2	10.0	5.0	~	~	7.0	13.0	~
1540	49	11	1	83	305	~	~	~	~	~	~	24.0	0.9	11.0	4.3	~	~	7.0	13.0	~
1541	49	11	13	83	317	37	~	~	~	~	~	34.0	0.5	21.0	0.3	~	~	11.0	7.5	~
1542	49	1	10	84	10	~	~	~	~	~	~	30.0	0.6	17.0	1.5	~	~	12.0	6.0	~
1543	50	11	1	79	305	~	~	~	39	~	~	24.0	0.9	10.5	4.6	~	~	7.0	13.0	~
1544	50	11	14	79	318	~	~	~	~	~	~	20.0	2.3	10.0	5.0	~	~	5.0	15.0	~
1545	50	11	30	79	334	28	~	~	34	~	~	15.0	7.5	8.0	7.5	~	~	5.0	15.0	~
1546	50	12	11	79	345	~	~	~	34	~	~	27.0	0.7	19.0	0.3	~	~	14.0	4.5	~
1547	50	12	20	79	354	32	~	~	35	~	~	26.0	0.7	17.0	1.5	~	~	12.0	6.0	~
1548	50	1	7	80	7	32	~	~	34	~	~	24.0	0.9	16.0	1.8	~	~	12.0	6.0	~
1549	50	1	22	80	22	32	~	~	33	~	~	25.0	0.8	17.0	1.5	~	~	13.0	0.5	~
1550	50	2	5	80	36	30	~	~	32	~	~	21.0	1.7	15.0	2.0	~	~	12.0	6.0	~
1551	50	2	26	80	57	32	~	~	33	~	~	29.0	0.6	30.0	0.3	~	~	27.0	0.3	~
1552	50	4	16	80	106	~	~	~	32	~	~	28.0	0.7	23.0	0.3	~	~	20.0	1.5	~
1553	50	5	2	80	122	45	~	~	36	~	~	28.0	0.7	25.0	0.3	~	~	21.0	1.2	~
1554	50	5	15	80	135	41	~	~	38	~	~	27.0	0.7	25.0	0.3	~	~	22.0	0.9	~
1555	50	6	4	80	155	39	~	~	40	~	~	28.0	0.7	26.0	0.3	~	~	23.0	0.6	~
1556	50	6	30	80	181	48	~	~	44	~	~	26.0	0.7	27.0	0.3	~	~	24.0	0.3	~
1557	50	7	18	80	199	54	~	~	46	~	~	27.0	0.7	27.0	0.3	~	~	24.0	0.3	~
1558	50	8	6	80	218	49	~	~	46	~	~	23.0	1.2	17.0	1.5	~	~	17.0	2.4	~
1559	50	8	27	80	239	50	~	~	46	~	~	23.0	1.2	15.0	2.0	~	~	12.0	6.0	~
1560	50	9	10	80	253	50	~	~	48	~	~	24.0	0.9	15.0	2.0	~	~	12.0	6.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 40

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1561	50	9	22	80	265	42	~	~	42	~	~	22.0	1.5	12.0	3.6	~	~	9.0	10.0	~
1562	50	11	11	80	315	32	~	~	38	~	~	26.0	0.7	13.0	3.0	~	~	10.0	8.5	~
1563	50	1	5	81	5	~	~	~	34	~	~	26.0	0.7	24.0	0.3	~	~	20.0	1.5	~
1564	50	2	3	81	34	~	~	~	33	~	~	25.0	0.8	24.0	0.3	~	~	21.0	1.2	~
1565	50	3	2	81	61	~	~	~	32	~	~	26.0	0.7	24.0	0.3	~	~	21.0	1.2	~
1566	50	4	30	81	120	34	~	~	34	~	~	27.0	0.7	26.0	0.3	~	~	22.0	0.9	~
1567	50	5	29	81	149	47	~	~	40	~	~	27.0	0.7	25.0	0.3	~	~	22.0	0.9	~
1568	50	7	2	81	183	50	~	~	~	~	~	34.0	0.5	26.0	0.3	~	~	23.0	0.6	~
1569	50	7	14	81	195	50	~	~	45	~	~	28.0	0.7	28.0	0.3	~	~	23.0	0.6	~
1570	50	7	21	81	202	50	~	~	45	~	~	26.0	0.7	26.0	0.3	~	~	24.0	0.3	~
1571	50	8	5	81	217	58	~	~	48	~	~	22.0	1.5	18.0	1.1	~	~	12.0	6.0	~
1572	50	8	19	81	231	52	~	~	50	~	~	22.0	1.5	25.0	0.3	~	~	10.0	8.5	~
1573	50	12	3	81	337	~	~	~	38	~	~	19.0	2.8	9.0	6.0	~	~	5.0	15.0	~
1574	50	9	9	82	252	~	~	~	52	~	~	10.0	16.0	9.0	6.0	~	~	6.0	14.0	~
1575	50	8	24	83	236	~	~	~	49	~	~	18.0	3.6	12.0	3.6	~	~	9.0	10.0	~
1576	50	10	20	83	293	~	~	~	42	~	~	19.0	2.8	9.0	6.0	~	~	6.0	14.0	~
1577	50	11	2	83	306	~	~	~	41	~	~	19.0	2.8	10.0	5.0	~	~	6.0	14.0	~
1578	50	11	13	83	317	35	~	~	39	~	~	22.0	1.5	23.0	0.3	~	~	17.0	2.4	~
1579	50	11	21	83	325	35	~	~	39	~	~	27.0	0.7	24.0	0.3	~	~	19.0	1.7	~
1580	50	11	29	83	333	34	~	~	38	~	~	27.0	0.7	24.0	0.3	~	~	19.0	1.7	~
1581	50	1	10	84	10	34	~	~	35	~	~	27.0	0.7	24.0	0.3	~	~	20.0	1.5	~
1582	51	7	6	82	187	~	62	~	55	76	~	47.0	0.3	~	~	29.0	0.9	~	~	~
1583	51	7	12	82	193	~	70	~	60	81	~	47.0	0.3	~	~	30.0	0.7	~	~	~
1584	51	7	24	82	205	~	~	~	60	80	~	47.0	0.3	~	~	30.0	0.7	~	~	~
1585	51	8	6	82	218	~	75	~	63	88	~	46.0	0.3	~	~	29.0	0.8	~	~	~
1586	51	8	30	82	242	~	61	~	58	74	~	24.0	1.5	~	~	17.0	6.0	~	~	~
1587	51	9	24	82	267	~	54	~	55	71	~	31.0	0.7	~	~	15.0	15.0	~	~	~
1588	51	10	30	82	303	~	38	~	41	32	~	43.0	0.4	~	~	28.0	1.0	~	~	~
1589	51	5	25	83	145	~	60	~	52	80	~	46.0	0.3	~	~	29.0	0.9	~	~	~
1590	51	6	13	83	164	~	54	~	56	69	~	45.0	0.3	~	~	29.0	0.9	~	~	~
1591	51	6	27	83	178	~	59	~	55	59	~	45.0	0.3	~	~	29.0	0.9	~	~	~
1592	51	7	11	83	192	~	57	~	52	75	~	46.0	0.3	~	~	29.0	0.9	~	~	~
1593	51	8	3	83	215	~	66	~	63	84	~	45.0	0.3	~	~	29.0	0.9	~	~	~
1594	51	8	22	83	234	~	66	~	63	69	~	34.0	0.3	~	~	22.0	0.9	~	~	~
1595	51	9	23	83	266	~	53	~	56	75	~	~	~	~	~	~	~	~	~	~
1596	52	7	6	82	187	~	~	~	~	~	~	47.0	0.3	~	~	31.0	0.7	~	~	~
1597	52	7	12	82	193	~	~	~	~	~	~	47.0	0.3	~	~	31.0	0.7	~	~	~
1598	52	7	24	82	205	~	~	~	~	~	~	47.0	0.3	~	~	31.0	0.7	~	~	~
1599	52	8	6	82	218	~	~	~	~	~	~	45.0	0.3	~	~	31.0	0.7	~	~	~
1600	52	8	30	82	242	~	~	~	~	~	~	23.0	2.0	~	~	20.0	4.0	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 41

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1601	52	9	24	82	267	~	~	~	~	~	~	35.0	0.5	~	~	19.0	4.5	~	~	~
1602	52	5	25	83	145	~	~	~	~	~	~	44.0	0.3	~	~	29.0	0.9	~	~	~
1603	52	6	13	83	164	~	~	~	~	~	~	42.0	0.4	~	~	29.0	0.9	~	~	~
1604	52	6	27	83	178	~	~	~	~	~	~	43.0	0.4	~	~	31.0	0.7	~	~	~
1605	52	7	11	83	192	~	~	~	~	~	~	43.0	0.4	~	~	29.0	0.9	~	~	~
1606	52	9	3	83	246	~	~	~	~	~	~	43.0	0.4	~	~	31.0	0.7	~	~	~
1607	52	9	22	83	265	~	~	~	~	~	~	27.0	1.1	~	~	26.0	1.3	~	~	~
1608	53	7	6	82	187	~	52	~	50	53	~	44.0	0.3	~	~	29.0	0.9	~	~	~
1609	53	7	12	82	193	~	56	~	52	57	~	45.0	0.3	~	~	29.0	0.9	~	~	~
1610	53	7	24	82	205	~	52	~	51	52	~	44.0	0.3	~	~	29.0	0.9	~	~	~
1611	53	8	6	82	218	~	57	~	55	58	~	22.0	3.0	~	~	29.0	0.9	~	~	~
1612	53	8	30	82	242	~	54	~	57	52	~	15.0	15.0	~	~	2.6	1.3	~	~	~
1613	53	9	24	82	267	~	53	~	52	50	~	30.0	0.7	~	~	22.0	3.0	~	~	~
1614	53	10	30	82	303	~	39	~	41	34	~	40.0	0.4	~	~	27.0	1.1	~	~	~
1615	53	5	24	83	144	~	48	~	43	50	~	42.0	0.4	~	~	28.0	1.0	~	~	~
1616	53	6	6	83	157	~	46	~	50	49	~	32.0	0.7	~	~	28.0	1.0	~	~	~
1617	53	6	27	83	178	~	49	~	51	48	~	36.0	0.5	~	~	28.0	1.0	~	~	~
1618	53	7	11	83	192	~	48	~	46	50	~	43.0	0.4	~	~	31.0	0.7	~	~	~
1619	53	8	3	83	215	~	58	~	54	59	~	20.0	4.0	~	~	36.0	0.5	~	~	~
1620	53	8	22	83	234	~	56	~	56	56	~	17.0	6.0	~	~	18.0	5.0	~	~	~
1621	53	9	23	83	252	~	50	~	53	48	~	~	~	~	~	~	~	~	~	~
1622	54	7	6	82	187	~	~	~	~	~	~	45.0	0.3	~	~	29.0	0.9	~	~	~
1623	54	7	12	82	193	~	~	~	~	~	~	46.0	0.3	~	~	28.0	1.0	~	~	~
1624	54	7	24	82	205	~	~	~	~	~	~	45.0	0.3	~	~	28.0	1.0	~	~	~
1625	54	8	6	82	218	~	~	~	~	~	~	45.0	0.3	~	~	28.0	1.0	~	~	~
1626	54	8	30	82	242	~	~	~	~	~	~	30.0	0.7	~	~	22.0	3.0	~	~	~
1627	54	9	24	82	267	~	~	~	~	~	~	35.0	0.5	~	~	15.0	15.0	~	~	~
1628	54	10	30	82	303	~	~	~	~	~	~	40.0	0.4	~	~	24.0	1.5	~	~	~
1629	54	5	24	83	144	~	~	~	~	~	~	44.0	0.3	~	~	29.0	0.9	~	~	~
1630	54	6	6	83	157	~	~	~	~	~	~	43.0	0.3	~	~	29.0	0.9	~	~	~
1631	54	6	27	83	178	~	~	~	~	~	~	43.0	0.3	~	~	29.0	0.9	~	~	~
1632	54	7	11	83	192	~	~	~	~	~	~	44.0	0.3	~	~	29.0	0.9	~	~	~
1633	54	8	3	83	215	~	~	~	~	~	~	43.0	0.3	~	~	29.0	0.9	~	~	~
1634	54	8	22	83	234	~	~	~	~	~	~	34.0	0.6	~	~	27.0	1.1	~	~	~
1635	55	11	21	80	325	~	~	~	~	~	~	37.0	0.5	~	~	19.0	4.5	~	~	~
1636	55	11	27	80	331	~	~	~	~	~	~	37.0	0.5	~	~	21.0	3.2	~	~	~
1637	55	12	6	80	340	~	~	~	~	~	~	38.0	0.5	~	~	22.0	3.0	~	~	~
1638	55	12	12	80	346	~	~	~	~	~	~	36.0	0.5	~	~	22.0	3.0	~	~	~
1639	55	12	18	80	352	~	~	~	~	~	~	35.0	0.5	~	~	22.0	3.0	~	~	~
1640	55	1	6	81	6	~	~	~	~	~	~	38.0	0.5	~	~	26.0	1.5	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 42

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1641	55	1	12	81	12	~	~	~	~	~	~	39.0	0.5	~	~	26.0	1.5	~	~	~
1642	55	1	30	81	30	~	~	~	~	~	~	39.0	0.5	~	~	26.0	1.5	~	~	~
1643	55	2	24	81	55	~	~	~	~	~	~	39.0	0.5	~	~	27.0	1.3	~	~	~
1644	55	3	24	81	55	~	~	~	~	~	~	39.0	0.5	~	~	27.0	1.3	~	~	~
1645	55	5	24	81	144	~	~	~	~	~	~	41.0	0.4	~	~	28.0	1.0	~	~	~
1646	55	6	6	81	157	~	~	~	~	~	~	41.0	0.4	~	~	29.0	0.9	~	~	~
1647	55	6	24	81	175	~	~	~	~	~	~	42.0	0.4	~	~	29.0	0.9	~	~	~
1648	55	7	18	81	199	~	~	~	~	~	~	42.0	0.4	~	~	29.0	0.9	~	~	~
1649	55	7	30	81	211	~	~	~	~	~	~	39.0	0.5	~	~	28.0	1.0	~	~	~
1650	55	8	6	81	218	~	~	~	~	~	~	35.0	0.5	~	~	26.0	1.5	~	~	~
1651	55	8	12	81	224	~	~	~	~	~	~	30.0	0.7	~	~	21.0	3.2	~	~	~
1652	55	8	18	81	230	~	~	~	~	~	~	24.0	1.5	~	~	18.0	5.3	~	~	~
1653	55	8	24	81	236	~	~	~	~	~	~	22.0	3.0	~	~	15.0	15.0	~	~	~
1654	55	9	27	81	270	~	~	~	~	~	~	22.0	3.0	~	~	15.0	15.0	~	~	~
1655	55	10	1	81	274	~	~	~	~	~	~	36.0	0.5	~	~	15.0	15.0	~	~	~
1656	55	10	15	81	288	~	~	~	~	~	~	32.0	0.6	~	~	17.0	6.0	~	~	~
1657	55	10	24	81	297	~	~	~	~	~	~	33.0	0.6	~	~	16.0	10.0	~	~	~
1658	55	10	30	81	303	~	~	~	~	~	~	32.0	0.7	~	~	16.0	10.0	~	~	~
1659	55	11	6	81	310	~	~	~	~	~	~	37.0	0.5	~	~	16.0	10.0	~	~	~
1660	55	11	12	81	316	~	~	~	~	~	~	39.0	0.5	~	~	16.0	0.5	~	~	~
1661	55	12	15	81	349	~	~	~	~	~	~	39.0	0.5	~	~	26.0	1.5	~	~	~
1662	55	12	24	81	358	~	~	~	~	~	~	41.0	0.4	~	~	26.0	1.3	~	~	~
1663	55	6	6	82	157	~	~	~	~	~	~	41.0	0.4	~	~	28.0	1.0	~	~	~
1664	55	6	24	82	175	~	~	~	~	~	~	41.0	0.4	~	~	28.0	1.0	~	~	~
1665	55	7	18	82	199	~	~	~	~	~	~	41.0	0.4	~	~	29.0	0.9	~	~	~
1666	55	8	6	82	218	~	~	~	~	~	~	26.0	1.3	~	~	25.0	1.3	~	~	~
1667	55	8	30	82	242	~	~	~	~	~	~	22.0	3.0	~	~	15.0	15.0	~	~	~
1668	55	9	24	82	267	~	~	~	~	~	~	22.0	3.0	~	~	15.0	15.0	~	~	~
1669	55	10	25	82	298	~	~	~	~	~	~	34.0	0.6	~	~	15.0	15.0	~	~	~
1670	55	4	6	83	96	~	34	~	34	~	~	39.0	0.5	~	~	27.0	1.3	~	~	~
1671	55	5	24	83	144	~	44	~	38	~	~	42.0	0.4	~	~	28.0	1.0	~	~	~
1672	55	6	15	83	166	~	51	~	47	~	~	40.0	0.4	~	~	27.0	1.3	~	~	~
1673	55	7	15	83	196	~	53	~	52	~	~	41.0	0.4	~	~	27.0	1.3	~	~	~
1674	55	7	24	83	205	~	~	~	~	~	~	39.0	0.5	~	~	27.0	1.3	~	~	~
1675	55	8	18	83	230	~	~	~	~	~	~	22.0	3.0	~	~	23.0	2.0	~	~	~
1676	56	6	27	82	178	~	72	~	66	82	~	25.0	0.5	~	~	25.0	0.5	~	~	~
1677	56	7	12	82	193	~	74	~	68	94	~	26.0	0.3	~	~	25.0	0.5	~	~	~
1678	56	7	18	82	199	~	70	~	69	90	~	25.0	0.5	~	~	19.0	1.3	~	~	~
1679	56	8	1	82	213	~	78	~	70	116	~	9.0	16.0	~	~	14.0	3.0	~	~	~
1680	56	8	30	82	242	~	71	~	71	76	~	7.0	16.0	~	~	6.0	16.0	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 43

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1681	56	9	24	82	267	~	64	~	66	68	~	24.0	0.6	~	~	7.0	16.0	~	~	~
1682	56	10	30	82	303	~	51	~	53	~	~	25.0	0.5	~	~	25.0	0.5	~	~	~
1683	56	3	18	83	77	~	48	~	49	47	~	25.0	0.5	~	~	26.0	0.3	~	~	~
1684	56	4	6	83	96	~	56	~	50	72	~	26.0	0.3	~	~	26.0	0.3	~	~	~
1685	56	5	24	83	144	~	75	~	73	70	~	25.0	0.5	~	~	26.0	0.3	~	~	~
1686	56	6	6	83	157	~	74	~	72	74	~	9.0	16.0	~	~	13.0	3.8	~	~	~
1687	56	6	12	83	163	~	~	~	~	~	~	9.0	16.0	~	~	10.0	16.0	~	~	~
1688	56	6	24	83	175	~	70	~	64	74	~	15.0	2.3	~	~	10.0	16.0	~	~	~
1689	56	7	6	83	187	~	68	~	66	83	~	25.0	0.5	~	~	22.0	0.9	~	~	~
1690	56	9	3	83	246	~	78	~	71	88	~	9.0	16.0	~	~	9.0	16.0	~	~	~
1691	56	9	21	83	264	~	71	~	71	70	~	7.0	16.0	~	~	8.0	16.0	~	~	~
1692	56	9	25	83	268	~	59	~	64	63	~	17.0	1.8	~	~	8.0	16.0	~	~	~
1693	57	6	27	82	178	~	~	~	~	~	~	25.0	0.5	~	~	25.0	0.5	~	~	~
1694	57	7	12	82	193	~	~	~	~	~	~	26.0	0.3	~	~	25.0	0.5	~	~	~
1695	57	7	18	82	199	~	~	~	~	~	~	25.0	0.5	~	~	18.0	1.5	~	~	~
1696	57	7	30	82	211	~	~	~	~	~	~	10.0	16.0	~	~	14.0	3.0	~	~	~
1697	57	9	24	82	267	~	~	~	~	~	~	17.0	1.8	~	~	7.0	16.0	~	~	~
1698	57	9	30	82	273	~	~	~	~	~	~	6.0	16.0	~	~	6.0	16.0	~	~	~
1699	57	10	30	82	303	~	~	~	~	~	~	25.0	0.5	~	~	25.0	0.5	~	~	~
1700	57	3	18	83	77	~	~	~	~	~	~	25.0	0.5	~	~	25.0	0.5	~	~	~
1701	57	4	6	83	96	~	~	~	~	~	~	26.0	0.3	~	~	26.0	0.3	~	~	~
1702	57	5	24	83	144	~	~	~	~	~	~	26.0	0.3	~	~	26.0	0.3	~	~	~
1703	57	6	6	83	157	~	~	~	~	~	~	9.0	16.0	~	~	11.0	16.0	~	~	~
1704	57	6	12	83	163	~	~	~	~	~	~	7.0	16.0	~	~	10.0	16.0	~	~	~
1705	57	6	24	83	175	~	~	~	~	~	~	9.0	16.0	~	~	10.0	16.0	~	~	~
1706	57	7	6	83	187	~	~	~	~	~	~	20.0	1.2	~	~	21.0	1.0	~	~	~
1707	57	8	3	83	215	~	~	~	~	~	~	8.0	16.0	~	~	9.0	16.0	~	~	~
1708	57	8	21	83	233	~	~	~	~	~	~	7.0	16.0	~	~	7.0	16.0	~	~	~
1709	57	9	25	83	268	~	~	~	~	~	~	8.0	16.0	~	~	8.0	16.0	~	~	~
1710	58	10	15	80	288	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1711	58	11	18	80	322	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
1712	58	12	12	80	346	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
1713	58	1	19	81	19	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1714	58	2	17	81	48	~	~	~	43	~	~	~	~	~	~	~	~	~	~	2.0
1715	58	3	13	81	72	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.8
1716	58	4	16	81	106	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.8
1717	58	5	27	81	147	~	~	~	65	~	~	~	~	~	~	~	~	~	~	~
1718	58	6	18	81	169	~	~	~	64	~	~	~	~	~	~	~	~	~	~	~
1719	58	7	15	81	196	~	~	~	75	~	~	~	~	~	~	~	~	~	~	~
1720	58	8	18	81	230	~	~	~	86	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 44

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1721	58	9	18	81	261	~	~	~	82	~	~	~	~	~	~	~	~	~	~	16.0
1722	58	10	14	81	287	~	~	~	58	~	~	~	~	~	~	~	~	~	~	16.0
1723	58	11	17	81	321	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
1724	58	12	11	81	345	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1725	58	1	14	82	14	~	~	~	35	~	~	~	~	~	~	~	~	~	~	16.0
1726	58	2	24	82	55	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1727	58	3	18	82	77	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1728	58	4	15	82	105	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1729	58	5	11	82	131	~	~	~	61	~	~	~	~	~	~	~	~	~	~	16.0
1730	58	6	23	82	174	~	~	~	77	~	~	~	~	~	~	~	~	~	~	16.0
1731	58	7	19	82	200	~	~	~	77	~	~	~	~	~	~	~	~	~	~	16.0
1732	58	8	17	82	229	~	~	~	83	~	~	~	~	~	~	~	~	~	~	16.0
1733	58	9	14	82	257	~	~	~	70	~	~	~	~	~	~	~	~	~	~	16.0
1734	58	10	21	82	294	~	~	~	55	~	~	~	~	~	~	~	~	~	~	16.0
1735	58	11	23	82	327	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1736	58	12	21	82	355	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1737	58	1	14	83	14	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1738	58	2	23	83	54	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1739	58	3	17	83	76	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1740	58	4	14	83	104	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
1741	58	5	12	83	132	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1742	58	6	14	83	165	~	~	~	73	~	~	~	~	~	~	~	~	~	~	16.0
1743	58	7	13	83	194	~	~	~	80	~	~	~	~	~	~	~	~	~	~	16.0
1744	58	8	15	83	227	~	~	~	85	~	~	~	~	~	~	~	~	~	~	16.0
1745	58	9	14	83	257	~	~	~	75	~	~	~	~	~	~	~	~	~	~	16.0
1746	58	10	13	83	283	~	~	~	62	~	~	~	~	~	~	~	~	~	~	16.0
1747	58	11	15	83	319	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1748	58	12	16	83	350	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1749	59	10	15	80	288	~	~	~	58	~	~	~	~	~	~	~	~	~	~	16.0
1750	59	11	18	80	322	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1751	59	12	12	80	346	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1752	59	1	19	81	19	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
1753	59	2	17	81	48	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1754	59	3	13	81	72	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
1755	59	4	16	81	106	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1756	59	5	27	81	147	~	~	~	69	~	~	~	~	~	~	~	~	~	~	16.0
1757	59	6	18	81	169	~	~	~	66	~	~	~	~	~	~	~	~	~	~	16.0
1758	59	7	15	81	196	~	~	~	77	~	~	~	~	~	~	~	~	~	~	16.0
1759	59	8	18	81	230	~	~	~	82	~	~	~	~	~	~	~	~	~	~	16.0
1760	59	9	18	81	261	~	~	~	81	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 45

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1761	59	10	14	81	287	~	~	~	58	~	~	~	~	~	~	~	~	~	~	16.0
1762	59	11	17	81	321	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1763	59	12	11	81	345	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
1764	59	1	15	82	15	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
1765	59	2	25	82	56	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1766	59	3	18	82	77	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1767	59	4	15	82	105	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1768	59	5	11	82	131	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1769	59	6	23	82	174	~	~	~	72	~	~	~	~	~	~	~	~	~	~	16.0
1770	59	7	19	82	200	~	~	~	76	~	~	~	~	~	~	~	~	~	~	16.0
1771	59	8	17	82	229	~	~	~	79	~	~	~	~	~	~	~	~	~	~	16.0
1772	59	9	15	82	258	~	~	~	68	~	~	~	~	~	~	~	~	~	~	16.0
1773	59	10	21	82	294	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1774	59	11	23	82	327	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
1775	59	12	21	82	355	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1776	59	1	14	83	14	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1777	59	2	24	83	55	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1778	59	3	17	83	76	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1779	59	4	14	83	104	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
1780	59	5	12	83	132	~	~	~	55	~	~	~	~	~	~	~	~	~	~	16.0
1781	59	6	14	83	165	~	~	~	69	~	~	~	~	~	~	~	~	~	~	16.0
1782	59	7	13	83	194	~	~	~	75	~	~	~	~	~	~	~	~	~	~	16.0
1783	59	8	15	83	227	~	~	~	81	~	~	~	~	~	~	~	~	~	~	16.0
1784	59	9	14	83	257	~	~	~	74	~	~	~	~	~	~	~	~	~	~	16.0
1785	59	10	13	83	283	~	~	~	63	~	~	~	~	~	~	~	~	~	~	16.0
1786	59	11	15	83	319	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
1787	59	12	16	83	350	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1788	60	10	14	80	287	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1789	60	11	18	80	322	~	~	~	44	~	~	~	~	~	~	~	~	~	~	~
1790	60	12	12	80	346	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1791	60	1	19	81	19	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1792	60	2	17	81	48	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1793	60	3	13	81	72	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
1794	60	4	16	81	106	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1795	60	5	27	81	147	~	~	~	54	~	~	~	~	~	~	~	~	~	~	~
1796	60	6	18	81	169	~	~	~	61	~	~	~	~	~	~	~	~	~	~	~
1797	60	7	15	81	196	~	~	~	68	~	~	~	~	~	~	~	~	~	~	~
1798	60	8	17	81	229	~	~	~	71	~	~	~	~	~	~	~	~	~	~	16.0
1799	60	9	18	81	261	~	~	~	66	~	~	~	~	~	~	~	~	~	~	16.0
1800	60	10	14	81	287	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 46

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1801	60	11	17	81	321	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1802	60	12	11	81	345	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1803	60	1	14	82	14	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
1804	60	2	25	82	56	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1805	60	3	18	82	77	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1806	60	4	15	82	105	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
1807	60	5	11	82	131	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1808	60	6	23	82	174	~	~	~	65	~	~	~	~	~	~	~	~	~	~	16.0
1809	60	7	19	82	200	~	~	~	65	~	~	~	~	~	~	~	~	~	~	16.0
1810	60	8	17	82	229	~	~	~	69	~	~	~	~	~	~	~	~	~	~	16.0
1811	60	9	15	82	258	~	~	~	61	~	~	~	~	~	~	~	~	~	~	16.0
1812	60	10	21	82	294	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1813	60	11	23	82	327	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
1814	60	12	21	82	355	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
1815	60	1	14	83	14	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
1816	60	2	24	83	55	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1817	60	3	17	83	76	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1818	60	4	14	83	104	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1819	60	5	12	83	132	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1820	60	6	14	83	165	~	~	~	62	~	~	~	~	~	~	~	~	~	~	16.0
1821	60	7	13	83	194	~	~	~	66	~	~	~	~	~	~	~	~	~	~	16.0
1822	60	8	15	83	227	~	~	~	70	~	~	~	~	~	~	~	~	~	~	16.0
1823	60	9	14	83	257	~	~	~	61	~	~	~	~	~	~	~	~	~	~	16.0
1824	60	10	13	83	283	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
1825	60	11	15	83	319	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1826	60	12	16	83	350	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1827	61	10	15	80	288	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.3
1828	61	11	18	80	322	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
1829	61	12	12	80	346	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1830	61	1	19	81	19	~	~	~	38	~	~	~	~	~	~	~	~	~	~	1.0
1831	61	2	17	81	48	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
1832	61	3	13	81	72	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.3
1833	61	4	16	81	106	~	~	~	51	~	~	~	~	~	~	~	~	~	~	0.3
1834	61	5	27	81	147	~	~	~	59	~	~	~	~	~	~	~	~	~	~	~
1835	61	6	18	81	169	~	~	~	63	~	~	~	~	~	~	~	~	~	~	~
1836	61	7	15	81	196	~	~	~	72	~	~	~	~	~	~	~	~	~	~	~
1837	61	8	18	81	230	~	~	~	82	~	~	~	~	~	~	~	~	~	~	16.0
1838	61	9	18	81	261	~	~	~	82	~	~	~	~	~	~	~	~	~	~	16.0
1839	61	10	14	81	287	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.3
1840	61	11	17	81	321	~	~	~	51	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 47

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1841	61	12	11	81	345	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
1842	61	1	14	82	14	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
1843	61	2	25	82	56	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
1844	61	3	18	82	77	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
1845	61	4	15	82	105	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
1846	61	5	11	82	131	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
1847	61	6	23	82	174	~	~	~	69	~	~	~	~	~	~	~	~	~	~	16.0
1848	61	7	19	82	200	~	~	~	70	~	~	~	~	~	~	~	~	~	~	16.0
1849	61	8	17	82	229	~	~	~	78	~	~	~	~	~	~	~	~	~	~	16.0
1850	61	9	15	82	258	~	~	~	65	~	~	~	~	~	~	~	~	~	~	16.0
1851	61	10	21	82	294	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.8
1852	61	11	23	82	327	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1853	61	12	21	82	355	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1854	61	1	14	83	14	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
1855	61	2	24	83	55	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
1856	61	3	17	83	76	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
1857	61	4	14	83	104	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
1858	61	5	12	83	132	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.3
1859	61	6	14	83	165	~	~	~	66	~	~	~	~	~	~	~	~	~	~	16.0
1860	61	7	13	83	194	~	~	~	72	~	~	~	~	~	~	~	~	~	~	16.0
1861	61	8	15	83	227	~	~	~	79	~	~	~	~	~	~	~	~	~	~	16.0
1862	61	9	14	83	257	~	~	~	73	~	~	~	~	~	~	~	~	~	~	16.0
1863	61	10	13	83	283	~	~	~	61	~	~	~	~	~	~	~	~	~	~	16.0
1864	61	11	15	83	319	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
1865	61	12	16	83	350	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
1866	62	10	15	80	288	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1867	62	11	18	80	322	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1868	62	12	12	80	346	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1869	62	1	19	81	19	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1870	62	2	17	81	48	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1871	62	3	13	81	72	~	~	~	37	~	~	~	~	~	~	~	~	~	~	1.1
1872	62	4	16	81	106	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.6
1873	62	5	27	81	147	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
1874	62	6	18	81	169	~	~	~	57	~	~	~	~	~	~	~	~	~	~	~
1875	62	7	15	81	196	~	~	~	59	~	~	~	~	~	~	~	~	~	~	~
1876	62	8	18	81	230	~	~	~	59	~	~	~	~	~	~	~	~	~	~	16.0
1877	62	9	18	81	261	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0
1878	62	10	14	81	287	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1879	62	11	17	81	321	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1880	62	12	11	81	345	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.5

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 48

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1881	62	1	15	82	15	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
1882	62	2	25	82	56	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
1883	62	3	18	82	77	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
1884	62	4	15	82	105	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
1885	62	5	11	82	131	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
1886	62	6	23	82	174	~	~	~	57	~	~	~	~	~	~	~	~	~	~	0.5
1887	62	7	19	82	200	~	~	~	57	~	~	~	~	~	~	~	~	~	~	0.6
1888	62	8	17	82	229	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1889	62	9	14	82	257	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1890	62	10	21	82	294	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1891	62	11	23	82	327	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1892	62	12	21	82	355	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1893	62	1	14	83	14	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1894	62	2	24	83	55	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.9
1895	62	3	17	83	76	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.4
1896	62	4	14	83	104	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.4
1897	62	5	12	83	132	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
1898	62	6	14	83	165	~	~	~	52	~	~	~	~	~	~	~	~	~	~	0.5
1899	62	7	13	83	194	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.9
1900	62	8	15	83	227	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1901	62	9	14	83	257	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1902	62	10	13	83	283	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1903	62	11	15	83	319	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1904	62	12	16	83	350	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1905	63	10	14	80	287	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1906	63	11	19	80	323	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1907	63	12	12	80	346	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1908	63	1	19	81	19	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1909	63	2	17	81	48	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
1910	63	3	13	81	72	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
1911	63	4	15	81	105	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1912	63	5	27	81	147	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0
1913	63	6	18	81	169	~	~	~	59	~	~	~	~	~	~	~	~	~	~	16.0
1914	63	7	15	81	196	~	~	~	68	~	~	~	~	~	~	~	~	~	~	16.0
1915	63	8	17	81	229	~	~	~	78	~	~	~	~	~	~	~	~	~	~	16.0
1916	63	9	18	81	261	~	~	~	79	~	~	~	~	~	~	~	~	~	~	16.0
1917	63	10	15	81	288	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1918	63	11	17	81	321	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1919	63	12	11	81	345	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1920	63	1	14	82	14	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 49

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1921	63	2	24	82	55	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
1922	63	3	18	82	77	~	~	~	41	~	~	~	~	~	~	~	~	~	~	2.0
1923	63	4	16	82	106	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1924	63	5	11	82	131	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1925	63	6	23	82	174	~	~	~	65	~	~	~	~	~	~	~	~	~	~	16.0
1926	63	7	19	82	200	~	~	~	66	~	~	~	~	~	~	~	~	~	~	16.0
1927	63	8	18	82	230	~	~	~	72	~	~	~	~	~	~	~	~	~	~	16.0
1928	63	9	14	82	257	~	~	~	65	~	~	~	~	~	~	~	~	~	~	16.0
1929	63	10	21	82	294	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
1930	63	11	23	82	327	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
1931	63	12	21	82	355	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
1932	63	1	15	83	15	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1933	63	2	25	83	56	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
1934	63	3	17	83	76	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1935	63	4	14	83	104	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
1936	63	5	12	83	132	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1937	63	6	14	83	165	~	~	~	59	~	~	~	~	~	~	~	~	~	~	16.0
1938	63	7	13	83	194	~	~	~	65	~	~	~	~	~	~	~	~	~	~	16.0
1939	63	8	15	83	227	~	~	~	71	~	~	~	~	~	~	~	~	~	~	16.0
1940	63	9	15	83	258	~	~	~	67	~	~	~	~	~	~	~	~	~	~	16.0
1941	63	10	13	83	283	~	~	~	59	~	~	~	~	~	~	~	~	~	~	16.0
1942	63	11	15	83	319	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1943	63	12	16	83	350	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
1944	64	10	14	80	287	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1945	64	11	19	80	323	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~
1946	64	12	12	80	346	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1947	64	1	19	81	19	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1948	64	2	17	81	48	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1949	64	3	13	81	72	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
1950	64	4	15	81	105	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
1951	64	5	27	81	147	~	~	~	45	~	~	~	~	~	~	~	~	~	~	~
1952	64	6	18	81	169	~	~	~	52	~	~	~	~	~	~	~	~	~	~	~
1953	64	7	15	81	196	~	~	~	54	~	~	~	~	~	~	~	~	~	~	0.3
1954	64	8	17	81	229	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0
1955	64	9	18	81	261	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
1956	64	10	14	81	287	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
1957	64	11	17	81	321	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1958	64	12	11	81	345	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
1959	64	1	14	82	14	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
1960	64	2	24	82	55	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 50

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
1961	64	3	18	82	77	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.5
1962	64	4	15	82	105	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.4
1963	64	5	11	82	131	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.6
1964	64	6	23	82	174	~	~	~	51	~	~	~	~	~	~	~	~	~	~	0.3
1965	64	7	19	82	200	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
1966	64	8	17	82	229	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
1967	64	9	14	82	257	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
1968	64	10	21	82	294	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1969	64	11	23	82	327	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
1970	64	12	21	82	355	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
1971	64	1	14	83	14	~	~	~	35	~	~	~	~	~	~	~	~	~	~	16.0
1972	64	2	24	83	55	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
1973	64	3	17	83	76	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.4
1974	64	4	14	83	104	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.6
1975	64	5	12	83	132	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.4
1976	64	6	14	83	165	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
1977	64	7	13	83	194	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
1978	64	8	15	83	227	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
1979	64	9	14	83	257	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
1980	64	10	13	83	283	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
1981	64	11	15	83	319	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
1982	64	12	16	83	350	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
1983	65	10	14	80	287	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1984	65	11	19	80	323	~	~	~	41	~	~	~	~	~	~	~	~	~	~	~
1985	65	12	12	80	346	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
1986	65	1	19	81	19	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
1987	65	2	17	81	48	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
1988	65	3	13	81	72	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
1989	65	4	15	81	105	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
1990	65	5	27	81	147	~	~	~	53	~	~	~	~	~	~	~	~	~	~	~
1991	65	6	18	81	169	~	~	~	57	~	~	~	~	~	~	~	~	~	~	~
1992	65	7	15	81	196	~	~	~	65	~	~	~	~	~	~	~	~	~	~	~
1993	65	8	17	81	229	~	~	~	74	~	~	~	~	~	~	~	~	~	~	16.0
1994	65	9	18	81	261	~	~	~	72	~	~	~	~	~	~	~	~	~	~	16.0
1995	65	10	14	81	287	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
1996	65	11	17	81	321	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
1997	65	12	11	81	345	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.5
1998	65	1	14	82	14	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
1999	65	2	24	82	55	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2000	65	3	18	82	77	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 51

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2001	65	4	15	82	105	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2002	65	5	11	82	131	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
2003	65	6	23	82	174	~	~	~	63	~	~	~	~	~	~	~	~	~	~	0.3
2004	65	7	19	82	200	~	~	~	64	~	~	~	~	~	~	~	~	~	~	0.7
2005	65	8	17	82	229	~	~	~	69	~	~	~	~	~	~	~	~	~	~	0.5
2006	65	9	14	82	257	~	~	~	61	~	~	~	~	~	~	~	~	~	~	0.3
2007	65	10	21	82	294	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.3
2008	65	11	23	82	327	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2009	65	12	21	82	355	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2010	65	1	14	83	14	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2011	65	2	24	83	55	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2012	65	3	17	83	76	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2013	65	4	14	83	104	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2014	65	5	12	83	132	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2015	65	6	14	83	165	~	~	~	57	~	~	~	~	~	~	~	~	~	~	0.3
2016	65	7	13	83	194	~	~	~	63	~	~	~	~	~	~	~	~	~	~	0.3
2017	65	8	15	83	227	~	~	~	70	~	~	~	~	~	~	~	~	~	~	0.6
2018	65	9	14	83	257	~	~	~	64	~	~	~	~	~	~	~	~	~	~	0.6
2019	65	10	13	83	283	~	~	~	56	~	~	~	~	~	~	~	~	~	~	0.6
2020	65	11	15	83	319	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.4
2021	65	12	16	83	350	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2022	66	10	14	80	287	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2023	66	11	19	80	323	~	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2024	66	12	12	80	346	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2025	66	1	19	81	19	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
2026	66	2	17	81	48	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2027	66	3	13	81	72	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2028	66	4	15	81	105	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2029	66	5	27	81	147	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2030	66	6	18	81	169	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2031	66	7	15	81	196	~	~	~	56	~	~	~	~	~	~	~	~	~	~	~
2032	66	8	17	81	229	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
2033	66	9	18	81	261	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0
2034	66	10	14	81	287	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2035	66	11	17	81	321	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
2036	66	12	11	81	345	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2037	66	1	14	82	14	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2038	66	2	24	82	55	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2039	66	3	18	82	77	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2040	66	4	15	82	105	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 52

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2041	66	5	11	82	131	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2042	66	6	23	82	174	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
2043	66	7	19	82	200	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
2044	66	8	17	82	229	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
2045	66	9	14	82	257	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
2046	66	10	21	82	294	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2047	66	11	23	82	327	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2048	66	12	21	82	355	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
2049	66	1	14	83	14	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2050	66	2	24	83	55	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2051	66	3	17	83	76	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2052	66	4	14	83	104	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2053	66	5	12	83	132	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2054	66	6	20	83	171	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
2055	66	7	13	83	194	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
2056	66	8	15	83	227	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
2057	66	9	14	83	257	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
2058	66	10	13	83	283	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
2059	66	11	15	83	319	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
2060	66	12	16	83	350	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2061	67	10	16	80	289	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2062	67	11	17	80	321	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2063	67	12	15	80	349	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2064	67	1	19	81	19	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2065	67	2	17	81	48	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2066	67	3	20	81	79	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2067	67	4	15	81	105	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2068	67	5	20	81	140	~	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2069	67	6	15	81	166	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2070	67	7	17	81	198	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2071	67	8	17	81	229	~	~	~	47	~	~	~	~	~	~	~	~	~	~	1.3
2072	67	9	16	81	259	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2073	67	10	16	81	289	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2074	67	11	17	81	321	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.4
2075	67	12	11	81	345	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2076	67	1	14	82	14	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2077	67	2	24	82	55	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2078	67	3	18	82	77	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2079	67	4	15	82	105	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2080	67	5	11	82	131	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 53

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2081	67	6	22	82	173	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2082	67	7	13	82	194	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2083	67	8	19	82	231	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.5
2084	67	9	21	82	264	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
2085	67	10	21	82	294	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.8
2086	67	11	18	82	322	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2087	67	12	21	82	355	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2088	67	1	14	83	14	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2089	67	2	24	83	55	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2090	67	3	17	83	76	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2091	67	4	20	83	110	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2092	67	5	12	83	132	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2093	67	6	15	83	166	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2094	67	7	18	83	199	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2095	67	8	16	83	228	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.6
2096	67	9	14	83	257	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
2097	67	10	13	83	283	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2098	67	11	15	83	319	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2099	67	12	16	83	350	~	~	~	35	~	~	~	~	~	~	~	~	~	~	1.2
2100	68	10	16	80	289	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.8
2101	68	11	17	80	321	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2102	68	12	15	80	349	~	~	~	36	~	~	~	~	~	~	~	~	~	~	1.0
2103	68	1	19	81	19	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.6
2104	68	2	17	81	48	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.5
2105	68	3	20	81	79	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2106	68	4	15	81	105	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2107	68	5	20	81	140	~	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2108	68	6	15	81	166	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2109	68	7	17	81	198	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2110	68	8	17	81	229	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.8
2111	68	9	16	81	259	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
2112	68	10	16	81	289	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.8
2113	68	11	17	81	321	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.7
2114	68	12	11	81	345	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2115	68	1	14	82	14	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.4
2116	68	2	24	82	55	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2117	68	3	18	82	77	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2118	68	4	15	82	105	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2119	68	5	11	82	131	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2120	68	6	22	82	173	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 54

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2121	68	7	13	82	194	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2122	68	8	19	82	231	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.8
2123	68	9	21	82	264	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.8
2124	68	10	21	82	294	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.7
2125	68	11	18	82	322	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.7
2126	68	12	21	82	355	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.7
2127	68	1	14	83	14	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2128	68	2	24	83	55	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2129	68	3	17	83	76	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2130	68	4	20	83	110	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2131	68	5	12	83	132	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2132	68	6	15	83	166	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.4
2133	68	7	18	83	199	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2134	68	8	15	83	227	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.4
2135	68	9	14	83	257	~	~	~	47	~	~	~	~	~	~	~	~	~	~	1.0
2136	68	10	13	83	283	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
2137	68	11	15	83	319	~	~	~	40	~	~	~	~	~	~	~	~	~	~	1.0
2138	68	12	16	83	350	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2139	69	10	15	80	288	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
2140	69	11	21	80	325	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2141	69	12	11	80	345	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
2142	69	1	16	81	16	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.4
2143	69	2	13	81	44	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.4
2144	69	3	20	81	79	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.4
2145	69	4	16	81	106	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.4
2146	69	5	15	81	135	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2147	69	6	17	81	168	~	~	~	57	~	~	~	~	~	~	~	~	~	~	~
2148	69	7	16	81	197	~	~	~	63	~	~	~	~	~	~	~	~	~	~	~
2149	69	8	18	81	230	~	~	~	69	~	~	~	~	~	~	~	~	~	~	16.0
2150	69	9	21	81	264	~	~	~	63	~	~	~	~	~	~	~	~	~	~	16.0
2151	69	10	15	81	288	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
2152	69	11	12	81	316	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2153	69	12	15	81	349	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.4
2154	69	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.8
2155	69	2	23	82	54	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.7
2156	69	3	19	82	78	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.9
2157	69	4	16	82	106	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.4
2158	69	5	12	82	132	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.6
2159	69	6	24	82	175	~	~	~	58	~	~	~	~	~	~	~	~	~	~	16.0
2160	69	7	14	82	195	~	~	~	61	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 55

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2161	69	8	17	82	229	~	~	~	63	~	~	~	~	~	~	~	~	~	~	16.0
2162	69	9	16	82	259	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0
2163	69	10	20	82	293	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
2164	69	11	18	82	322	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2165	69	12	17	82	351	~	~	~	34	~	~	~	~	~	~	~	~	~	~	15.0
2166	69	1	19	83	19	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.6
2167	69	2	23	83	54	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.6
2168	69	3	18	83	77	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.4
2169	69	4	13	83	103	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.4
2170	69	5	13	83	133	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.4
2171	69	6	16	83	167	~	~	~	55	~	~	~	~	~	~	~	~	~	~	2.0
2172	69	7	18	83	199	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
2173	69	8	16	83	228	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
2174	69	9	19	83	262	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0
2175	69	10	17	83	290	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
2176	69	11	16	83	320	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
2177	69	12	20	83	354	~	~	~	34	~	~	~	~	~	~	~	~	~	~	16.0
2178	70	10	15	80	288	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2179	70	11	14	80	318	~	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2180	70	12	11	80	345	~	~	~	37	~	~	~	~	~	~	~	~	~	~	2.0
2181	70	1	19	81	19	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.6
2182	70	2	13	81	44	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.5
2183	70	3	20	81	79	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2184	70	4	16	81	106	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2185	70	5	15	81	135	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2186	70	6	17	81	168	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2187	70	7	16	81	197	~	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2188	70	8	18	81	230	~	~	~	57	~	~	~	~	~	~	~	~	~	~	16.0
2189	70	9	21	81	264	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
2190	70	10	15	81	288	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2191	70	11	12	81	316	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
2192	70	12	15	81	349	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2193	70	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.4
2194	70	2	23	82	54	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2195	70	3	18	82	77	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2196	70	4	16	82	106	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2197	70	5	12	82	132	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2198	70	6	24	82	175	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.5
2199	70	7	14	82	195	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.4
2200	70	8	17	82	229	~	~	~	56	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 56

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2201	70	9	16	82	259	~	~	~	50	~	~	~	~	~	~	~	~	~	~	16.0
2202	70	10	20	82	293	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.4
2203	70	11	18	82	322	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.6
2204	70	12	17	82	351	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.4
2205	70	1	19	83	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2206	70	2	23	83	54	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2207	70	3	18	83	77	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2208	70	4	13	83	103	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2209	70	5	13	83	133	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2210	70	6	16	83	167	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2211	70	7	18	83	199	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
2212	70	8	16	83	228	~	~	~	59	~	~	~	~	~	~	~	~	~	~	16.0
2213	70	9	19	83	262	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
2214	70	10	17	83	290	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
2215	70	11	16	83	320	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
2216	70	12	20	83	354	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
2217	71	10	15	80	288	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
2218	71	11	14	80	318	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2219	71	12	11	80	345	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
2220	71	1	16	81	16	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2221	71	2	13	81	44	~	~	~	35	~	~	~	~	~	~	~	~	~	~	8.0
2222	71	3	20	81	79	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2223	71	4	16	81	106	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2224	71	5	15	81	135	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2225	71	6	17	81	168	~	~	~	53	~	~	~	~	~	~	~	~	~	~	~
2226	71	7	16	81	197	~	~	~	57	~	~	~	~	~	~	~	~	~	~	~
2227	71	8	18	81	230	~	~	~	55	~	~	~	~	~	~	~	~	~	~	16.0
2228	71	9	21	81	264	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
2229	71	10	15	81	288	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
2230	71	11	12	81	316	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
2231	71	12	15	81	349	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2232	71	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2233	71	2	23	82	54	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2234	71	3	19	82	78	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2235	71	4	16	82	106	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2236	71	5	12	82	132	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2237	71	6	24	82	175	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.3
2238	71	7	14	82	195	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.4
2239	71	8	17	82	229	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
2240	71	9	16	82	259	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 57

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2241	71	10	20	82	293	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
2242	71	11	18	82	322	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.7
2243	71	12	17	82	351	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2244	71	1	19	83	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2245	71	2	23	83	54	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2246	71	3	18	83	77	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2247	71	4	12	83	102	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2248	71	5	13	83	133	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2249	71	6	16	83	167	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
2250	71	7	18	83	199	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
2251	71	8	16	83	228	~	~	~	55	~	~	~	~	~	~	~	~	~	~	16.0
2252	71	9	19	83	262	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
2253	71	10	17	83	290	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
2254	71	11	16	83	320	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
2255	71	12	20	83	354	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
2256	72	10	15	80	288	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2257	72	11	14	80	318	~	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2258	72	12	11	80	345	~	~	~	34	~	~	~	~	~	~	~	~	~	~	16.0
2259	72	1	16	81	16	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.7
2260	72	2	13	81	44	~	~	~	32	~	~	~	~	~	~	~	~	~	~	1.0
2261	72	3	20	81	79	~	~	~	32	~	~	~	~	~	~	~	~	~	~	0.3
2262	72	4	16	81	106	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2263	72	5	15	81	135	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2264	72	6	17	81	168	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2265	72	7	16	81	197	~	~	~	52	~	~	~	~	~	~	~	~	~	~	~
2266	72	8	18	81	230	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
2267	72	9	21	81	264	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
2268	72	10	15	81	288	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2269	72	11	12	81	316	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
2270	72	12	15	81	349	~	~	~	35	~	~	~	~	~	~	~	~	~	~	16.0
2271	72	1	15	82	15	~	~	~	34	~	~	~	~	~	~	~	~	~	~	9.0
2272	72	2	23	82	54	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.4
2273	72	3	19	82	78	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2274	72	4	16	82	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.4
2275	72	5	12	82	132	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2276	72	6	24	82	175	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.9
2277	72	7	14	82	195	~	~	~	50	~	~	~	~	~	~	~	~	~	~	1.0
2278	72	8	17	82	229	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
2279	72	9	16	82	259	~	~	~	46	~	~	~	~	~	~	~	~	~	~	16.0
2280	72	10	20	82	293	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 58

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2281	72	11	18	82	322	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2282	72	12	17	82	351	~	~	~	33	~	~	~	~	~	~	~	~	~	~	16.0
2283	72	1	19	83	19	~	~	~	31	~	~	~	~	~	~	~	~	~	~	16.0
2284	72	2	23	83	54	~	~	~	32	~	~	~	~	~	~	~	~	~	~	9.0
2285	72	3	18	83	77	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2286	72	4	12	83	102	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2287	72	5	13	83	133	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2288	72	6	16	83	167	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.7
2289	72	7	18	83	199	~	~	~	48	~	~	~	~	~	~	~	~	~	~	2.0
2290	72	8	16	83	228	~	~	~	53	~	~	~	~	~	~	~	~	~	~	16.0
2291	72	9	19	83	262	~	~	~	47	~	~	~	~	~	~	~	~	~	~	16.0
2292	72	10	17	83	290	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
2293	72	11	16	83	320	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2294	72	12	20	83	354	~	~	~	34	~	~	~	~	~	~	~	~	~	~	16.0
2295	73	10	15	80	288	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2296	73	11	12	80	316	~	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2297	73	12	11	80	345	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2298	73	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2299	73	2	13	81	44	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.4
2300	73	3	20	81	79	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.6
2301	73	4	16	81	106	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2302	73	5	15	81	135	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2303	73	6	16	81	167	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2304	73	7	16	81	197	~	~	~	54	~	~	~	~	~	~	~	~	~	~	~
2305	73	8	18	81	230	~	~	~	55	~	~	~	~	~	~	~	~	~	~	16.0
2306	73	9	21	81	264	~	~	~	52	~	~	~	~	~	~	~	~	~	~	16.0
2307	73	10	15	81	288	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2308	73	11	12	81	316	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2309	73	12	14	81	348	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
2310	73	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	3.0
2311	73	2	23	82	54	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2312	73	3	18	82	77	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2313	73	4	16	82	106	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2314	73	5	12	82	132	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2315	73	6	24	82	175	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2316	73	7	14	82	195	~	~	~	51	~	~	~	~	~	~	~	~	~	~	0.3
2317	73	8	17	82	229	~	~	~	54	~	~	~	~	~	~	~	~	~	~	16.0
2318	73	9	16	82	259	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
2319	73	10	20	82	293	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2320	73	11	18	82	322	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 59

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2321	73	12	17	82	351	~	~	~	34	~	~	~	~	~	~	~	~	~	~	16.0
2322	73	1	19	83	19	~	~	~	35	~	~	~	~	~	~	~	~	~	~	16.0
2323	73	2	23	83	54	~	~	~	33	~	~	~	~	~	~	~	~	~	~	16.0
2324	73	3	18	83	77	~	~	~	35	~	~	~	~	~	~	~	~	~	~	1.0
2325	73	4	12	83	102	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.8
2326	73	5	13	83	133	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.5
2327	73	6	16	83	167	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.5
2328	73	7	18	83	199	~	~	~	50	~	~	~	~	~	~	~	~	~	~	1.0
2329	73	8	16	83	228	~	~	~	55	~	~	~	~	~	~	~	~	~	~	16.0
2330	73	9	19	83	262	~	~	~	49	~	~	~	~	~	~	~	~	~	~	16.0
2331	73	10	17	83	290	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
2332	73	11	16	83	320	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2333	73	12	20	83	354	~	~	~	36	~	~	~	~	~	~	~	~	~	~	16.0
2334	74	10	15	80	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2335	74	11	12	80	316	~	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2336	74	12	11	80	345	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2337	74	1	19	81	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2338	74	2	13	81	44	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2339	74	3	20	81	79	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2340	74	4	16	81	106	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2341	74	5	15	81	135	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2342	74	6	16	81	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2343	74	7	16	81	197	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2344	74	8	18	81	230	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2345	74	9	21	81	264	~	~	~	52	~	~	~	~	~	~	~	~	~	~	0.3
2346	74	10	15	81	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2347	74	11	12	81	316	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2348	74	12	14	81	348	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2349	74	1	15	82	15	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2350	74	2	23	82	54	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2351	74	3	18	82	77	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2352	74	4	16	82	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2353	74	5	12	82	132	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2354	74	6	24	82	175	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2355	74	7	14	82	195	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2356	74	8	17	82	229	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2357	74	9	16	82	259	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2358	74	10	20	82	293	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2359	74	11	18	82	322	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2360	74	12	17	82	351	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 60

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2361	74	1	19	83	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2362	74	2	23	83	54	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2363	74	3	18	83	77	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2364	74	4	12	83	102	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2365	74	5	13	83	133	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2366	74	6	16	83	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2367	74	7	18	83	199	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
2368	74	8	16	83	228	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.3
2369	74	9	19	83	262	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
2370	74	10	17	83	290	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2371	74	11	16	83	320	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2372	74	12	20	83	354	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2373	75	10	15	80	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2374	75	11	12	80	316	~	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2375	75	12	11	80	345	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2376	75	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2377	75	2	13	81	44	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2378	75	3	20	81	79	~	~	~	32	~	~	~	~	~	~	~	~	~	~	0.3
2379	75	4	16	81	106	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2380	75	5	15	81	135	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2381	75	6	16	81	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2382	75	7	16	81	197	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2383	75	8	18	81	230	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.4
2384	75	9	21	81	264	~	~	~	48	~	~	~	~	~	~	~	~	~	~	16.0
2385	75	10	15	81	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2386	75	11	12	81	316	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2387	75	12	14	81	348	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.5
2388	75	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2389	75	2	23	82	54	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2390	75	3	19	82	78	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2391	75	4	16	82	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2392	75	5	12	82	132	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2393	75	6	24	82	175	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
2394	75	7	14	82	195	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
2395	75	8	17	82	229	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.3
2396	75	9	16	82	259	~	~	~	46	~	~	~	~	~	~	~	~	~	~	2.0
2397	75	10	20	82	293	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.9
2398	75	11	18	82	322	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.6
2399	75	12	17	82	351	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.6
2400	75	1	19	83	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.4

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 61

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2401	75	2	23	83	54	~	~	~	32	~	~	~	~	~	~	~	~	~	~	0.5
2402	75	3	18	83	77	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2403	75	4	12	83	102	~	~	~	32	~	~	~	~	~	~	~	~	~	~	0.3
2404	75	5	13	83	133	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2405	75	6	16	83	167	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2406	75	7	18	83	199	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2407	75	8	16	83	228	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.4
2408	75	9	18	83	261	~	~	~	46	~	~	~	~	~	~	~	~	~	~	1.2
2409	75	10	17	83	290	~	~	~	41	~	~	~	~	~	~	~	~	~	~	16.0
2410	75	11	16	83	320	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.6
2411	75	12	20	83	354	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.6
2412	76	10	15	80	288	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2413	76	11	12	80	316	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2414	76	12	11	80	345	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2415	76	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2416	76	2	13	81	44	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2417	76	3	20	81	79	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2418	76	4	16	81	106	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2419	76	5	15	81	135	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2420	76	6	16	81	167	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2421	76	7	16	81	197	~	~	~	52	~	~	~	~	~	~	~	~	~	~	~
2422	76	8	18	81	230	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.4
2423	76	9	21	81	264	~	~	~	51	~	~	~	~	~	~	~	~	~	~	1.0
2424	76	10	15	81	288	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2425	76	11	12	81	316	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2426	76	12	14	81	348	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2427	76	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2428	76	3	19	82	78	~	~	~	34	~	~	~	~	~	~	~	~	~	~	~
2429	76	4	16	82	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2430	76	5	12	82	132	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2431	76	6	24	82	175	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2432	76	7	14	82	195	~	~	~	51	~	~	~	~	~	~	~	~	~	~	0.3
2433	76	8	17	82	229	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.3
2434	76	9	16	82	259	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2435	76	10	20	82	293	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2436	76	11	18	82	322	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2437	76	12	17	82	351	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2438	76	1	19	83	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2439	76	2	23	83	54	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2440	76	3	18	83	77	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 62

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2441	76	4	12	83	102	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2442	76	5	13	83	133	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2443	76	6	16	83	167	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2444	76	7	18	83	199	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2445	76	8	16	83	228	~	~	~	55	~	~	~	~	~	~	~	~	~	~	0.3
2446	76	9	19	83	262	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2447	76	10	17	83	290	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2448	76	11	16	83	320	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2449	76	12	20	83	354	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2450	77	10	15	80	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2451	77	11	12	80	316	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2452	77	12	11	80	345	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2453	77	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2454	77	2	13	81	44	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2455	77	3	20	81	79	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2456	77	4	16	81	106	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2457	77	5	15	81	135	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2458	77	6	16	81	167	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2459	77	7	16	81	197	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2460	77	8	18	81	230	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2461	77	9	21	81	264	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
2462	77	10	15	81	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2463	77	11	12	81	316	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2464	77	12	14	81	348	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2465	77	1	15	82	15	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2466	77	3	19	82	78	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2467	77	4	16	82	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2468	77	5	12	82	132	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2469	77	6	24	82	175	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2470	77	7	14	82	195	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
2471	77	8	17	82	229	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
2472	77	9	16	82	259	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2473	77	10	20	82	293	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2474	77	11	18	82	322	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.6
2475	77	12	17	82	351	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2476	77	1	19	83	19	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2477	77	2	23	83	54	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2478	77	3	18	83	77	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2479	77	4	12	83	102	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2480	77	5	13	83	133	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 63

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2481	77	6	16	83	167	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2482	77	7	18	83	199	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2483	77	8	16	83	228	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.3
2484	77	9	19	83	262	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2485	77	10	17	83	290	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2486	77	11	16	83	320	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2487	77	12	20	83	354	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2488	78	10	15	80	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2489	78	11	10	80	314	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2490	78	12	11	80	345	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2491	78	1	16	81	16	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2492	78	2	22	81	53	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2493	78	3	20	81	79	~	~	~	32	~	~	~	~	~	~	~	~	~	~	0.3
2494	78	4	16	81	106	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2495	78	5	15	81	135	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2496	78	6	16	81	167	~	~	~	44	~	~	~	~	~	~	~	~	~	~	~
2497	78	7	16	81	197	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2498	78	8	18	81	230	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.3
2499	78	9	21	81	264	~	~	~	51	~	~	~	~	~	~	~	~	~	~	16.0
2500	78	10	15	81	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2501	78	11	12	81	316	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2502	78	12	14	81	348	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2503	78	6	24	82	175	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
2504	78	7	14	82	195	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2505	78	8	17	82	229	~	~	~	51	~	~	~	~	~	~	~	~	~	~	0.3
2506	78	9	16	82	259	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3
2507	78	10	20	82	293	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2508	78	11	18	82	322	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2509	78	5	13	83	133	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2510	78	6	16	83	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2511	78	7	18	83	199	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2512	78	8	16	83	228	~	~	~	53	~	~	~	~	~	~	~	~	~	~	0.3
2513	78	9	19	83	262	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2514	78	10	17	83	290	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2515	78	11	16	83	320	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2516	79	10	15	80	288	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2517	79	11	10	80	314	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2518	79	12	11	80	345	~	~	~	35	~	~	~	~	~	~	~	~	~	~	~
2519	79	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	16.0
2520	79	2	13	81	44	~	~	~	34	~	~	~	~	~	~	~	~	~	~	15.0

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 64

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2521	79	3	20	81	79	~	~	~	34	~	~	~	~	~	~	~	~	~	~	15.0
2522	79	4	16	81	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	2.0
2523	79	5	15	81	135	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2524	79	6	16	81	167	~	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2525	79	7	16	81	197	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2526	79	8	18	81	230	~	~	~	46	~	~	~	~	~	~	~	~	~	~	4.8
2527	79	9	21	81	264	~	~	~	45	~	~	~	~	~	~	~	~	~	~	16.0
2528	79	10	15	81	288	~	~	~	38	~	~	~	~	~	~	~	~	~	~	16.0
2529	79	11	12	81	316	~	~	~	37	~	~	~	~	~	~	~	~	~	~	16.0
2530	79	12	14	81	348	~	~	~	35	~	~	~	~	~	~	~	~	~	~	16.0
2531	79	6	24	82	175	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2532	79	7	14	82	195	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3
2533	79	8	17	82	229	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.7
2534	79	9	16	82	259	~	~	~	42	~	~	~	~	~	~	~	~	~	~	16.0
2535	79	10	20	82	293	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2536	79	11	18	82	322	~	~	~	36	~	~	~	~	~	~	~	~	~	~	1.2
2537	79	5	13	83	133	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2538	79	6	16	83	167	~	~	~	37	~	~	~	~	~	~	~	~	~	~	0.3
2539	79	7	18	83	199	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2540	79	8	16	83	228	~	~	~	46	~	~	~	~	~	~	~	~	~	~	0.3
2541	79	9	19	83	262	~	~	~	43	~	~	~	~	~	~	~	~	~	~	16.0
2542	79	10	17	83	290	~	~	~	40	~	~	~	~	~	~	~	~	~	~	16.0
2543	79	11	16	83	320	~	~	~	37	~	~	~	~	~	~	~	~	~	~	7.5
2544	80	10	15	80	288	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2545	80	11	10	80	314	~	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2546	80	12	11	80	345	~	~	~	35	~	~	~	~	~	~	~	~	~	~	~
2547	80	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2548	80	2	13	81	44	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2549	80	3	20	81	79	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2550	80	4	16	81	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2551	80	5	15	81	135	~	~	~	34	~	~	~	~	~	~	~	~	~	~	0.3
2552	80	6	16	81	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2553	80	7	16	81	197	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2554	80	8	18	81	230	~	~	~	50	~	~	~	~	~	~	~	~	~	~	0.7
2555	80	9	21	81	264	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2556	80	10	15	81	288	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2557	80	11	12	81	316	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.5
2558	80	12	14	81	348	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2559	80	6	24	82	175	~	~	~	41	~	~	~	~	~	~	~	~	~	~	0.3
2560	80	7	14	82	195	~	~	~	45	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA
Page 65

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2561	80	8	17	82	229	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2562	80	9	16	82	259	~	~	~	44	~	~	~	~	~	~	~	~	~	~	16.0
2563	80	10	20	82	293	~	~	~	39	~	~	~	~	~	~	~	~	~	~	16.0
2564	80	11	18	82	322	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.7
2565	80	3	18	83	77	~	~	~	33	~	~	~	~	~	~	~	~	~	~	15.0
2566	80	5	13	83	133	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2567	80	6	16	83	167	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2568	80	7	18	83	199	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2569	80	8	16	83	228	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2570	80	9	19	83	262	~	~	~	44	~	~	~	~	~	~	~	~	~	~	0.3
2571	80	10	17	83	290	~	~	~	39	~	~	~	~	~	~	~	~	~	~	0.3
2572	80	11	16	83	320	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2573	81	10	15	80	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2574	81	11	10	80	314	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2575	81	12	11	80	345	~	~	~	35	~	~	~	~	~	~	~	~	~	~	~
2576	81	1	16	81	16	~	~	~	34	~	~	~	~	~	~	~	~	~	~	~
2577	81	2	13	81	44	~	~	~	34	~	~	~	~	~	~	~	~	~	~	~
2578	81	3	20	81	79	~	~	~	34	~	~	~	~	~	~	~	~	~	~	~
2579	81	4	16	81	106	~	~	~	34	~	~	~	~	~	~	~	~	~	~	~
2580	81	5	15	81	135	~	~	~	33	~	~	~	~	~	~	~	~	~	~	~
2581	81	6	16	81	167	~	~	~	45	~	~	~	~	~	~	~	~	~	~	~
2582	81	7	16	81	197	~	~	~	55	~	~	~	~	~	~	~	~	~	~	~
2583	81	8	18	81	230	~	~	~	56	~	~	~	~	~	~	~	~	~	~	~
2584	81	9	21	81	264	~	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2585	81	10	15	81	288	~	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2586	81	11	12	81	316	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2587	81	12	14	81	348	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2588	81	6	24	82	175	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2589	81	7	14	82	195	~	~	~	49	~	~	~	~	~	~	~	~	~	~	0.3
2590	81	8	17	82	229	~	~	~	53	~	~	~	~	~	~	~	~	~	~	15.0
2591	81	9	16	82	259	~	~	~	47	~	~	~	~	~	~	~	~	~	~	0.3
2592	81	10	20	82	293	~	~	~	40	~	~	~	~	~	~	~	~	~	~	0.3
2593	81	11	18	82	322	~	~	~	36	~	~	~	~	~	~	~	~	~	~	0.3
2594	81	3	18	83	77	~	~	~	35	~	~	~	~	~	~	~	~	~	~	0.3
2595	81	5	13	83	133	~	~	~	33	~	~	~	~	~	~	~	~	~	~	0.3
2596	81	6	16	83	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	0.3
2597	81	7	18	83	199	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2598	81	8	16	83	228	~	~	~	54	~	~	~	~	~	~	~	~	~	~	0.3
2599	81	9	19	83	262	~	~	~	48	~	~	~	~	~	~	~	~	~	~	0.3
2600	81	10	17	83	290	~	~	~	42	~	~	~	~	~	~	~	~	~	~	0.3

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 66

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2601	81	11	16	83	320	~	~	~	38	~	~	~	~	~	~	~	~	~	~	0.3
2602	82	7	16	85	197	~	~	~	~	~	~	~	16.0	11.0	14.0	~	~	19.0	2.0	~
2603	82	8	18	85	230	~	~	~	~	~	~	~	16.0	11.3	14.0	~	~	20.5	1.6	~
2604	82	9	19	85	262	~	~	~	~	~	~	26.0	0.5	19.7	2.0	~	~	11.7	14.0	~
2605	82	11	14	85	318	~	~	~	~	~	~	24.0	2.0	24.3	0.8	~	~	24.3	0.8	~
2606	82	3	24	86	55	~	~	~	~	~	~	31.0	0.3	26.0	0.5	~	~	26.0	0.5	~
2607	82	5	5	86	125	~	~	~	~	~	~	27.0	0.3	27.0	0.3	~	~	27.0	0.3	~
2608	82	6	18	86	169	~	~	~	~	~	~	24.3	0.9	20.5	1.6	~	~	11.7	13.0	~
2609	82	7	2	86	183	~	~	~	~	~	~	~	16.0	~	16.0	~	~	0.0	16.0	~
2610	82	8	7	86	220	~	~	~	~	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2611	82	9	19	86	262	~	~	~	~	~	~	26.0	0.5	24.3	0.9	~	~	18.5	2.0	~
2612	82	10	15	86	288	~	~	~	~	~	~	26.0	0.5	24.3	0.9	~	~	20.5	1.6	~
2613	83	1	26	84	26	~	~	~	34	~	~	24.0	0.8	15.0	1.6	~	~	12.0	4.0	~
2614	83	2	17	84	48	~	~	~	35	~	~	25.0	0.6	17.0	1.2	~	~	11.5	7.0	~
2615	83	3	8	84	67	48	~	~	36	~	~	26.0	0.5	18.0	1.0	~	~	14.0	2.0	~
2616	83	3	19	84	78	~	~	~	39	~	~	25.5	0.6	20.0	0.5	~	~	11.5	7.0	~
2617	83	4	9	84	99	40	~	~	39	~	~	26.0	0.5	20.0	0.5	~	~	10.0	15.0	~
2618	83	5	4	84	124	42	~	~	40	~	~	25.5	0.6	21.0	0.4	~	~	19.5	0.6	~
2619	83	5	24	84	144	45	~	~	44	~	~	26.0	0.5	21.0	0.4	~	~	21.0	0.4	~
2620	83	6	9	84	160	50	~	~	46	~	~	15.0	3.3	15.0	1.8	~	~	14.0	2.0	~
2621	83	6	26	84	177	56	~	~	50	~	~	13.0	7.8	13.5	2.2	~	~	13.3	2.3	~
2622	83	7	5	84	186	56	~	~	48	~	~	14.2	3.8	14.0	2.0	~	~	17.0	1.2	~
2623	83	7	16	84	197	58	~	~	54	~	~	10.4	16.0	0.0	16.0	~	~	13.5	2.1	~
2624	83	8	13	84	225	~	~	~	56	~	~	10.0	16.0	0.0	16.0	~	~	14.0	2.0	~
2625	83	9	27	84	270	~	~	~	49	~	~	9.7	16.0	~	16.0	~	~	~	16.0	~
2626	83	10	29	84	302	36	~	~	42	~	~	11.5	12.5	16.0	1.3	~	~	~	16.0	~
2627	83	11	27	84	331	32	~	~	38	~	~	13.3	4.8	14.0	2.0	~	~	~	16.0	~
2628	83	1	24	85	24	29	~	~	34	~	~	12.5	10.0	11.8	5.0	~	~	12.0	4.0	~
2629	83	3	2	85	61	32	~	~	32	~	~	13.8	5.3	12.0	4.0	~	~	~	16.0	~
2630	83	4	24	85	114	41	~	~	40	~	~	26.0	0.5	17.7	1.1	~	~	~	16.0	~
2631	83	6	12	85	163	50	~	~	47	~	~	19.0	2.0	0.0	16.0	~	~	~	16.0	~
2632	83	8	23	85	235	54	~	~	52	~	~	21.3	1.5	15.5	1.5	~	~	~	16.0	~
2633	83	10	3	85	274	43	~	~	47	~	~	20.5	1.6	13.5	2.2	~	~	~	16.0	~
2634	83	11	18	85	322	32	~	~	37	~	~	15.0	3.3	12.0	4.0	~	~	~	16.0	~
2635	83	2	24	86	55	35	~	~	32	~	~	24.3	0.8	19.5	0.7	~	~	18.5	0.9	~
2636	83	3	21	86	80	46	~	~	38	~	~	24.6	0.6	20.0	0.5	~	~	19.5	0.7	~
2637	83	4	15	86	105	41	~	~	40	~	~	27.0	0.3	21.0	0.4	~	~	21.0	0.4	~
2638	83	5	22	86	142	49	~	~	47	~	~	27.0	0.3	21.0	0.4	~	~	21.0	0.4	~
2639	83	6	5	86	156	51	~	~	44	~	~	24.3	0.9	20.5	0.4	~	~	20.5	0.4	~
2640	83	6	25	86	176	65	~	~	52	~	~	10.7	16.0	~	16.0	~	~	12.3	3.3	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 67

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2641	83	8	6	86	218	59	~	~	54	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2642	83	9	3	86	246	61	~	~	55	~	~	0.0	16.0	~	16.0	~	~	~	16.0	~
2643	84	7	10	85	191	59	~	~	~	~	~	24.0	0.8	33.0	0.3	~	~	~	0.3	~
2644	84	9	16	85	259	48	~	~	~	~	~	36.0	0.4	32.0	0.7	~	~	30.0	0.5	~
2645	84	11	14	85	318	~	~	~	~	~	~	35.0	0.4	31.0	0.4	~	~	30.0	0.5	~
2646	84	2	26	86	57	~	~	~	~	~	~	35.0	0.4	31.0	0.4	~	~	30.0	0.5	~
2647	84	4	3	86	93	36	~	~	~	~	~	36.0	0.4	31.0	0.4	~	~	31.0	0.4	~
2648	84	5	5	86	125	43	~	~	~	~	~	36.0	0.4	32.0	0.4	~	~	32.0	0.4	~
2649	84	7	2	86	183	59	~	~	~	~	~	36.0	0.4	30.5	0.5	~	~	31.0	0.4	~
2650	84	8	7	86	220	50	~	~	~	~	~	16.5	1.3	23.0	1.0	~	~	3.0	0.5	~
2651	84	9	19	86	262	42	~	~	~	~	~	25.5	0.9	20.0	1.8	~	~	28.0	0.8	~
2652	85	7	10	85	191	62	~	~	55	~	~	16.5	1.3	20.8	1.4	~	~	21.0	1.3	~
2653	85	9	16	85	259	48	~	~	51	~	~	31.7	0.6	32.0	0.7	~	~	19.0	1.8	~
2654	85	11	14	85	318	32	~	~	39	~	~	31.7	0.6	32.0	0.4	~	~	17.0	5.5	~
2655	85	2	26	86	57	~	~	~	34	~	~	~	0.3	~	0.3	~	~	~	0.3	~
2656	85	4	3	86	93	36	~	~	37	~	~	33.5	0.4	32.0	0.4	~	~	31.0	0.7	~
2657	85	5	6	86	126	41	~	~	40	~	~	33.5	0.4	32.0	0.4	~	~	32.0	0.4	~
2658	85	7	2	86	183	56	~	~	52	~	~	31.7	0.6	~	0.3	~	~	33.0	0.3	~
2659	85	8	7	86	220	53	~	~	53	~	~	18.0	1.2	21.0	1.3	~	~	26.0	0.8	~
2660	85	9	19	86	262	42	~	~	45	~	~	21.5	1.0	21.5	1.2	~	~	22.0	1.1	~
2661	86	4	24	85	114	41	~	~	38	~	~	~	0.3	~	0.3	~	~	19.0	0.7	~
2662	86	5	13	85	133	41	~	~	42	~	~	17.0	2.5	19.0	0.7	~	~	18.0	0.9	~
2663	86	6	3	85	154	48	~	~	46	~	~	~	0.3	17.0	1.2	~	~	17.0	2.0	~
2664	86	6	26	85	177	50	~	~	50	~	~	22.5	1.3	14.0	2.0	~	~	18.0	1.0	~
2665	86	7	30	85	211	61	~	~	59	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2666	86	8	8	85	220	55	~	~	57	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2667	86	8	22	85	234	~	~	~	54	~	~	20.5	0.3	18.0	1.0	~	~	~	16.0	~
2668	86	9	25	85	268	44	~	~	47	~	~	25.0	0.4	20.0	0.7	~	~	14.0	2.0	~
2669	86	11	18	85	322	~	~	~	35	~	~	19.0	2.1	15.0	1.7	~	~	13.5	2.3	~
2670	86	3	26	86	85	39	~	~	37	~	~	25.0	0.4	20.0	0.6	~	~	20.0	0.6	~
2671	86	4	20	86	110	41	~	~	38	~	~	~	0.3	~	0.3	~	~	19.0	0.8	~
2672	86	5	15	86	135	41	~	~	46	~	~	~	0.3	19.0	0.4	~	~	20.0	0.5	~
2673	86	6	10	86	161	~	~	~	47	~	~	23.0	1.3	17.0	1.3	~	~	14.0	2.0	~
2674	86	6	22	86	173	~	~	~	49	~	~	16.5	1.4	19.3	1.5	~	~	17.7	1.9	~
2675	86	8	6	86	218	62	~	~	56	~	~	0.0	16.0	0.0	16.0	~	~	~	16.0	~
2676	86	9	3	86	246	63	~	~	56	~	~	12.0	12.0	10.0	15.0	~	~	~	16.0	~
2677	87	9	16	85	259	~	~	~	~	~	~	26.0	0.3	22.0	0.4	~	~	~	~	~
2678	87	11	14	85	318	~	~	~	~	~	~	26.0	0.3	21.5	0.5	~	~	~	~	~
2679	87	4	3	86	93	32	~	~	~	~	~	25.0	0.4	29.8	0.4	~	~	~	~	~
2680	87	5	5	86	125	39	~	~	~	~	~	27.0	0.3	32.0	0.3	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 68

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2681	87	7	2	86	183	57	~	~	~	~	~	27.0	0.3	26.0	0.4	~	~	~	~	~
2682	87	8	7	86	220	46	~	~	~	~	~	21.0	1.3	26.0	1.1	~	~	~	~	~
2683	87	9	22	86	265	95	~	~	~	~	~	25.0	0.5	27.5	1.0	~	~	~	~	~
2684	88	9	16	85	259	48	~	~	~	~	~	25.0	0.6	32.0	0.3	~	~	~	~	~
2685	88	11	14	85	318	30	~	~	~	~	~	25.0	0.6	31.0	0.4	~	~	~	~	~
2686	88	2	26	86	57	32	~	~	~	~	~	25.0	0.6	31.0	0.4	~	~	~	~	~
2687	88	4	3	86	93	36	~	~	~	~	~	25.0	0.6	32.0	0.3	~	~	~	~	~
2688	88	5	5	86	125	39	~	~	~	~	~	27.0	0.3	31.0	0.4	~	~	~	~	~
2689	88	7	1	86	182	59	~	~	~	~	~	15.0	15.0	22.0	1.5	~	~	~	~	~
2690	88	8	7	86	220	55	~	~	~	~	~	~	16.0	~	16.0	~	~	~	~	~
2691	88	9	22	86	265	97	~	~	~	~	~	25.0	0.6	22.5	1.4	~	~	~	~	~
2692	89	9	16	85	259	46	~	~	50	~	~	25.5	0.5	24.0	1.2	~	~	0.0	16.0	~
2693	89	11	14	85	318	~	~	~	36	~	~	19.0	1.8	30.5	0.5	~	~	19.0	2.0	~
2694	89	2	26	86	57	30	~	~	34	~	~	24.5	0.7	30.5	0.4	~	~	25.5	1.0	~
2695	89	4	3	86	93	34	~	~	37	~	~	25.5	0.6	23.0	0.3	~	~	28.5	0.4	~
2696	89	5	5	86	125	41	~	~	40	~	~	26.5	0.5	24.0	0.3	~	~	30.5	0.5	~
2697	89	7	1	86	182	59	~	~	53	~	~	20.0	1.6	21.0	1.6	~	~	26.0	0.9	~
2698	89	8	7	86	220	54	~	~	55	~	~	~	16.0	~	16.0	~	~	16.0	~	~
2699	89	9	22	86	265	36	~	~	48	~	~	19.5	1.7	20.0	1.9	~	~	~	16.0	~
2700	90	3	5	84	64	~	~	~	30	~	~	22.5	0.4	21.5	0.5	~	~	~	16.0	~
2701	90	3	18	84	77	~	~	~	34	~	~	22.5	0.4	21.5	0.5	~	~	23.0	1.2	~
2702	90	4	4	84	35	37	~	~	33	~	~	22.5	0.4	21.8	0.5	~	~	25.5	0.8	~
2703	90	4	19	84	109	44	~	~	38	~	~	23.0	0.3	22.0	0.4	~	~	25.0	0.9	~
2704	90	5	4	84	124	44	~	~	38	~	~	23.0	0.3	21.2	0.5	~	~	26.0	0.7	~
2705	90	5	24	84	144	47	~	~	42	~	~	22.5	0.4	23.5	0.3	~	~	25.0	0.9	~
2706	90	6	26	84	177	54	~	~	50	~	~	24.0	0.3	23.0	0.3	~	~	22.8	1.3	~
2707	90	7	5	84	186	55	~	~	52	~	~	23.0	0.3	22.5	0.4	~	~	21.0	1.4	~
2708	90	7	17	84	198	56	~	~	53	~	~	16.0	1.1	18.0	0.9	~	~	16.0	15.0	~
2709	90	8	13	84	225	~	~	~	55	~	~	13.5	1.4	12.5	1.6	~	~	16.0	15.0	~
2710	90	9	27	84	270	39	~	~	44	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2711	90	10	29	84	302	36	~	~	38	~	~	9.0	15.0	~	16.0	~	~	~	16.0	~
2712	90	11	28	84	332	31	~	~	34	~	~	21.5	0.5	8.8	16.0	~	~	~	16.0	~
2713	90	2	28	85	59	31	~	~	29	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2714	90	3	28	85	87	31	~	~	32	~	~	9.0	15.0	9.8	11.3	~	~	~	16.0	~
2715	90	5	3	85	123	43	~	~	41	~	~	24.0	0.3	22.5	0.4	~	~	21.0	1.4	~
2716	90	6	11	85	162	59	~	~	47	~	~	24.0	0.3	22.0	0.4	~	~	17.0	4.0	~
2717	90	6	13	85	164	~	~	~	45	~	~	20.0	0.8	21.5	0.5	~	~	26.0	0.7	~
2718	90	8	14	85	226	52	~	~	52	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2719	90	9	23	85	266	45	~	~	46	~	~	22.5	0.4	21.5	0.5	~	~	~	16.0	~
2720	90	3	20	86	79	37	~	~	32	~	~	20.2	0.8	21.2	0.6	~	~	14.5	16.0	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 69

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2721	90	4	12	86	102	~	~	~	38	~	~	22.5	0.4	22.0	0.4	~	~	21.0	1.4	~
2722	90	5	15	86	135	~	~	~	41	~	~	22.0	0.4	22.0	0.4	~	~	20.1	1.5	~
2723	90	6	25	86	176	59	~	~	52	~	~	22.5	0.4	22.5	0.4	~	~	20.5	1.6	~
2724	90	7	15	86	196	~	~	~	53	~	~	19.5	0.8	18.0	0.9	~	~	16.0	15.0	~
2725	90	8	6	86	218	57	~	~	54	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2726	91	1	26	84	26	~	~	~	35	~	~	19.5	0.6	25.5	0.5	~	~	26.3	0.4	~
2727	91	2	17	84	48	~	~	~	35	~	~	19.2	0.7	25.3	0.7	~	~	26.0	0.4	~
2728	91	3	8	84	67	43	~	~	38	~	~	20.0	0.5	26.0	0.5	~	~	26.3	0.4	~
2729	91	3	19	84	78	~	~	~	39	~	~	20.0	0.5	25.5	0.5	~	~	26.3	0.4	~
2730	91	4	9	84	99	50	~	~	42	~	~	20.2	0.4	26.0	0.4	~	~	26.3	0.4	~
2731	91	5	4	84	124	48	~	~	46	~	~	20.2	0.4	25.8	0.6	~	~	26.3	0.4	~
2732	91	5	24	84	144	52	~	~	50	~	~	20.3	0.4	26.3	0.4	~	~	27.0	0.3	~
2733	91	6	9	84	160	56	~	~	52	~	~	21.0	0.3	26.3	0.4	~	~	26.3	0.4	~
2734	91	6	26	84	177	61	~	~	60	~	~	21.5	0.3	27.5	0.3	~	~	27.5	0.3	~
2735	91	7	5	84	186	65	~	~	64	~	~	14.0	2.0	25.9	0.6	~	~	27.5	0.3	~
2736	91	7	16	84	197	70	~	~	66	~	~	0.0	16.0	13.0	8.0	~	~	24.0	1.0	~
2737	91	8	13	84	225	~	~	~	66	~	~	~	16.0	0.0	16.0	~	~	18.0	1.8	~
2738	91	9	27	84	270	41	~	~	50	~	~	14.0	2.0	0.0	16.0	~	~	12.0	15.0	~
2739	91	10	29	84	302	39	~	~	41	~	~	13.8	2.1	21.5	1.3	~	~	13.0	8.0	~
2740	91	11	27	84	331	35	~	~	36	~	~	19.5	0.7	25.5	0.7	~	~	19.0	1.2	~
2741	91	1	24	85	24	32	~	~	33	~	~	19.2	0.7	25.0	0.9	~	~	25.0	0.9	~
2742	91	3	21	85	80	32	~	~	32	~	~	13.0	2.4	24.7	1.0	~	~	25.5	0.5	~
2743	91	4	24	85	114	50	~	~	44	~	~	20.3	0.4	26.3	0.4	~	~	26.3	0.4	~
2744	91	6	12	85	163	54	~	~	56	~	~	20.3	0.4	26.3	0.4	~	~	27.0	0.3	~
2745	91	7	15	85	196	75	~	~	70	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2746	91	8	23	85	235	59	~	~	59	~	~	21.0	0.3	26.3	0.4	~	~	26.3	0.4	~
2747	91	10	2	85	274	41	~	~	48	~	~	20.3	0.4	26.3	0.4	~	~	26.3	0.4	~
2748	91	11	18	85	322	31	~	~	36	~	~	12.5	2.3	25.5	0.6	~	~	26.3	0.4	~
2749	91	2	24	86	55	31	~	~	33	~	~	19.5	0.6	25.5	0.6	~	~	26.0	0.5	~
2750	91	3	21	86	80	50	~	~	40	~	~	20.3	0.4	26.0	0.5	~	~	26.3	0.4	~
2751	91	4	15	86	105	50	~	~	44	~	~	20.3	0.4	26.3	0.4	~	~	26.3	0.4	~
2752	91	5	22	86	142	52	~	~	48	~	~	21.0	0.3	26.3	0.4	~	~	26.3	0.4	~
2753	91	6	5	86	156	56	~	~	52	~	~	21.0	0.3	26.3	0.4	~	~	26.3	0.4	~
2754	91	6	25	86	176	70	~	~	64	~	~	0.0	16.0	12.5	12.0	~	~	0.0	16.0	~
2755	91	8	6	86	218	77	~	~	68	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2756	91	9	3	86	246	66	~	~	64	~	~	18.0	1.0	~	16.0	~	~	~	16.0	~
2757	92	2	17	84	48	~	~	~	36	~	~	25.3	0.6	29.0	0.7	~	~	30.0	0.6	~
2758	92	3	5	84	64	~	~	~	38	~	~	25.3	0.6	29.0	0.7	~	~	30.0	0.6	~
2759	92	3	18	84	77	~	~	~	39	~	~	25.5	0.6	29.5	0.5	~	~	30.0	0.6	~
2760	92	4	4	84	35	55	~	~	42	~	~	26.0	0.5	30.0	0.6	~	~	30.0	0.6	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 70

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2761	92	4	19	84	109	57	~	~	48	~	~	26.0	0.5	30.3	0.4	~	~	30.3	0.4	~
2762	92	5	4	84	124	43	~	~	46	~	~	26.0	0.5	30.2	0.4	~	~	30.4	0.4	~
2763	92	5	24	84	144	53	~	~	50	~	~	26.0	0.5	30.0	0.6	~	~	30.5	0.4	~
2764	92	6	26	84	177	61	~	~	62	~	~	23.0	1.1	29.0	0.7	~	~	30.5	0.4	~
2765	92	7	5	84	186	66	~	~	65	~	~	18.0	4.0	24.3	1.2	~	~	30.0	0.6	~
2766	92	7	17	84	198	64	~	~	69	~	~	~	16.0	18.3	3.0	~	~	24.0	1.3	~
2767	92	9	27	84	270	39	~	~	53	~	~	~	16.0	~	16.0	~	~	21.8	1.5	~
2768	92	10	29	84	302	39	~	~	42	~	~	21.0	1.4	~	16.0	~	~	~	16.0	~
2769	92	11	28	84	332	32	~	~	37	~	~	21.6	0.4	19.5	2.0	~	~	~	16.0	~
2770	92	2	28	85	59	32	~	~	34	~	~	14.3	16.0	17.0	15.0	~	~	~	16.0	~
2771	92	3	28	85	87	41	~	~	39	~	~	24.0	1.0	26.0	1.1	~	~	18.0	4.2	~
2772	92	5	3	85	123	48	~	~	54	~	~	17.8	2.1	23.0	1.3	~	~	21.0	1.6	~
2773	92	6	11	85	162	77	~	~	57	~	~	22.5	1.2	21.0	1.6	~	~	18.0	4.0	~
2774	92	8	25	85	237	86	~	~	64	~	~	21.9	1.3	15.8	16.0	~	~	~	16.0	~
2775	92	9	23	85	266	~	~	~	57	~	~	26.0	0.5	30.5	0.4	~	~	27.5	0.9	~
2776	92	3	20	86	79	~	~	~	41	~	~	25.0	0.6	29.0	0.7	~	~	28.3	0.8	~
2777	92	4	12	86	102	~	~	~	37	~	~	25.8	0.5	29.8	0.5	~	~	26.7	0.9	~
2778	92	5	15	86	135	54	~	~	48	~	~	27.0	0.3	30.3	0.4	~	~	26.3	0.9	~
2779	92	6	13	86	164	~	~	~	54	~	~	25.8	0.6	29.0	0.7	~	~	26.5	0.9	~
2780	92	6	25	86	176	66	~	~	62	~	~	~	16.0	16.5	16.0	~	~	18.0	4.0	~
2781	92	7	15	86	196	~	~	~	68	~	~	~	16.0	~	16.0	~	~	16.8	16.0	~
2782	92	8	6	86	218	62	~	~	73	~	~	~	16.0	~	16.0	~	~	~	16.0	~
2783	92	9	3	86	246	58	~	~	66	~	~	16.0	2.6	~	16.0	~	~	~	16.0	~
2784	93	6	19	81	170	33	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2785	93	7	19	81	200	48	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2786	93	8	15	81	227	51	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2787	93	9	13	81	256	51	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2788	93	10	15	81	288	40	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2789	93	11	13	81	317	38	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2790	93	6	16	82	167	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2791	93	7	16	82	197	~	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2792	93	8	13	82	225	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2793	93	9	18	82	261	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2794	94	6	19	81	170	40	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2795	94	7	18	81	199	50	~	~	45	~	~	~	~	~	~	~	~	~	~	~
2796	94	8	15	81	227	54	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2797	94	9	13	81	256	50	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2798	94	10	15	81	288	39	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2799	94	11	13	81	317	39	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2800	94	6	16	82	167	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 71

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2801	94	7	17	82	198	~	~	~	44	~	~	~	~	~	~	~	~	~	~	~
2802	94	8	13	82	225	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2803	94	9	18	82	261	~	~	~	44	~	~	~	~	~	~	~	~	~	~	~
2804	95	6	14	81	165	43	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2805	95	7	18	81	199	51	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2806	95	8	16	81	228	54	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2807	95	9	14	81	257	52	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2808	95	10	16	81	289	40	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2809	95	11	12	81	316	41	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2810	95	12	17	81	351	36	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2811	95	2	18	82	49	37	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2812	95	6	16	82	167	~	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2813	95	7	16	82	197	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2814	95	8	13	82	225	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2815	95	9	18	82	261	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2816	96	6	20	81	171	41	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2817	96	7	18	81	199	51	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2818	96	8	15	81	227	51	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2819	96	9	12	81	255	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2820	97	6	19	81	170	44	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2821	97	7	19	81	200	53	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2822	97	8	15	81	227	56	~	~	52	~	~	~	~	~	~	~	~	~	~	~
2823	97	9	13	81	256	56	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2824	97	10	15	81	288	42	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2825	97	11	13	81	317	42	~	~	44	~	~	~	~	~	~	~	~	~	~	~
2826	97	12	18	81	352	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2827	97	6	16	82	167	~	~	~	44	~	~	~	~	~	~	~	~	~	~	~
2828	97	7	16	82	197	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2829	97	8	13	82	225	~	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2830	97	9	18	82	261	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2831	98	6	14	81	165	45	~	~	44	~	~	~	~	~	~	~	~	~	~	~
2832	98	7	18	81	199	56	~	~	52	~	~	~	~	~	~	~	~	~	~	~
2833	98	8	16	81	227	61	~	~	56	~	~	~	~	~	~	~	~	~	~	~
2834	98	9	14	81	257	57	~	~	56	~	~	~	~	~	~	~	~	~	~	~
2835	98	10	16	81	289	42	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2836	98	11	12	81	316	46	~	~	45	~	~	~	~	~	~	~	~	~	~	~
2837	98	12	17	81	351	36	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2838	98	2	18	82	49	37	~	~	36	~	~	~	~	~	~	~	~	~	~	~
2839	98	5	14	82	134	~	~	~	39	~	~	~	~	~	~	~	~	~	~	~
2840	98	6	16	82	167	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 72

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2841	98	7	16	82	197	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2842	98	8	13	82	225	~	~	~	54	~	~	~	~	~	~	~	~	~	~	~
2843	98	9	18	82	261	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2844	99	6	19	81	170	48	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2845	99	7	19	81	200	56	~	~	52	~	~	~	~	~	~	~	~	~	~	~
2846	99	8	15	81	228	58	~	~	56	~	~	~	~	~	~	~	~	~	~	~
2847	99	9	13	81	256	58	~	~	54	~	~	~	~	~	~	~	~	~	~	~
2848	99	10	15	81	288	43	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2849	99	11	13	81	317	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2850	99	12	18	81	352	~	~	~	36	~	~	~	~	~	~	~	~	~	~	~
2851	99	2	18	82	49	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2852	99	3	15	82	74	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2853	99	4	16	82	106	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2854	99	5	14	82	134	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2855	99	6	16	82	167	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2856	99	7	17	82	198	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2857	99	8	13	82	225	~	~	~	54	~	~	~	~	~	~	~	~	~	~	~
2858	99	9	18	82	261	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2859	100	6	19	81	170	44	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2860	100	7	18	81	199	53	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2861	100	8	15	81	227	56	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2862	100	9	13	81	256	52	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2863	100	10	15	81	288	44	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2864	100	11	13	81	317	42	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2865	100	12	18	81	352	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2866	100	2	18	82	49	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2867	100	5	14	82	134	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2868	100	6	16	82	167	~	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2869	100	7	17	82	198	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2870	100	8	13	82	225	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2871	100	9	18	82	261	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2872	101	6	20	81	171	44	~	~	43	~	~	~	~	~	~	~	~	~	~	~
2873	101	7	18	81	199	53	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2874	101	8	15	81	227	56	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2875	101	9	12	81	255	54	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2876	101	10	15	81	288	42	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2877	101	11	12	81	316	42	~	~	42	~	~	~	~	~	~	~	~	~	~	~
2878	101	2	18	82	49	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2879	101	5	14	82	134	~	~	~	36	~	~	~	~	~	~	~	~	~	~	~
2880	101	6	16	82	167	~	~	~	44	~	~	~	~	~	~	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 73

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2881	101	7	17	82	198	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2882	101	8	13	82	225	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2883	101	9	18	82	261	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2884	102	6	19	81	170	48	~	~	45	~	~	~	~	~	~	~	~	~	~	~
2885	102	7	19	81	200	54	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2886	102	8	15	81	227	55	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2887	102	9	13	81	256	51	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2888	102	10	15	81	288	43	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2889	102	11	13	81	317	40	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2890	102	12	18	81	352	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2891	102	2	18	82	49	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2892	102	3	15	82	74	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2893	102	4	16	82	106	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2894	102	5	14	82	134	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2895	102	6	16	82	167	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2896	102	7	17	82	198	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~
2897	102	8	13	82	225	~	~	~	54	~	~	~	~	~	~	~	~	~	~	~
2898	102	9	18	82	261	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2899	103	6	15	81	165	48	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2900	103	7	18	81	199	55	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2901	103	8	15	81	227	57	~	~	53	~	~	~	~	~	~	~	~	~	~	~
2902	103	9	12	81	255	53	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2903	103	10	15	81	288	43	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2904	103	11	12	81	316	41	~	~	41	~	~	~	~	~	~	~	~	~	~	~
2905	103	2	18	82	49	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2906	103	3	15	82	74	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2907	103	4	16	82	106	~	~	~	38	~	~	~	~	~	~	~	~	~	~	~
2908	103	5	14	82	134	~	~	~	46	~	~	~	~	~	~	~	~	~	~	~
2909	103	6	16	82	167	~	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2910	103	7	17	82	198	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2911	103	8	13	82	225	~	~	~	52	~	~	~	~	~	~	~	~	~	~	~
2912	103	9	18	82	261	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2913	104	6	15	81	165	50	~	~	47	~	~	~	~	~	~	~	~	~	~	~
2914	104	7	18	81	199	55	~	~	53	~	~	~	~	~	~	~	~	~	~	~
2915	104	8	15	81	227	61	~	~	55	~	~	~	~	~	~	~	~	~	~	~
2916	104	9	12	81	255	55	~	~	53	~	~	~	~	~	~	~	~	~	~	~
2917	104	10	15	81	288	43	~	~	~	~	~	~	~	~	~	~	~	~	~	~
2918	104	11	12	81	316	38	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2919	104	12	18	81	352	~	~	~	35	~	~	~	~	~	~	~	~	~	~	~
2920	104	2	18	82	49	~	~	~	36	~	~	~	~	~	~	~	~	~	~	~

TABLE 8 - SOIL TEMPERATURE AND SOIL MOISTURE MONITORING DATA

Page 74

	SITE	MO	DAY	YR	DAY_NO	TEMP3	TEMP6	TEMP12	TEMP20	S_TEMP	A_TEMP	MOIST6	BAR6	MOIST12	BAR12	MOIST16	BAR16	MOIST24	BAR24	BAR20
2921	104	3	15	82	74	~	~	~	36	~	~	~	~	~	~	~	~	~	~	~
2922	104	4	16	82	106	~	~	~	37	~	~	~	~	~	~	~	~	~	~	~
2923	104	5	14	82	134	~	~	~	40	~	~	~	~	~	~	~	~	~	~	~
2924	104	6	16	82	167	~	~	~	48	~	~	~	~	~	~	~	~	~	~	~
2925	104	7	17	82	198	~	~	~	51	~	~	~	~	~	~	~	~	~	~	~
2926	104	8	13	82	225	~	~	~	50	~	~	~	~	~	~	~	~	~	~	~
2927	104	9	18	82	261	~	~	~	49	~	~	~	~	~	~	~	~	~	~	~