THESIS

ESTABLISHMENT PATTERNS OF BITTERBRUSH

Submitted by

Leonard Paur

In partial fulfillment of the requirements

for the Degree of Master of Science

Colorado State University

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COLORADO STATE UNIVERSITY

August, 1971

WE HEREBY RECOMMEND THAT THE THESIS PREPARED UNDER OUR SUPERVISION BY LEONARD PAUR ENTITLED ESTABLISHMENT PATTERNS OF BITTERBRUSH BE ACCEPTED AS FULFILLING IN PART REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE.

Committee on Graduate Work

Donald E. Jameson

Harold W. Steinhoff

George M. Van Dyne
Adviser

Head of Department

ABSTRACT OF THESIS

ESTABLISHMENT PATTERNS OF BITTERBRUSH

During the summer of 1969, 50 bitterbrush (Purshia tridentata) plants were collected from each of 25 sites located from approximately 10 to 35 miles west of Fort Collins, Colorado. These sites were selected to represent the range of topographic conditions under which bitterbrush is found in this area. The principle objective was to relate establishment patterns over time, as indicated by the 1969 age structure, to the weather history of the area.

The bitterbrush plants were aged by cross-dating techniques using ponderosa pine as a control. The age structure of the sample indicates a severe lack of establishment since 1950. The reason for this reduction in establishment is unknown. There appear to be no differential effects due to weather during the period of good establishment prior to 1950 as compared to the period of poor establishment since. Spring temperature proved to be the best predictor of establishment.

The age structures of the 25 plots proved to be significantly different. The growth and vigor were found to be significantly influenced by topography.

Maximum stem diameter was found to be the best single predictor of age within the array of measurements taken on the live plant. Even maximum stem diameter is a crude index at best for the ages of plants in the area studied.

Both bitterbrush and ponderosa pine were analyzed for growth response to weather. Temperature proved to be more limiting for both species than did moisture.

Leonard Paur
Department of Fishery and
Wildlife Biology
Colorado State University
Fort Collins, Colorado 80521
August, 1971

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My appreciation is extended to the U.S. Forest Service for their cooperation in providing vegetation maps and the range on which to do field work.

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To the many other persons who offered suggestions and encouragement, I am grateful. Particularly to Dr. Robert C. Francis who gave many hours of his time to aid in various statistical aspects, Dr. Charles W. Ferguson of the Laboratory of Tree-Ring Research, University of Arizona, who was responsible for guiding my efforts in the area of dendrochronology, Dr. Harold C. Fritts of the Laboratory of Tree-Ring Research, University of Arizona, who aided in the

interpretation of ring width data in terms of weather, and Lois, my wife, whose understanding and patience made the task much less difficult.

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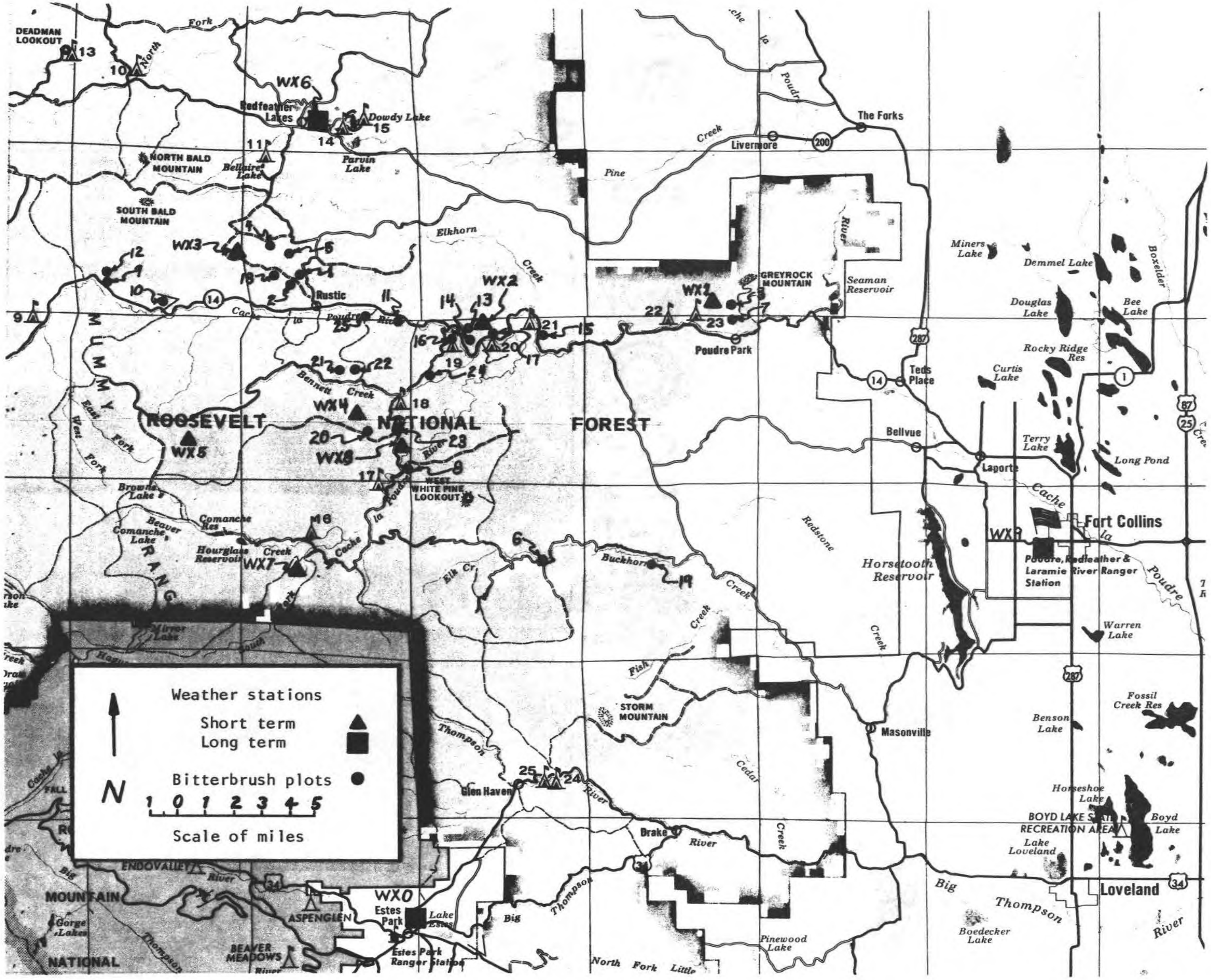
Weather stations
Short term
Long term
Bitterbrush plots
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1 0 1 2 3 4 5
Scale of miles
DEADMAN LOOKOUT
Redfeather Lakes
Dowdy Lake
Parvin Lake
NORTH BALD MOUNTAIN
Bellaire Lake
SOUTH BALD MOUNTAIN
Elkhorn Creek
Rustic
Cache la Poudre River
GREYROCK MOUNTAIN
Seaman Reservoir
Poudre Park
The Forks
Livermore
Pine Creek
Bennett Creek
ROOSEVELT NATIONAL FOREST
MUMMY RANGE
WEST WHITE PINE LOOKOUT
Browns Lake
Comanche Res
Comanche Lake
Hourglass Reservoir
Beaver Creek
Buckhorn Creek
Redstone Creek
Horsetooth Reservoir
Fish Creek
STORM MOUNTAIN
Masonville
Cedar Creek
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Big Thompson River
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Estes Park
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Mirror Lake
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Fort Collins
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Miners Lake
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Loveland
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WX0
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WX9

Biotic Factors

The area investigated during this study is at the eastern edge of the bitterbrush range (Figure 1). Reports on bitterbrush in general indicate that the plants on the study area may be somewhat smaller and perhaps less vigorous than their counterparts elsewhere. This would lead one to question whether this area is good bitterbrush range.

The vegetation is dominated by coniferous trees. Ponderosa pine (Pinus ponderosa), lodgepole pine (Pinus contorta), and Douglas-fir (Pseudotsuga menziesii) are among the most common. Other trees are quaking aspen (Populus tremuloides) and Rocky Mountain juniper (Juniperous scopulorum). A wide variety of shrubs including bitterbrush, big sagebrush (Artemisia tridentata), skunkbush sumac (Rhus trilobata), squaw currant (Ribes cereum), true mountain mahogany (Cercocarpus montanus), and mallow ninebark (Physocarpus monogynus) are most abundant. The herbaceous vegetation consists of numerous grasses and forbs.

Ungulates native to the region are elk (Cervus canadensis), mule deer (Odocoileus hemionus) and mountain sheep (Ovis canadensis). Introduced ungulates are domestic cattle, horses, and sheep. Small mammals include both lagomorphs and rodents. Ground squirrels and chipmunks are most important as far as

bitterbrush is concerned except in rare occasions when voles may cause extensive destruction of bitterbrush due to stem girdling.

Climate

The climate of the region is continental with warm summers and cold winters, most of the precipitation coming during the summer. The mean annual precipitation for the Little South Fork drainage is 18-22 inches, but may be highly variable (Johnson et al. 1963). Records from near-by but somewhat lower Fort Collins show a range of temperatures from a low of -38F to a high of 102F for the period from 1887 to and including 1957 (Parshall 1961). The mean monthly temperatures for the same period ranged from 26.1F for January to 69.5F for July. The total annual precipitation ranged from 7.11 inches to 27.57 inches with a mean of 14.68 inches. Locations of weather stations from which data are used are indicated in Figure 2. Table 1 lists the elevation, length of record and items contained in the record for each weather station. Evidence of drought years is found in the literature as well as in the ring width sequences of ponderosa pine and bitterbrush. Examples of drought years are 1893, 1919, and 1954 (Fry 1954, Parshall 1961).

Table 1. Summary of weather records available in and near the study area. All dates are inclusive.

Station Name	Station Number	Elevation (Feet)	Data Type Available[1]	Period of record
Hewlett Gulch	1	6440	TMAX, TMNX, TMIN, TMNM, PPT	1/61-5/65
Kelly Flats	2	7000	TMAX, TMNX, TMIN, TMNM, PPT	1/61-12/65
Seven Mile Creek	3	8120	TMAX, TMNX, TMIN, TMNM, PPT	1/61-5/65
Jack's Gulch	4	8940	TMAX, TMNX, TMIN, TMNM, PPT	1/61-5/65
Sheep Saddle	5	10320	TMAX, TMNX, TMIN, TMNM, PPT	7/61-12/64
Red Feather Lakes	6	8237	TMAX, TMNX, TMIN, TMNM TEMP, PPT	1/60-12/69 9/41-12/69
Pingree Park	7	9014	TMNX, TMNM PPT	7/61-12/69 6/61-12/69
Quigley Mountain	8	8115	TMNX, TMNM, PPT	6/62-12/69
Fort Collins	9	5001	TMAX, TMNX, TMIN, TMNM TEMP PPT	3/31-12/69 1/97-12/30 1/97-12/69

Table 1. (Cont.)

Station Name	Station Number	Elevation (Feet)	Data Type Available[1]	Period of Record
Estes Park	10	7497	TMAX, TMIN, TEMP	1/17-12/69
			TMNX, TMNM	1/52-12/69
			PPT	1/10-12/69

[1] TMAX--Maximum monthly temperature
TMNX--Mean maximum monthly temperature
TMIN--Minimum monthly temperature
TMNM--Mean minimum monthly temperature
TEMP--Mean monthly temperature
PPT--Total monthly precipitation

METHODS AND MATERIALS

Site Selection

Site selection was based on securing adequate ranges of elevation, slope and aspect. The resulting 25 plots ranged in elevation from 5900 feet to 8750 feet, in slope from 7% to 64%, and aspects from 24° to 304° azimuth from true north. However the northwest quadrant was largely missing due to the absence of bitterbrush on slopes with that exposure. Location, topographic measurements and mean 'A' soil horizon depth are given in Table 2. The plots selected contained all the communities in which bitterbrush is likely to be found. Figures 3, 4, and 5 illustrate three typical communities sampled ranging from a non-existent overhead canopy to a dense canopy. Figure 2 depicts the location of the plots within the study area.

Plot Location

The selection of a stand was followed by a ground reconnaissance during which bitterbrush density was determined. The plot sampled was circular and variable in size with radii ranging from 75 feet to 150 feet depending on bitterbrush density. With the plot diameter as a limiting criteria the plot center was located to insure

Table 2. Plot location, topographic description, and mean 'A' soil horizon depth.

Plot	Location	Sec.	T-N	R-W	Elevation (feet)	Slope (%)	Aspect (M^{o})	'A' Soil Horizon (cm)
1	SE 1/4, NE 1/4	29	9	73	7850	32	40	11.0
2	SW 1/4, SE 1/4	29	9	73	7500	19	80	17.7
3	SW 1/4, SE 1/4	26	9	71	6000	55	250	13.5
4	NE 1/4, SE 1/4	19	9	73	8750	26	130	15.6
5	SE 1/4, SW 1/4	20	9	73	8500	13	155	9.9
6	NW 1/4, SE 1/4	14	7	72	7750	64	145	15.4
7	NW 1/4, NE 1/4	2	8	71	5900	50	140	25.0
8	NE 1/4, SE 1/4	36	8	73	8050	29	190	7.1
9	SE 1/4, SE 1/4	30	9	74	7750	7	170	25.0
10	NE 1/4, SW 1/4	33	9	74	7950	40	80	16.3
11	SE 1/4, SW 1/4	36	9	73	7000	10	55	10.8
12	SE 1/4, SE 1/4	30	9	74	8000	55	215	23.3
13	NW 1/4, NW 1/4	4	8	72	7100	37	65	22.4
14	NE 1/4, SE 1/4	5	8	72	6900	24	280	13.6
15	NE 1/4, SW 1/4	2	8	72	6500	13	235	13.0
16	SE 1/4, SW 1/4	5	8	72	7250	25	290	9.0
17	SW 1/4, SE 1/4	4	8	72	6750	42	180	17.4
18	NE 1/4, SW 1/4	29	9	73	7700	14	10	16.1
19	SW 1/4, SW 1/4	16	7	71	7300	13	30	6.4
20	NW 1/4, SE 1/4	26	8	73	8350	27	195	6.6

Table 2. (Cont.)

Plot	Location	Sec.	T-N	R-W	Elevation (feet)	Slope (%)	Aspect (M^{o})	'A' Soil Horizon (cm)
21	SE 1/4, NE 1/4	16	8	73	8500	24	180	7.4
22	SW 1/4, NW 1/4	15	8	73	8400	22	150	11.1
23	NW 1/4, NE 1/4	25	8	73	8200	16	110	8.0
24	NW 1/4, NE 1/4	18	8	72	7600	31	255	8.1
25	SE 1/4, SW 1/4	35	9	73	7200	52	100	22.6

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INTRODUCTION

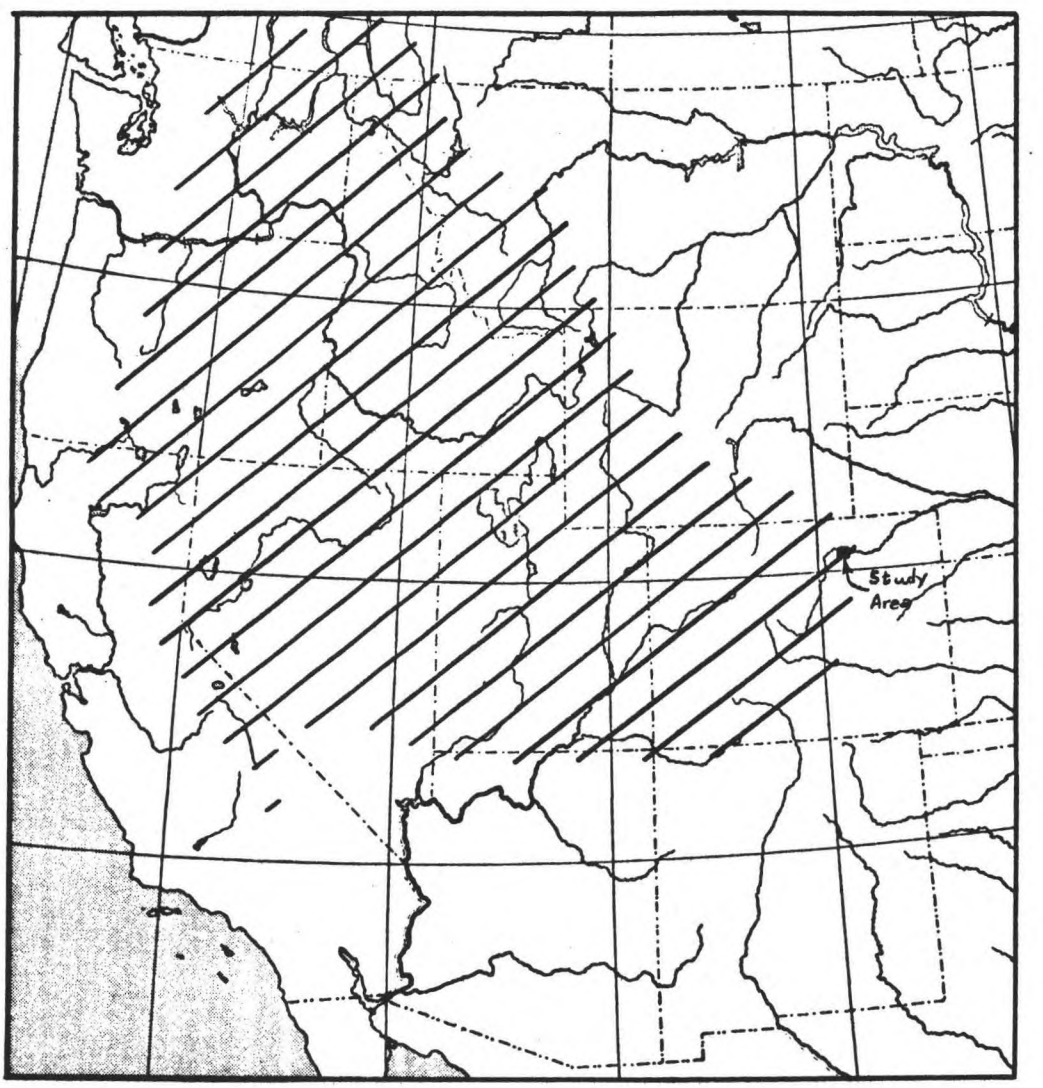
Species Description

Antelope bitterbrush (Purshia tridentata Pursh, D. C.) is one of the most important and most widely distributed of all western browse shrubs (U.S. Dep. Agr. 1937). Bitterbrush occurs from 3500 feet to 11,500 feet in elevation and ranges over some 340,000,000 acres in 11 western states extending from southern Canada to southern California and northern New Mexico as shown in Figure 1 (Hormay 1943, Nord 1965). Harrington (1954) indicates records of bitterbrush in Colorado are from the western half of the state between elevations of 5000 and 8000 feet, however I have found bitterbrush communities to elevations in excess of 9000 feet.

The growth form varies depending on its environment from a low mat-like form to 15-foot tree-like forms. The plant may live to ages of at least 160 years but perhaps averages between 32 and 44 years (Nord 1959). This plant prefers relatively young, coarse, sandy soils that are deep and well drained with a pH of 6.0 to 7.3 (Wagle 1958).

Bitterbrush may be propagated in two ways: 1. Sexually through the production of seeds, 2. Vegetatively through layering, the rooting of decumbent branches which may later become separated

Figure 1. Range of bitterbrush (after Hormay 1943) showing location of the study area.


Study
Area

from the parent plant. Most authors feel that sexual reproduction is the primary means of bitterbrush propagation. The plants are aided in establishment by rodents through the caching of seeds.

Values of Bitterbrush

Bitterbrush is an important ingredient in the diet of many animals. Mitchell (1951) indicates cattle use bitterbrush as forbs and grass become depleted. Other large animals that utilize bitterbrush are sheep, goats, deer, elk, and antelope (Hormay 1943). Bitterbrush is a particularly valuable plant on mule deer winter ranges for it is utilized intensively by deer in the fall and early winter (Interstate Deer Herd Committee 1954, Wilkins 1957). Investigations of seasonal trends in carbohydrate content in bitterbrush indicate that the fall and early winter are the times when the greatest percentage of carbohydrates are available (Short et al. 1966, McConnell and Garrison 1966).

Other animals that utilize bitterbrush include mice, chipmunks, and ground squirrels. The voles (Microtus spp.) utilize bitterbrush primarily during periods of high vole population density when they girdle the stems beneath the snow during winter (Hoskins and Dalke 1955). Other mice (Peromyscus spp.), chipmunks (Eutamias spp.), and ground squirrels (Citellus spp.) eat large quantities of bitterbrush seed in the fall and also cache seeds throughout the summer. Gordon

(1943) reports that ground squirrels and chipmunks make many small local caches when food is abundant with a main food cache in or near the home den. However when food is scarce the number of these small local caches decreases.

It is apparent from the above discussion that bitterbrush is an important food source for a variety of animals. In addition this plant is an important aid in erosion control and watershed stabilization because it readily invades road cuts and similar pioneer sites.

Objectives

Primary among the multiple goals of this study is the identification of peak establishment periods over past years. The establishment peaks, if they exist and can be defined, are to be explained primarily in terms of temperature and precipitation records. The relative importance of seeds as opposed to vegetative means of reproduction is to be determined. Corollary to this goal is an investigation into the establishment of plants through caches of rodents. These caches are manifest in the plant population by points containing multiple plants. Comparing the frequency of rodent caches with the establishment peaks and associated weather records a hypothesis on the interaction of rodents may be proposed.

A further goal of the study is to investigate the effects of physical site factors on the growth, vigor, and establishment of

bitterbrush. The response of bitterbrush and ponderosa pine to temperature and precipitation as measured by ring width variation will be determined. The comparison of measured ponderosa pine and bitterbrush ring width sequences will be made to determine the usability of ponderosa pine as an index to bitterbrush growth or establishment in future studies.

An attempt will be made to determine if some simple physical measurement of the crown or stem could be isolated which would not require destruction of the plant or extensive time to obtain in the field and yet would yield usable age estimates with which to build age structures for bitterbrush stands.

DESCRIPTION OF THE STUDY AREA

Location

The area selected for study lies in the Front Range of the northern Colorado Rocky Mountains. Most of the area is in the Cache la Poudre River drainage west of Fort Collins, Colorado. The study area lies between 40° 30' and 40° 45' north latitude and between 105° 15' and 105° 45' west longitude. It is approximately 23 miles in the east-west dimension and 12 miles in the north-south dimension (Figure 2).

Geology and Soil

The easterly dipping paleozoic sedimentary beds which are still evident in the foothills to the east of the Front Range have been eroded away from the study area where most of the soil has developed from parent material of Pre-Cambrian rocks, primarily granite (Fenneman 1931). Topographically, the area is rugged and mountainous having been formed relatively recently by the cutting down of the Cache la Poudre River and its tributaries into an older peneplain (Fenneman 1931). The valleys in the area are steep-sided with the soils being relatively young and poorly developed.

Figure 2. Locations of the bitterbrush plots sampled and weather stations used.

that the plot fell well inside the bitterbrush stand. The plot center was marked with a wooden 2x2 four feet long driven into the ground and flagged with a plastic ribbon.

Data Collection

Physical Measurements on the Plot

Data taken on the plot as a whole were the date that sampling on that plot was started, the plot radius in feet, the aspect as an azimuth in degrees from magnetic north, the slope in percent, the elevation in feet above sea level, and bitterbrush density on both an absolute and relative basis. The aspect was determined by measuring the azimuth of the fall line with a lensatic compass. The slope was determined by use of an abney level read in percent. The elevation was read from a 7.5 minute topographic quadrangle of the area. Absolute bitterbrush density was rated on a 1, 2, or 3 scale based on the experience of the observer with other bitterbrush stands in the same area. A low density stand was recorded as 1. The biomass percentage of bitterbrush present relative to other shrub species on the site was estimated as either less than 25% which was recorded as 1, 26% to 50% which was recorded as 2, 51% to 75% which was recorded as 3, or greater than 75% which was recorded as 4.

Figure 3. Plot number 9 is a bitterbrush community with no overhead canopy but a rather large big sagebrush component.

Figure 4. Plot 11 has a sparse overhead canopy of ponderosa pine and a shrub component consisting of bitterbrush, true mountain mahogany, squaw currant, mallow ninebark, skunkbush, big sagebrush and waxflower.

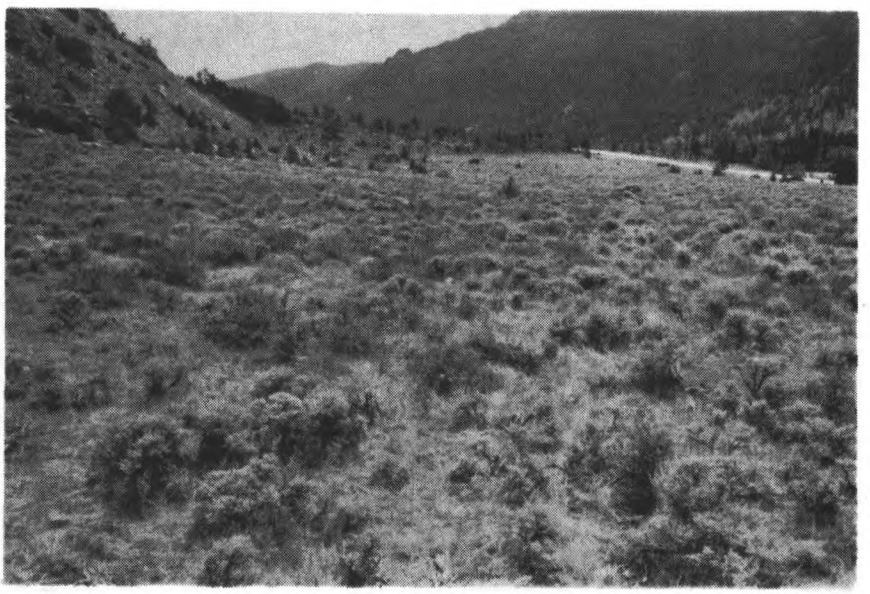


Figure 5. Plot 8 is an example of a bitterbrush stand under a moderately dense canopy of ponderosa pine.

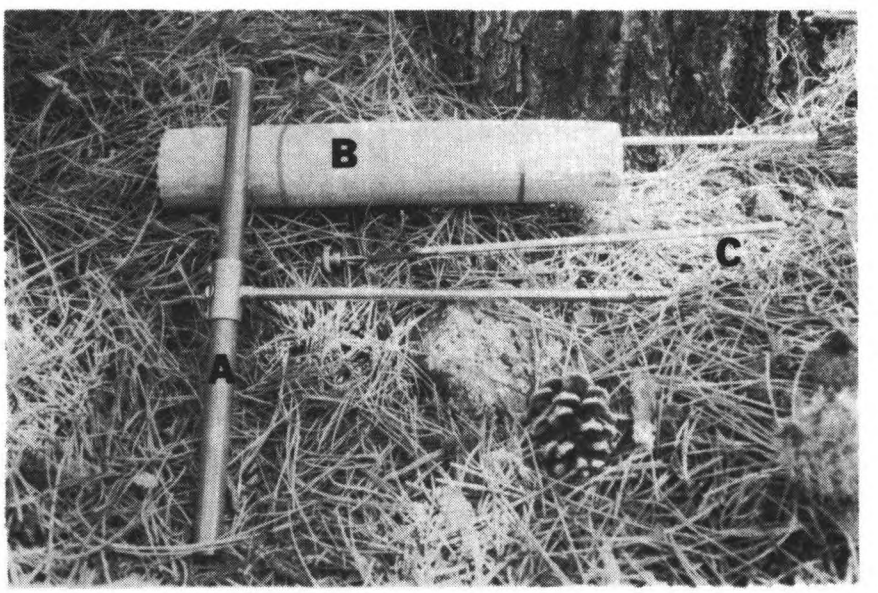
Ponderosa Pine

Three ponderosa pine trees were selected on or near each plot for control on the chronology of the area. A core, using a Swedish increment borer, was obtained from each tree and stored in a roll of corrugated cardboard with the identification number written on the outside (Figure 6). The tree number was designated by a combination of the plot number and the tree sequence number starting from magnetic north clockwise. For example for three trees cored on plot four the numbers would be 41, 42, and 43. The azimuth from magnetic north and distance in steps from the plot center to each of these trees was recorded for ease of relocation.

Bitterbrush

The bitterbrush sampling was based on a circular plot with 100 possible points designated on a radial grid calculated such that each point within the grid represents areas of equal size (Van Dyne 1965). Fifty of the 100 possible points in the grid were selected by drawing pairs of numbers from a random number table. The first number of each pair designated the radial and the second number designated the distance from the center along that radial thus specifying the point to be sampled (Snedecor and Cochran 1967). The fifty points within the grid thus selected were located in the following manner. The radials were determined on basis of magnetic north using a magnetic compass

Figure 6. Tree coring equipment: A. Increment borer, B. Cardboard storage roll, C. Increment borer tray with core in place after removal from the borer. The borer is 12 inches long.


B
C
A

to determine the direction of the radial to the nearest 1^{o}, the distances along the radial were determined by pacing. When the point was located on the ground the bitterbrush plant nearest that point was selected for an observation. A map of each site was plotted on polar coordinate graph paper depicting the location of the plants collected.

Each plant was recorded according to plot number, radial number, and distance number, this combination identifying the plant uniquely and hereafter referred to as the identification number. Data collected on each plant were crown height to the nearest centimeter, maximum crown diameter to the nearest centimeter, minimum crown diameter (perpendicular to the maximum crown diameter) to the nearest centimeter, the number of layers, if any, total length of all layers combined to the nearest centimeter, and an ocular estimate of the percent of dead material in the crown. The stem was cut above ground level with a large pair of hedge pruning shears except for very large specimens which were cut with a tree trimming saw. The stem was then excavated using a round-nosed shovel and severed below ground level to obtain a sample of the oldest part of the plant stem. Presence or absence of fungus (Agrobacterium spp.) on the root near ground level was noted. The specimen was labeled with its identification number and stored in a paper bag. The 'A' horizon soil depth at the location of each plant was measured with a flexible steel centimeter rule and recorded to the nearest centimeter down to

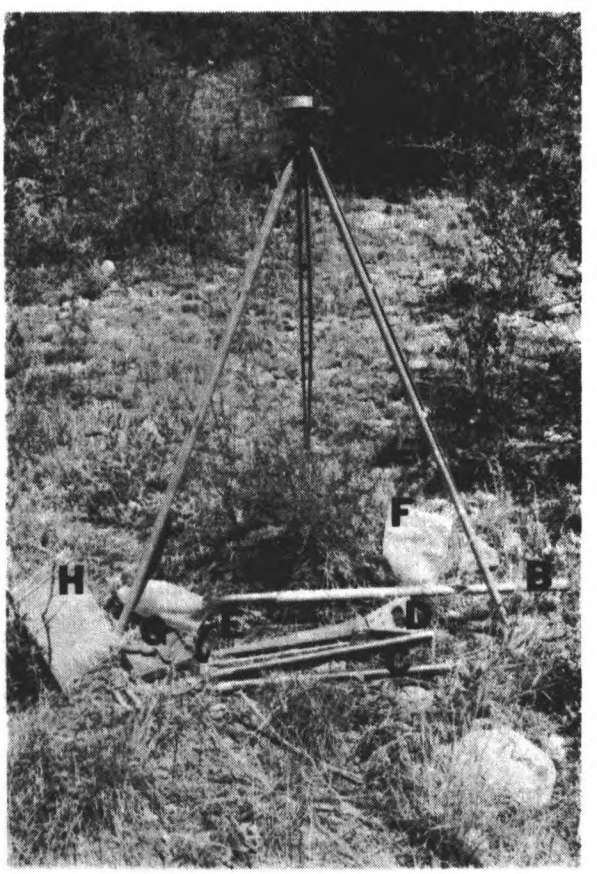
a maximum depth of 25 centimeters. The field equipment used is shown in Figure 7. Determination of the 'A' horizon thickness was based primarily on color and texture of the soil. A sample copy of the field data form used is found in Appendix 1. The field data collected plus age data determined in the laboratory are tabulated in Appendix 2.

A brief qualitative description indicating the salient features of each community was recorded after collection on each plot. These descriptions are included in Appendix 3.

Stem Preparation

The bitterbrush stems were air dried for 6 to 8 weeks. The stems were examined to determine where a sound section could be obtained near ground level which should include the oldest portion of the stem. The sectioning was done using a hand coping saw for small fragile stems or an electric sabre saw for larger, more durable specimens. These sections were cut to approximately one inch in length for convenient handling and storage. The stem identification number was written on one sanded end of the section with a black felt tip pen. The other end of the section was polished using an apparatus similar to the one described by Roughton (1966). The apparatus consisted of three circular sanding disks 9 inches in diameter cut from 1/4 inch tempered masonite. These were mounted on the three

Figure 7. Field equipment: A. Compass and tripod, B. Round-nosed shovel, C. Pruning shears, D. Tree trimming saw, E. Steel centimeter rule, F. Paper bag with bitterbrush stems, G. Compass case, and H. Clip board.


F
H
B
D

available arbors after being surfaced with sandpaper of various grits. The sandpaper was cemented to the face of the disk with rubber cement for ease of replacement. The five grades used were: garnet cabinet paper with grits #80 and #150, silicon carbide wet or dry paper with grits #220, #320, and #400. The sixth face was surfaced with felt. The side of the section to be polished was run through the series of sandpaper disks and finally polished on the felt to obtain a very smooth and flat surface. The felt technique was developed after early attempts failed to obtain a high polish with fine sandpaper. Initial attempts with the felt pad included using a polishing compound, Rogers rubbing and blending compound #4045 commonly used in automotive body shops, which gave a very polished and smooth surface but tended to fill the wood pores. This had a tendency to obscure the rings slightly so was later discontinued and the felt was used dry.

Dating

The prepared stem sections and the ponderosa pine cores were taken to the Laboratory of Tree-Ring Research, Tucson, Arizona, for further measurement and analysis. Here the ponderosa pine cores were mounted in prepared, grooved, wooden strips which left half the diameter of the 4 mm diameter core exposed above the face of the wooden strip. The cores were then sanded down to the wooden strip with an electric belt sander using successively finer grits

finishing with a 200 grit belt. The resulting core showed the exposed growth rings of the ponderosa pine in well defined transverse lines (Figure 8A).

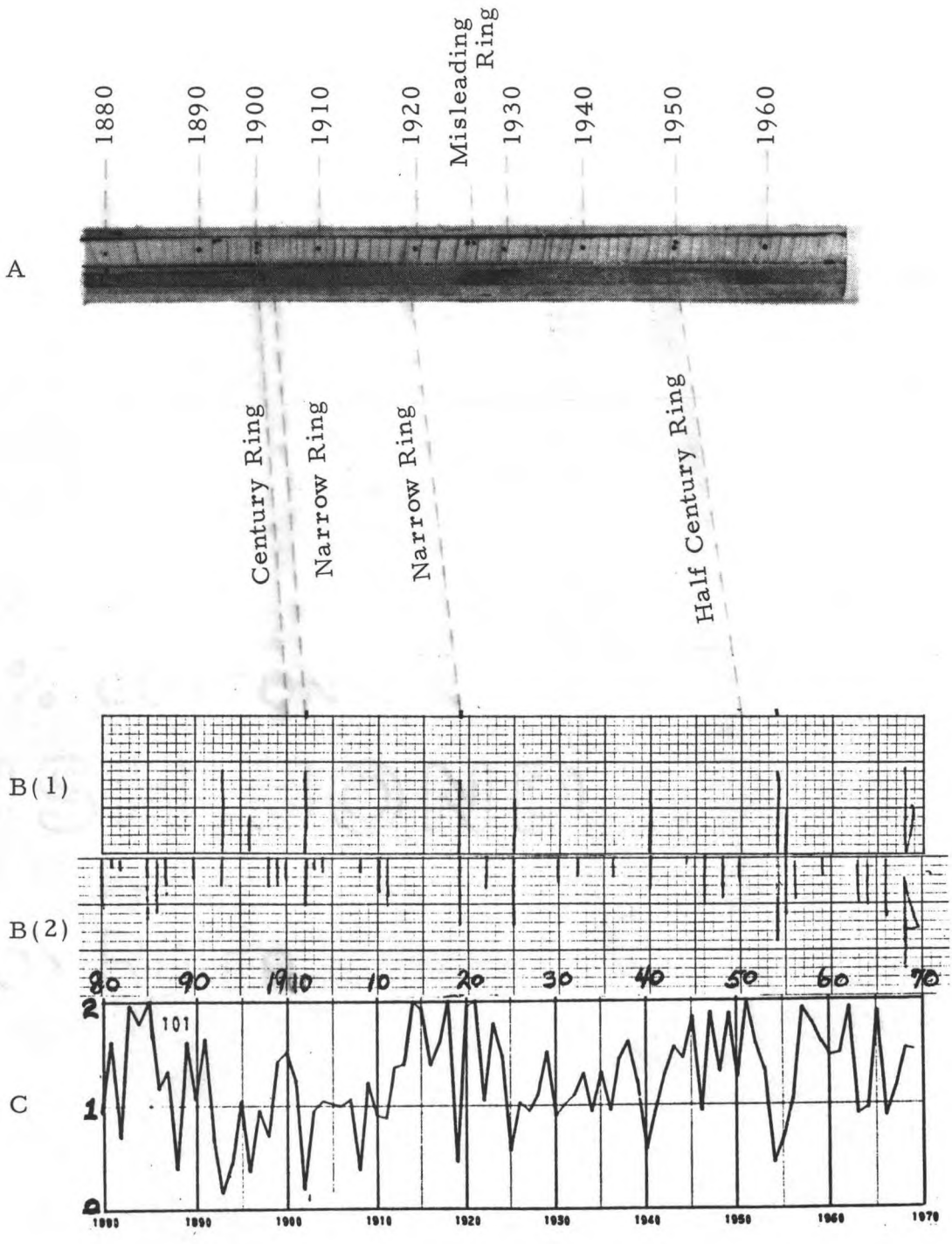
The chronology of the area was worked out based on these prepared ponderosa pine cores. Techniques used were those common to tree-ring dating as described by Stokes and Smiley (1968). As a 'feel' for the material is developed a master skeleton plot is compiled. This master skeleton plot (Figure 8B(2)) is a hand drawn sequence depicting the narrow rings observed in the material. Normally drawn on a strip of graph paper for ease of utilization, the narrow rings on the master skeleton plot are drawn from the upper edge of the strip as bars vertically downward. The length of the bar is roughly proportional to the narrowness of the ring (i.e., the narrower the ring the longer the bar). When an adequate amount of material has been plotted in this fashion and the master skeleton plot has been corrected to represent what is considered the true skeleton plot for the area, it is then used as a guide for dating all subsequent specimens. Skeleton plots of subsequent material are drawn on separate strips of graph paper with the base of the bar at the lower edge of the strip and the bar extending vertically upward, still with the length of the bar proportional to the narrowness of the ring. The subsequent skeleton plots may then be compared with the master skeleton plot simply by placing the two edge to edge, as in Figure 8B,

Figure 8. A comparison of three ways of interpreting ring width sequences:

A. A ponderosa pine core

B. Skeleton plots (1) the skeleton plot of the core A, (2) the master skeleton plot for the area.

C. A graphic display of the measured ring widths (mm) from the core A.


1880
1890
1900
1910
1920
Misleading Ring
1930
1940
1950
1960
A
Century Ring
Narrow Ring
Narrow Ring
Half Century Ring
B(1)
B(2)
80
90
1910
10
20
30
40
50
60
70
C
2
1
0
101
1880
1890
1900
1910
1920
1930
1940
1950
1960
1970

and matching the narrow rings. The sequence of narrow rings in the master skeleton plot whould be matched exactly by the narrow rings of subsequent material. If the narrow rings are displaced this is evidence of either double (false) rings or missing rings. The master skeleton plot may also be used to verify graphical display of measured ring width data as indicated in Figure 8C.

The specimens are dated and pin-pricked prior to ring width measurement. The pin-pricking is done by comparing the specimen with the master skeleton plot and placing a single pin-prick in the center of decade rings. Two pin-pricks are placed side-by-side within half-century rings, and three pin-pricks are placed side-by-side within century rings. The presence of double, missing, or otherwise misleading rings is noted by putting a pin-prick along the edge of the core on either side of the misleading ring (Figure 8A). Some 1246 bitterbrush sections were dated in a similar manner. A representative radius of the section was selected and scribed with a teasing needle. The rings along the mark were then dated in the manner described above for ponderosa pine.

The fact that ponderosa pine and bitterbrush crossdate very well, that is the ring sequence of narrow and wide rings is approximately the same in both species, made it possible to utilize the master skeleton plot developed for the ponderosa pine while dating the bitterbrush stems. Other studies have also found bitterbrush to be

highly sensitive and readily dated (Ferguson 1959, Roughton 1966). Missing rings and false rings were present only rarely and were not considered to be a serious problem (Ferguson 1969).

Since the bitterbrush sample was a representative (random) cross-section of the shrub population rather than individuals selected for dendrochronological examination, the precise age could not always be determined. Causes of difficulty are rotten or missing stem centers and very tight or complex ring patterns or both, particularly near the stem pith. In light of the uncertainty introduced by the above-mentioned difficulties the bitterbrush stems were dated in the following three-step sequence:

1. The visible rings were crossdated backwards in time as far as the specimen would permit thus providing a year for the oldest identifiable part of the stem.
2. An estimate of the year of establishment was made on the basis of my experience in reading the sections.
3. A confidence rating based on the nature of the stem was assigned to this year of establishment. A confidence rating of 1 indicates that the year of establishment is within plus or minus one year of the year estimated, a confidence rating of 2 indicates an interval of plus or minus five years, a confidence rating of 3 indicates an interval of plus or minus 10 years, a confidence rating of 4 indicates an

interval of greater than plus or minus 10 years and a confidence rating of 5 indicates that a conservative estimate was made of the year of establishment and that the actual year may be "considerably" earlier.

Ring Width Measurement

The ring widths of ten selected ponderosa pine were measured to the nearest .01 mm utilizing a custom built instrument designed and built by Fred C. Hensen Co., Pasadena, California, for the Laboratory of Tree-Ring Research. The apparatus consists of a binocular microscope with a fine cross-hair in one ocular and a stage on which the specimen is mounted and which could be moved by turning a drive screw. Thus by aligning the cross-hair on one edge of the ring and driving the stage until the cross-hair arrives at the other edge of the ring the thickness of the ring is measured. The angular motion of the drive screw is interpreted by a counter in .01 mm and automatically punched on paper tape. The data are then punched on Hollerith cards by running the paper tape through a tape-to-card converter. The resulting data are stored as ten measured ring-widths per card. The ring widths for the selected ponderosa pine cores were measured beginning with the ring formed in 1881 to and including the ring formed in 1969. Fifty of the best and most representative bitterbrush sections were also measured. Ring width measurement data are tabulated in Appendix 4.

ANALYSIS AND DISCUSSION

Age Structure

The bulk of the analysis, in one way or another, is based upon the age structure data for the bitterbrush community. Figure 9A depicts the age structure of the entire sample with exception of 4 stems which were lost and two stems which were established earlier than 100 years ago. This sample was then to be the basis for determining the establishment patterns in bitterbrush over time. Early autocorrelation analyses indicated a five year periodicity in establishment.

Attempts were made to correct the sample for mortality in the following fashion. If one were able to follow a community of plants for 100 years to record the number of plants established annually and if the number of plants established from year to year was relatively constant, the plot of these data over time would result in an approximately horizontal line at a level indicating the yearly establishment. Establishment in this context is being used to mean germination and survival to the end of the first summer. My sample however was not taken over a period of years but rather at one point in time. A sample taken in this fashion is confounded with mortality. If we make the simplifying assumptions that establishment is relatively constant

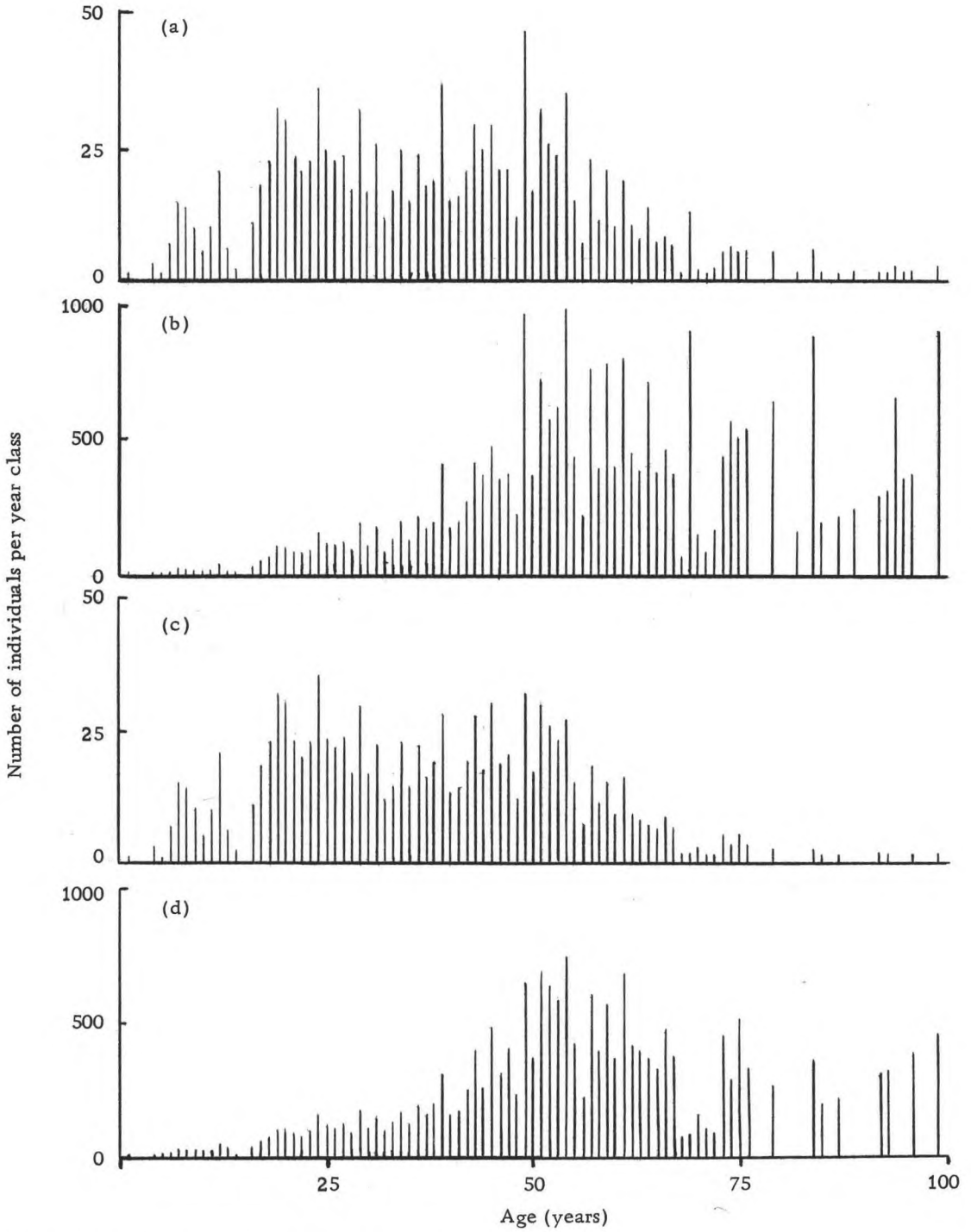


Figure 9. (a) Age structure of the entire sample.
(b) Establishment history I. Age structure in (a) corrected for mortality.
(c) Age structure in (a) culled to include only those plants with a high degree of confidence in the year of establishment.
(d) Establishment history II. Age structure in (c) corrected for mortality.

from year to year and that mortality is relatively constant from year to year then we can correct for mortality quite simply. If our assumptions are correct and we can determine what the survival rate from one year to the next is then our age structure corrected for mortality should represent the approximately horizontal establishment level indicated above. My attempts at correcting the age structure for mortality resulted in the establishment history shown in Figure 9B where the high peaks in establishment for the older part of the sequence are approximately horizontal as is the record from 1930 to 1950 (19 to 39 years ago). The rate used in this correction is 94% survival from one year to the next. This correction for mortality also strengthened the apparent periodicity of establishment in the population as determined by autocorrelation analyses.

The survival rate of 94% is considerably higher than most literature values. Holmgren (1956) reports on the survival of bitterbrush for the first three years after seeding under three treatments. In his control situation the seeds were placed directly into the ground with no weed control, no seedlings survived through the first summer. Under treatment one the area into which the seeds were planted was cleaned once prior to seeding and then left, 48% of the seedlings emerging survived for the first summer and 14% still survived after three years. Treatment two was cleaned prior to seeding and kept clean during the first season, the survival at the end of the third

year was greater than 50% of the seedlings emerging. Treatment three was kept clean the three years of the trial. In treatment three 68% of the emerging seedlings survived the first summer with greater than 50% surviving at the end of the three years.

Hubbard (1956) states that soil moisture is the most important factor in seedling establishment. His data indicates that seedling mortality under heavy plant competition is 57% to 60% the first year. Seedling mortality under light plant competition is only about 21%. Hubbard also compares growth of bitterbrush under weed-free and natural conditions. He indicates crowns under natural conditions have reached 4.5 to 5.5 inches in height after three years, while crowns under weed-free conditions averaged 26 inches high. From these findings I would conclude that the survival estimate of 94% is optimistic and that the actual survival rate is probably much lower.

I decided to cull my sample and retain only those bitterbrush plants which had an assigned confidence of one or two. The resulting sample contained 1110 plants or 89.2% of the original sample. The age structure of the culled sample is shown in Figure 9C. Auto-correlation analyses of the culled age structure indicated that the periodicity which was noted in the earlier analyses had disappeared. The disappearance of the periodicity was due to the method used in estimating the year of establishment. For plants which were difficult to date the year of establishment was estimated with a high degree of

uncertainty. There was a strong tendency to assign these plants to either decade or half decade years. This method of assigning the year of establishment for these plants, approximately 10% of the sample, resulted in the apparent periodicity of establishment for the bitterbrush population.

While the correction for mortality is a crude estimate at best it was used to correct the culled age structure data in an attempt to get a more realistic relationship between the number of plants established in a particular year and the observed weather. The establishment history of the culled sample is shown in Figure 9D.

Predicting Age from Physical Measurements

The age structure as determined by the methods indicated above (Figure 9C) is considered to be the best age structure possible to obtain for this particular species. While being accurate, this method is relatively slow and tedious and also requires destructive sampling of the plants. It was considered desirable to have a technique for determining age structures which is faster, can be carried out in the field, and does not require destructive sampling of the plants. With this end in mind attempts were made to predict the age of plants from various physical measurements made on the crown and stem.

McConnell and Smith (1963) carried out similar experiments based on four separate sites. Their analyses indicated that the

maximum stem diameter was the best indicator of age, but must be determined for each site since the slope of the regression equation changes from site to site. Their regression analyses, based on stem maximum diameters as the independent variable, resulted in coefficients of determination ranging from 58% to 93%. The results of a regression analysis on 25 plots with 49 or 50 stems per plot is summarized in Table 3. From Table 3 we see that the slopes of the simple linear regressions on maximum stem diameter range from .417 to 1.655 with a mean slope for the 25 plots of 1.008. The coefficient of determination ranges from a low of 23% for plot 15 to a high of 74% for plots 3 and 22. The mean coefficient of determination for the 25 plots is 53%.

The coefficient of determination values presented are all in percent. The values are calculated as:

$$r^2 = 100 \times \left(1 - \frac{SS_{reg}}{SS_{\bar{y}}}\right)$$

where:

r^2 = coefficient of determination value reported

SS_{reg} = sum of squared deviations from the regression line

$SS_{\bar{y}}$ = sum of squared deviations from the mean of the dependent variable.

Plot 3 was selected, since it had a relatively high coefficient of determination, for further analysis. If the number of independent

Table 3. Summary of linear regression analyses of plant age or maximum stem diameter by plot. The number of observations is either 49 or 50 in all cases.

Plot	Mean Age	Regression Intercept	Equation Slope	Coefficient of Determination (Percent)
1	30	16	0.9	39
2	35	13	1.0	66
3	40	6	1.1	74
4	50	23	1.1	61
5	51	27	1.1	57
6	30	19	0.5	31
7	49	30	0.6	32
8	48	26	1.1	57
9	49	10	1.3	65
10	42	16	1.4	48
11	22	9	0.8	55
12	55	34	0.7	46
13	40	19	0.7	54
14	29	13	0.7	61
15	35	24	0.4	23
16	44	24	1.0	50
17	45	33	0.5	25
18	20	5	1.6	52
19	47	28	0.8	45
20	29	11	1.1	63
21	33	13	1.3	73
22	31	5	1.7	74
23	37	9	1.9	65
24	41	17	1.4	55
25	37	17	0.7	55

variables was increased from one, stem maximum diameter, to five to include stem minimum diameter, crown height, crown maximum diameter, and crown minimum diameter the coefficient of determination increases from 74% to 84%. However if the data are culled to exclude all except those plants with a confidence in the year of establishment of one or two, and the analysis is recalculated with the five independent variables mentioned above the coefficient of determination drops from 84% to 71%. If the regression is forced through the origin the coefficient of determination is further decreased from 71% to 59%. Logarithmic transformations were attempted on the data by taking the logarithm of both the dependent and independent variables. Coefficients of determination for this analysis ranged from 52% for a single independent variable, crown maximum diameter, to 66% when all five variables are included. The coefficient of determination for a single variable linear regression for each of the independent variables tested for plot 3, on only those stems which have a confidence in the year of establishment of one or two, range from 14% for crown height to 59% for stem maximum diameter (Table 4). Although I agree with McConnell and Smith that stem maximum diameter appears to be the best single indicator of age I would hardly recommend the use of this method for any but estimates where only the most gross sort of accuracy is required.

Table 4. Summary of regression analysis of plant age on various plant dimensions for plot 3.

Independent Variables[1]					Number of Observations	Transformations or Constraints	Coefficient of Determination (Percent)
X_1	X_2	X_3	X_4	X_5			
x	x	x	x	x	49		84
			x		49		74
x	x	x	x	x	45		71
x					45		14
	x				45		42
		x			45		34
			x		45		59
				x	45		53
x	x	x	x	x	45	Constrained through (0, 0)	59
			x		45	Log_e X, Log_e Y	61
	x				45	Log_e X, Log_e Y	52
x	x	x	x	x	45	Log_e X_1, X_2, X_3, X_4, X_5, Log_e Y	66

[1] X_1 - Crown height

X_2 - Crown maximum diameter

X_3 - Crown minimum diameter

X_4 - Stem maximum diameter

X_5 - Stem minimum diameter

Stem Growth Response to Weather

Long study has shown that the widths of growth rings in trees reflect the temperature and precipitation regimes under which they are formed (Fritts 1966). Multivariate techniques for specifying the relationships between tree growth and weather have been developed and are being used by the Laboratory of Tree-Ring Research (Fritts 1970). In order to use the multivarate techniques indicated above it is necessary to obtain growth-ring indices from the ring width data derived from measurements of the growth rings themselves. The indices are calculated from the ring width measurements as deviations from a regression line, the form of which is specified to account for variability in the ring widths due to growth (Fritts 1963, Fritts, et al. 1969). The standardizing process, in addition to correcting the ring width sequence for growth, reduces all ring width measurements to a scale from approximately 0 to 2 for the data presented in this analysis. This facilitates interplant and interspecies comparisons. The measurements were standardized by use of linear regressions in all cases with a separate equation being fitted to the sequence from each stem (Appendix 5).

The ring growth response to temperature and precipitation was determined by the multivariate technique developed by Fritts (1970) at the Laboratory of Tree-Ring Research and the University of Arizona Computer Center. This technique is executed in three steps:

1. A principal components analysis is performed on the original temperature and precipitation data from the area of concern.
2. The ring width measurements are standarized to obtain ring width indices which are corrected for age specific growth.
3. A stepwise regression of the ring width indices on the principal components of the weather data is performed to determine the response to temperature and precipitation.

The resulting response function indicates departures from normal due to differences in weather. The results of the response analysis are summarized in Figures 10 through 14. Figures 10, 11 and 12 represent the response of bitterbrush at various elevations. Figure 13 is the response of a composite of bitterbrush from all elevations, and Figure 14 is a response of ponderosa pine from all elevations. The solid line depicts the calculated response function and the dashed lines on either side of the response function depict the 95% confidence band about this response function.

The following observations are based primarily on Figure 13 with some reference to Figures 10 through 12. It is apparent from the bitterbrush response functions that increased winter temperature, particularly in January, results in increased ring growth; however higher spring temperatures result in reduced ring growth.

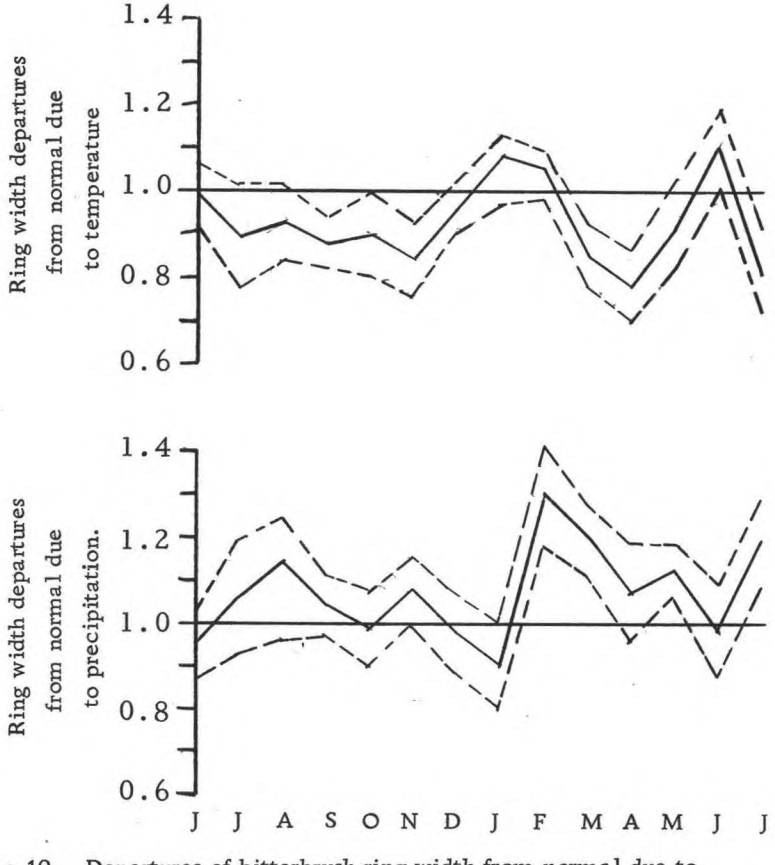


Figure 10. Departures of bitterbrush ring width from normal due to weather for plots between 6000 feet and 7000 feet above sea level. Departures indicated are in response to one unit increase in the driving variable. The dashed lines indicate the 95% confidence band about the mean response

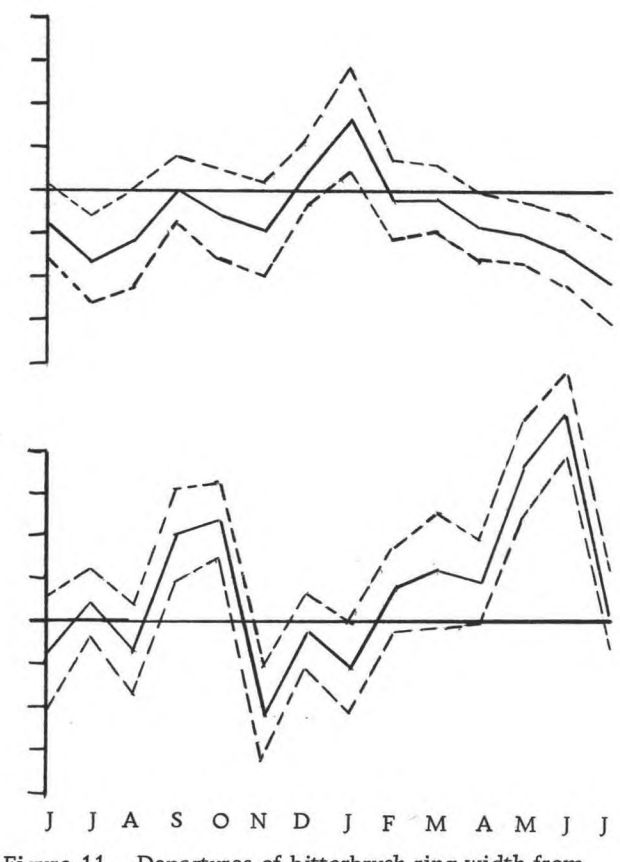


Figure 11. Departures of bitterbrush ring width from normal due to weather for plots between 7000 feet and 8000 feet above sea level. Departures indicated are in response to one unit increase in the driving variable. The dashed lines indicate the 95% confidence band about the mean response.

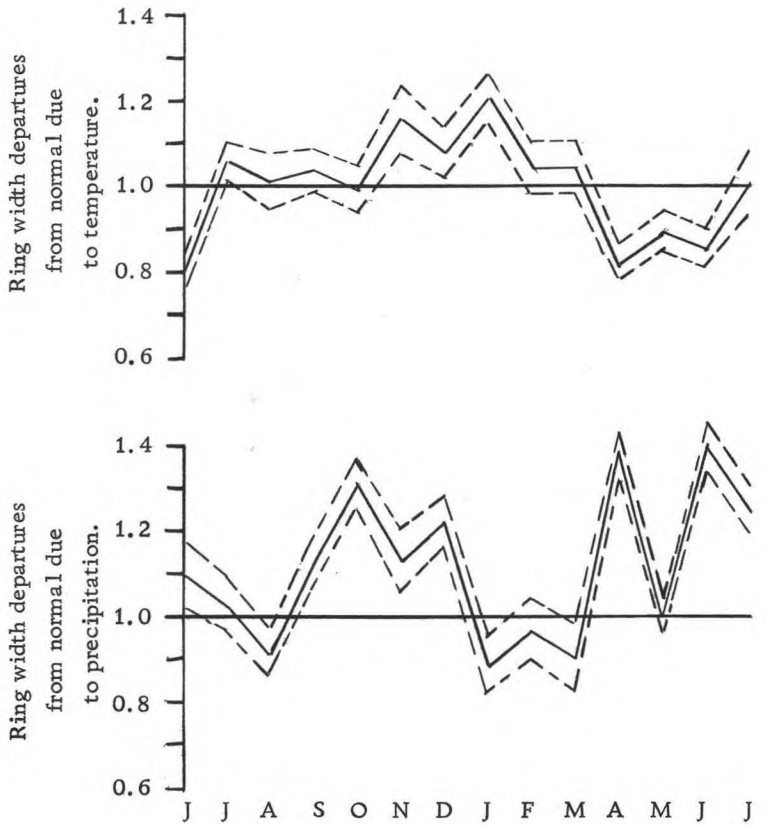


Figure 12. Departures of bitterbrush ring width from normal due to weather for plots between 8000 feet and 9000 feet above sea level. Departures indicated are in response to one unit increase in the driving variable. The dashed lines indicate the 95% confidence band about the mean response.

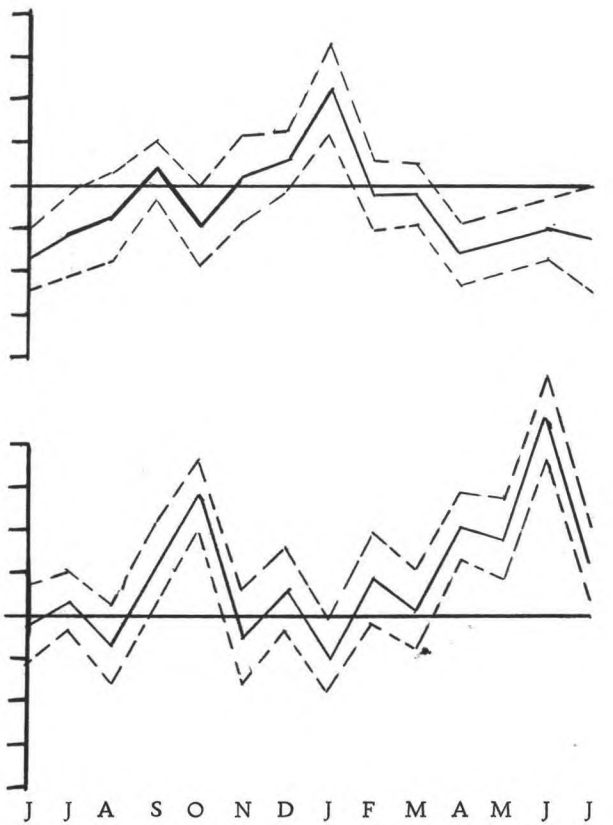


Figure 13. Departures of bitterbrush ring width from normal due to weather for plots between 6000 feet and 9000 feet above sea level. Departures indicated are in response to one unit increase in the driving variable. The dashed lines indicate the 95% confidence band about the mean response.

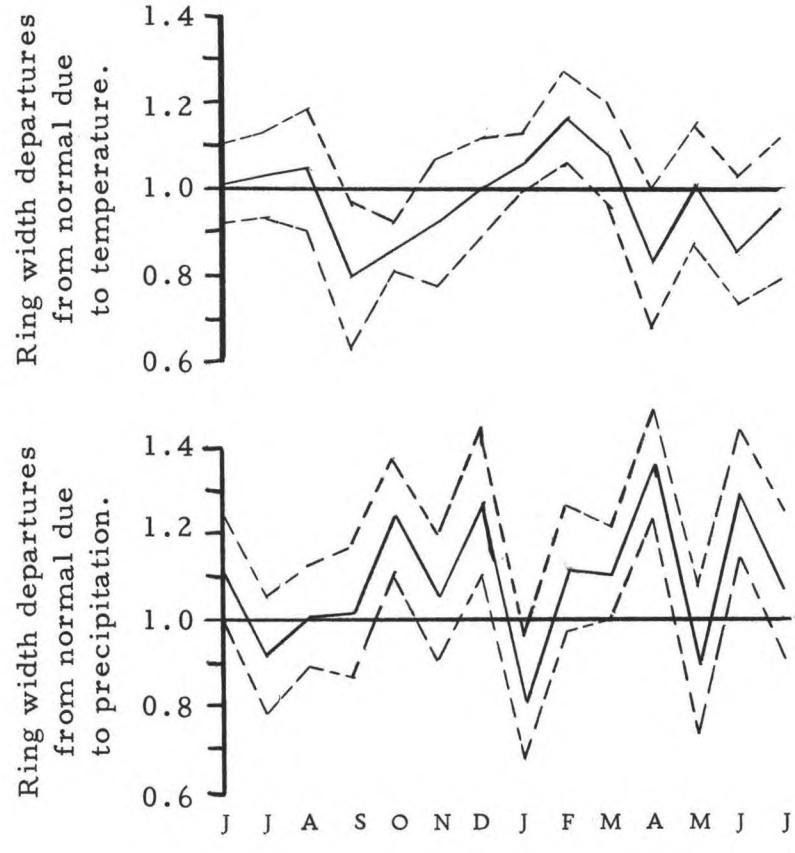


Figure 14. Departures of ponderosa pine ring width from normal due to weather for plots between 6000 feet and 9000 feet above sea level. Departures indicated are in response to one unit increase in the driving variable. The dashed lines indicate the 95% confidence band about the mean response.

The precipitation response follows a slightly different pattern. With increased fall precipitation, primarily that which occurs in September, and increased spring precipitation, primarily that which occurs in June, ring growth is increased. It does not appear however that precipitation causes a clearly defined restriction on ring growth at any time of the year. It appears that bitterbrush is probably never seriously moisture-limited, with the possible exception of early winter, as far as growth of established plants is concerned but may be temperature-limited, particularly during the spring of the year.

The ponderosa pine response is less well defined. It appears that there is little temperature response in ponderosa pine with the possible inhibition of growth with high autumn temperatures. The growth of ponderosa pine is enhanced by precipitation occurring during the early spring and summer and by that of the previous autumn. Like bitterbrush, however, it appears that ponderosa pine may be slightly moisture limited by the moisture conditions occurring during early winter although high autumn temperatures may be a more serious inhibitor of ring growth.

Interspecific Ring Width Comparisons

Since the skeleton plot crossdating technique proved very useful in crossdating between bitterbrush and ponderosa pine it was hypothesized that perhaps the ring widths of bitterbrush could be predicted

from ring widths of ponderosa pine. The value in being able to do this is that ponderosa pine cores are obtained more easily and more quickly than are bitterbrush stem sections and that the pine cores are also much less difficult to read. Prior to statistical analysis the ring widths of bitterbrush versus ponderosa pine were plotted. The resulting scattergram demonstrated a pattern of such randomness that it was obvious that predictability was not feasible. No further analysis on predicting bitterbrush ring widths from those of ponderosa pine were made. Even ring width prediction between plants within species showed very little if any real correlation.

Topographic Effects

Elevation, slope and aspect were measured on each of the 25 sites. The effect of these factors on growth, vigor as measured by percent live material in the crown, and establishment as indicated by the age structure of the stand were analyzed. Elevation was divided into low, below 7500 feet above mean sea level, and high for elevations of 7500 feet and higher. Slope was divided into flat, for slopes of 30% or less incline, and steep, for slopes with greater than 30% incline. Aspect was divided into wet, those aspects from 316° to 135° true north inclusive, and dry, for aspects of 136° to 315° true north inclusive.

Growth

The analysis of covariance of the response of growth to topographical factors is summarized in Table 5. Growth in this sense is taken to be stem diameter growth since the measurement used as an index is the maximum stem diameter at ground level. The covariates considered were age of the plant and 'A' horizon soil depth.

The slope-aspect interaction term failed to be significant as did the covariate 'A' horizon soil depth. An analysis of covariance model with these two terms deleted failed to be significantly different from the full model with all terms included. Since the covariate age is highly significant all stems were corrected to a standard age. A linear correction for age was considered reasonable since the stem growth as a function of age, as determined from ring width measurements on two long-lived bitterbrush plants (Figure 15), does not deviate greatly from a straight-line relationship. The two stems depicted were chosen because they represent different areas, have relatively long series and initial inspection of ring width plots indicated a greater than average tendency to deviate from a linear relationship.

Mean stem maximum diameters were calculated for each treatment combination based on the coefficients calculated in the Biomedical computer program (05V) for general linear hypothesis. These stem diameters were all based on the covariate age adjusted to

Table 5. Analysis of covariance table of the response to topographic factors of bitterbrush growth as measured by the stem maximum diameter.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value
Elevation (E)	1	9283	9283	128.82**
Slope (S)	1	580	580	8.05**
Aspect (A)	1	85	85	1.18
ExS	1	1407	1407	19.53**
ExA	1	231	231	3.21
SxA	1	37	37	0.51
ExSxA	1	978	978	12.74**
Among Plots Within Treatments	17	14464	851	11.81**
Covariates	2	70864	35432	491.70**
Age	1	70720	70720	981.41**
'A' Horizon Depth	1	40	40	0.54
Error	1083	78041	72	

** Significant at p=.01.

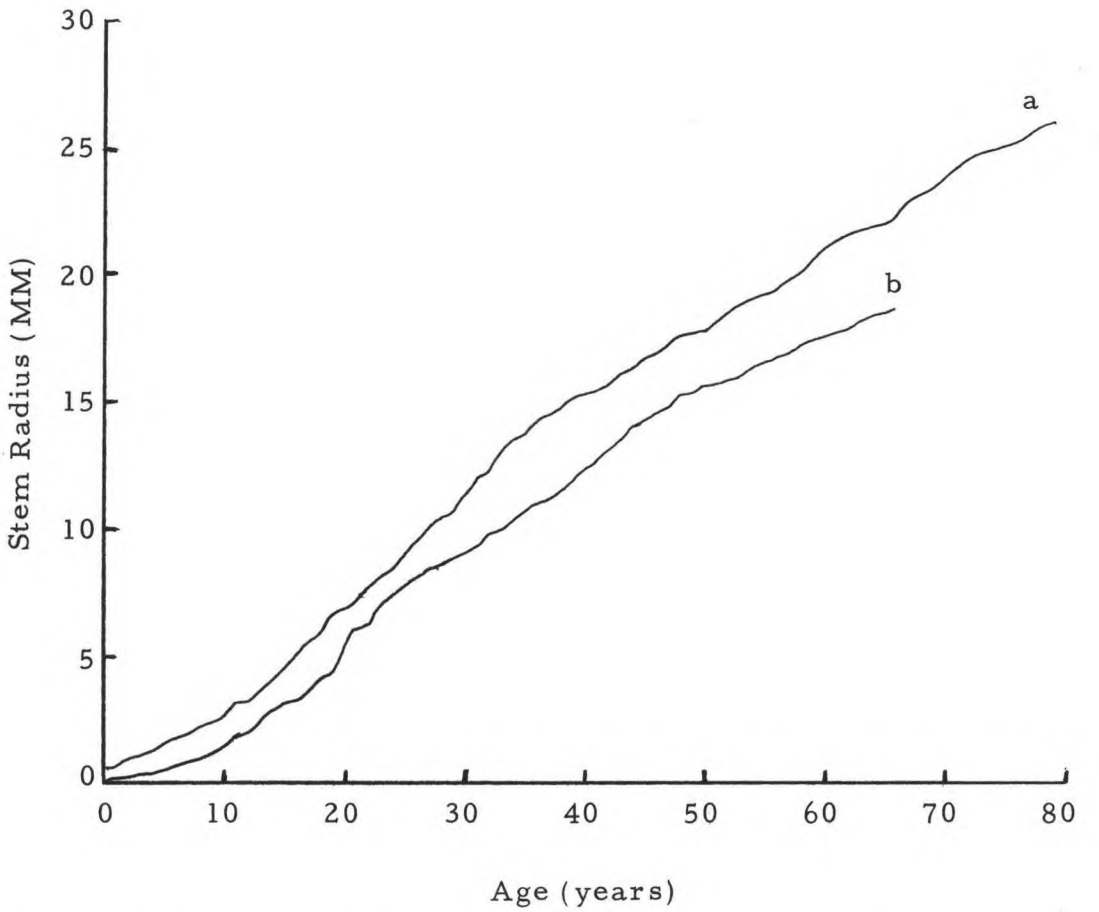


Figure 15. Stem radial growth, as indicated by the plots of cumulative ring width for stems 1294 (a) and 449 (b), is an approximately linear function of age.

30 years. A mean stem diameter of 21 mm for the low elevations as compared to the diameter of 15 mm for the high elevation stems was found to be significantly different at p=0.01 (Table 5). A mean stem diameter of 17 mm on flatter slopes was found to be significantly different at p=0.01 from a diameter of 19 mm found on the steeper slopes. Aspect was not found to have a significant effect on growth. The two-way interaction of elevation as conditioned by slope (ExS) was found to be significant at p=0.01. The mean stem maximum diameters for the treatment combinations (ExS) were calculated to be the following:

		Elevation	
		Low	High
Slope	Flat	19 mm	23 mm
	Steep	15 mm	15 mm

The three-way interaction between elevation, slope, and aspect (ExSxA) was also significant at p=0.01. The mean stem maximum diameters for the treatment combinations (ExSxA) were the following:

		Slope	
		Flat	Steep
Aspect	Wet	18 mm	25 mm
	Dry	20 mm	22 mm

Low Elevation

		Slope	
		Flat	Steep
Aspect	Wet	15 mm	15 mm
	Dry	15 mm	16 mm

High Elevation

This analysis indicates that elevation has the strongest effect on growth with slope second and aspect third in importance.

Vigor

The percent of dead material in the crown is considered to be a crude indicator of the state of vigor of the plant. The analysis of covariance used to analyze the response of vigor to topographical factors is identical in structure to the analysis outlined above for the response of growth (Table 6).

Elevation is seen to be the only significant topographical factor affecting vigor. The covariate, age, is highly significant and again the plants are corrected to a standard age for analysis. The mean percent dead material in the crown for 30 year old plants at low elevations is 35% while the mean percent at high elevations is 25%. This difference is significant at $p=0.01$ indicating that vigor is higher at higher elevations. The interaction of elevation as conditioned by aspect (ExA) is significant at $p=0.01$. The expected mean percent dead in the crown for the treatment combinations (ExA) were calculated to be the following:

		Elevation	
		Low	High
Aspect	Wet	34%	26%
	Dry	37%	23%

Table 6. Analysis of covariance table of the response to topographic factors of bitterbrush vigor as measured by the percent dead material in the crown.

Source	Degrees of Freedom	Sum of Squares	Mean Square	F Value
Elevation (E)	1	20090	20090	63.00**
Slope (S)	1	284	284	0.89
Aspect (A)	1	55	55	0.17
ExS	1	852	852	2.67
ExA	1	2661	2661	8.34**
SxA	1	58	58	0.18
ExSxA	1	709	709	2.22
Among Plots Within Treatment	17	54221	3178	9.97**
Covariates	2	138382	69191	216.99**
Age	1	136474	136474	427.99**
'A' Horizon Depth	1	331	331	1.04
Error	1083	345332	319	

** Significant at p=.01.

There are other very weak trends which the analysis indicates but which are not statistically significant. One of these tendencies is that a greater percent of the crown material is dead on steep slopes regardless of elevation and/or aspect. The most striking pattern is that the lower, steeper, southwesterly facing slopes have the greatest percent dead in the crown. This is an expected result since this particular type of site is under the highest stress. It was noted while sampling that the plants at the lowest elevations, which happened to occur on steep southwesterly facing slopes, appeared to have noticeably smaller leaves than did plants at higher elevations. This may be construed to be further evidence of the moisture and/or temperature stress on these sites. As with growth, vigor was found to be most strongly effected by elevation, very slightly by slope and to no measurable extent by aspect except as a conditioning variable.

Establishment

The establishment of bitterbrush as indicated by the age structures of the populations sampled was analyzed in a frame work similar to the analysis of variance performed on growth and vigor. For purposes of this analysis the culled age structure of 1110 plants was used with the year class frequencies lumped into ten 10-year age classes. The over-all structure of the analysis is presented in Table 7.

Table 7. Summary of age structure by plot and topographic site type. Data include only those stems which have a confidence in the year of establishment of one or two.

Elevation	Slope	Aspect	Plot	Age Classes 1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Low	Flat	Wet	11	13	9	15	9	2	1	0	0	0	0
			19	1	0	3	8	8	13	3	2	0	0
			Mean	7.0	4.5	9.0	8.5	10.0	7.0	1.5	1.0	0.0	0.0
		Dry	14	6	11	14	8	6	3	0	0	0	0
			15	3	1	9	12	11	2	0	0	0	0
			16	0	3	3	7	18	15	1	0	0	1
			Mean	3.0	5.0	8.7	9.0	11.7	6.7	0.3	0.0	0.0	0.3
	Steep	Wet	13	2	2	6	11	13	10	0	0	0	0
			25	3	3	14	11	5	4	2	0	0	0
			Mean	2.5	2.5	10.0	11.0	9.0	7.0	1.0	0.0	0.0	0.0
		Dry	3	1	7	17	3	7	6	2	0	2	0
			7	0	1	3	6	18	14	5	0	0	0
			17	1	1	2	7	8	14	1	0	0	0
			Mean	0.7	3.0	7.3	5.3	11.0	11.3	2.7	0.0	0.7	0.0
High	Flat	Wet	2	0	11	10	6	14	7	0	0	0	0
			18	2	31	11	1	3	0	0	0	0	0
			23	1	6	16	5	3	3	1	1	0	0
			Mean	1.0	16.0	12.3	4.0	6.7	3.3	0.3	0.3	0.0	0.0

Table 7. (Cont.)

Elevation	Slope	Aspect	Plot	Age Classes 1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
High	Flat	Dry	5	0	4	7	4	3	13	10	1	0	1
			8	0	2	4	5	14	11	8	2	0	0
			9	1	6	7	4	6	10	5	2	1	2
			20	5	13	14	7	4	4	3	0	0	0
			21	0	11	15	9	5	9	0	0	0	0
			22	11	5	12	4	7	3	2	0	0	0
			Mean	2.8	6.8	9.8	5.5	6.5	8.3	4.7	0.8	0.2	0.5
	Steep	Wet	1	2	14	9	11	11	3	0	0	0	0
			10	1	4	9	10	9	9	1	3	0	0
			Mean	1.5	9.0	9.0	10.5	10.0	6.0	0.5	1.5	0.0	0.0
		Dry	4	0	2	6	9	7	6	10	4	0	0
			6	1	4	25	9	8	1	0	0	0	0
			12	0	0	2	7	8	13	8	5	1	0
			24	2	3	4	10	9	7	2	0	0	0
			Mean	0.8	2.2	9.2	8.8	8.0	6.8	5.0	2.2	0.2	0.0
		Over-all Mean		2.2	6.2	9.5	7.3	8.3	7.2	2.6	0.8	0.2	0.2

The analysis performed was based on the G-test statistic (Sokal and Rohlf 1969). The G-test statistic is similar to chi square but is somewhat more robust with respect to zero data values and is less difficult to calculate. From Table 8, where this analysis is summarized, it is apparent that age structure of the bitterbrush populations sampled was not independent of any effect tested with the exception of the slope-aspect interaction. An observation made in the field during sampling was that bitterbrush stands on relatively flat sites with reasonably well developed soil and no strong plant competition tended to be generally composed of young plants. Bitterbrush growing on what could be considered stress sites however were generally much older. Perhaps the stress sites are marginal for most vegetation but an established bitterbrush is better able to maintain itself under extreme conditions than the herbaceous competition. Thus, bitterbrush could furnish propagules for further establishment on the site following the decrease in competition due to a die-off of herbaceous vegetation during a severe drought. The few propagules which are hardy enough to become established are then observed in the population as very old plants. On the other hand the bitterbrush on relatively good sites, while becoming established readily, may be killed at an early age due to competition; thus, the observed population is relatively young.

Table 8. Summary of age structure analysis of plants ranging in age from 1 to 100 years old (inclusive).

Source	Degrees of Freedom	G-Test[1] Statistic
Plot	216	656**
Elevation (E)	9	47**
Slope (S)	9	48**
Aspect (A)	9	55**
ExS	9	27**
ExA	9	50**
SxA	9	10
ExSxA	63	110**

[1] Sokal and Rohlf 1969.

** Significant at p=0.01.

Mechanisms of Establishment

Rodents have long been considered by many researchers to be an important vector in the establishment of bitterbrush. West (1968) feels that 90% of the bitterbrush seedlings in Oregon develop from rodent caches. Studies by Ferguson (1967) indicate that survival of bitterbrush seedlings is directly correlated with initial number of seedlings that emerge from a point such as one might find at a rodent cache. Perhaps the record number of seedlings from one rodent cache is the 139 seedlings reported by Hormay (1943). Ferguson (1962) reports that if one bitterbrush seed, in seeding trials, is placed per point the percent survival after three years is approximately 50% however if the number of seeds is greater than one the percent survival after three years increases to greater than 75%. Roughton (1966) found that on five northern Colorado Front Range areas 29% to 88% of the plants sampled were believed to have been established from rodent caches. He estimated that rodent caches account for 49% of all bitterbrush establishment and perhaps as high as 88% of the seedlings of the year. He cautioned that the latter figure may be low due to mortality unaccounted for by his data. Guinta (1968), working in approximately the same area as did Roughton, considered his stands to be reproducing primarily through vegetative means. In an attempt to provide further information on this question of relative importance of seed vs. vegetative

reproduction for this particular area I recorded all vegetative reproduction and points with multiple plants.

Vegetative reproduction in bitterbrush occurs through the rooting of decumbent branches which are commonly known as 'layers'. My observation in the field was that layering occurs most often on stress sites and in populations where the plants are old and decadant. When a decumbent branch roots it may remain attached to the parent or in time become separated from the parent plant and thus become established as an individual of its own right.

Data which I collected includes indentifying plants which either became established from layers or have layers attached, the total number of layers per plant, and the total length of these layers. Of the entire sample, 102 plants or about 8.2% had layers attached. A total of 145 layers were found with a total length for all layers of 5790 cm. Thus the mean length of layers in my sample is approximately 40 cm with a mean number of approximately 1.4 layers per plant which exhibited layering. Of the 1250 plants sampled only seven or about 0.6% had become established from layers. This amount of vegetative reproduction hardly seems adequate to maintain a population.

These findings are in disagreement with those of Guinta (1968) who considered vegetative propagation to be the main source of recruitment into the population. There are two reasons for this

disagreement. First the stands that Guinta examined were relatively decadant populations and thus could be expected to exhibit a higher degree of layering than would a general cross section of the bitterbrush community such as I was dealing with. Second and more importantly I believe Guinta misinterpreted his data. Even a high degree of layering does not imply a similarly high rate of vegetative reproduction. In my sample over 8% of the plants exhibited layers but less than 1% of the plants were established by this means. Thus less than 10% of the layers ever become established as plants of their own right. By comparison over 99% of the plants in the population were established from seeds.

Roughton (1966) collected all the plants in a cluster established from a rodent cache. Thus, the percent of plants established by rodents in his sample is relatively high, ranging up to 88% of all plants collected from one of his study areas. I recorded plants which came from points with multiple plants indicating a rodent cache, but from any such point I collected only one of the individuals while making note of the size of the group. A total of 123 plants came from multiple plant points accounting for about 9.8% of the sample. Approximately a constant percentage of the plants in any portion of the age structure was established from rodent caches (Table 9). I believe that rodents have an approximately equal impact on the proportion of bitterbrush established during any time period.

Table 9. Summary of bitterbrush establishment due to rodent caching.

Decade	Sample Size	Number from Rodent Caches	Percent from Rodent Caches
1880-1889	9	1	11
1890-1899	29	2	7
1900-1909	88	7	8
1910-1919	206	27	13
1920-1929	241	26	11
1930-1939	209	14	7
1940-1949	253	26	10
1950-1959	155	12	8
1960-1969	56	8	14

Establishment History

It was hypothesized that the establishment of bitterbrush during the past may have not been uniform from year to year. Daubenmire (1947) states that among deep rooted perennials native to arid regions the entire crop of seedlings which is produced may die regularly during the dry seasons. The perpetuation of these species is made possible only by occasional years of above-average precipitation which permits the roots of the seedlings to reach deep enough to get to a permanent water supply before drought strikes. This or similar mechanisms may be acting on bitterbrush. I attempted to discover periods of high and low establishment which were to be interpreted in terms of temperature and precipitation records.

Figure 9C would indicate that there were no strong peak establishment periods during the past. The establishment prior to about 1950, although variable, appears to be at an approximately uniform level from year to year. The single-year establishment peaks seen in Figure 9C are due to a confounding of sampling error and population variability. Being unable to distinguish between these two sources of variability I feel obligated to attribute the bulk of this variation to sampling error. The reduction in numbers prior to about 1910 is the result of old age with most of the older plants dying between 60 and 75 years of age. Even more notable than the lack of peaks in the establishment pattern is the decided reduction in numbers

observed per year class since 1950. Establishment dropped sharply from 1950 to 1954. The precipitation received in 1954 was exceedingly low resulting in one of the worst droughts of this century. The lack of precipitation in 1954 and the resultant death of young plants may explain the lack of bitterbrush establishment for that year. Subsequent to 1954 establishment has been very low indeed. Contrary to what one might expect, i.e., very high frequency of individuals in the young year classes, there is a decided reduction in the number of young plants found. The effect is most remarkable in year classes 1 through 5.

The age structures described by Roughton (1966) are very similar to the age structure exhibited by my data. His study areas showed a marked reduction in establishment in 1954 as sampled in 1963 with one exception. The establishment on his study area 'G' indicates a peak for 1954. An apparent explanation for this peak is that this particular area had burned in 1954. Vegetation competition with bitterbrush for establishment was thus eliminated and rodent caches, which may either have been in the ground at the time of the burn and escaped unharmed or were cached subsequent to the burn by rodents harvesting bitterbrush seeds from the surrounding shrub community, became the source of new plants for the burned area.

An intial appraisal of the age structure in Figure 9C may lead one to believe the age structure shown to be in error in the young

year classes. I do not believe this to be the case. The sampling scheme used should prevent any strong bias of this sort. I located the point to be sampled as indicated under methods above. A search was then started from this point within ever increasing concentric circles. The area was searched carefully with the bitterbrush plant, whether large or small, closest to the point being the individual selected for an observation. This should give samples reasonably unbiased for bitterbrush age structures. I think there has been a remarkable lack of establishment since approximately 1950.

Although no causative factors have been isolated which could be responsible for the reduced establishment in bitterbrush since 1950 it is interesting to speculate on possible causes. The grazing history of the Roosevelt Forest (Wills 1971), within which this study was executed, shows decreasing grazing use through Forest Service cattle allotments since the early 1900's. The 1925 cattle use on the forest was estimated to be approximately 75, 000 animal unit months while the 1970 use by cattle on the forest was estimated to be only about 19, 000 animal unit months. The approximately linear decrease in use on the forest since 1925 until the present time does not appear to be a strong factor in the establishment of bitterbrush. Although good estimates of deer and elk numbers are not available, the concensus of many people from this region is that deer numbers during the early 1950's were very high. Forest Service records indicate

that deer numbers increased from a relatively low level in 1925 to considerably higher numbers with a peak occurring in the 1950's. The browsing pressure from the alleged high deer numbers of the 1950's may have been a significant factor affecting the establishment of bitterbrush over the region studied. Elk are not considered to be a significant factor in the establishment of bitterbrush due to their food habits and relatively low, albeit increasing, numbers.

If as indicated above most bitterbrush are the result of rodent caches the population size of these animals would have a profound effect on the rate of bitterbrush establishment. In years when the rodent food supply is relatively scarse it may be that the number of seeds cached is much lower with a higher proportion being eaten. Alternately the rodent populations may be too low to provide seed caches in adequate numbers to promote good bitterbrush establishment. There is considerable difficulty in interpreting the relationship between rodents and bitterbrush establishment since data on rodent populations are sketchy to non-existent.

Establishment and Weather

Weather Prediction

One of the objectives of this study was to explain establishment peaks in bitterbrush by the use of the available weather information. As indicated above no significant establishment peaks were detected.

It was hypothesized that the variability in establishment of any particular stand sampled could best be explained by the weather occurring at that point in space. Since the plots which I sampled had no weather stations located on them it was decided to attempt to predict the weather at these locations from three long term records available from outside the area at Fort Collins, Estes Park, and Red Feather Lakes. These three stations roughly straddled the study area (Figure 2). Multiple regression analysis was used in an attempt to develop equations which would make it possible to predict, within reasonable error, the temperature and precipitation at any plot location for any month of interest in the past.

The weather stations with long term records are referred to as the base stations. The other seven stations in Table 1 are located within the general area studied. Two of these stations, Pingree Park and Quigley Mountain, which had records of 9 and 8 years respectively were to be used to develop the prediction equations which would later be used to predict weather at any particular plot location. The five shorter weather records from stations 1 through 5 were to serve as validation records on which to test the prediction equations.

The temperature records at stations 7 or 8 or both could be predicted from the temperature records of the three base stations with a reasonable degree of accuracy by multiple regression. The precipitation records at stations 7 and 8 however could not be

predicted from the precipitation records at the three base stations within an error which could serve any useful purpose in explaining the establishment of bitterbrush at any location. Furthermore it was shown that the two longest and most reliable precipitation records, Fort Collins and Estes Park, were not highly correlated. Weighting factors tried in the regression analysis were the distances between stations, both vertically and horizontally. These analyses are summarized in Table 10.

Due to the failure of attempts to determine prediction equations which could reliably predict precipitation it was decided to abandon this approach to the problem. Rather than using prediction equations based on the base stations to derive weather for any point of interest in time and space it was decided to use only one long term record, Fort Collins, as an indicator of trend in temperature and precipitation from month to month and year to year. The Fort Collins record was selected because it was the longest and perhaps the most reliable.

Bitterbrush Establishment Prediction

Subsequent to initial unsuccessful attempts at analysis by principal component analysis techniques (Seal 1964) the establishment of bitterbrush as a function of weather was analyzed with step-wise multiple regression (Draper and Smith 1966). The computer routine used in this analysis was STAT03R developed by the Colorado State

Table 10. Summary of weather prediction analysis.

Independent[1] Stations(s)	Dependent[1] Stations(s)	Data Type	Weighting Factor	Number of Observations	Coefficient of Determination (Percent)
6, 9, 10	7	Temperature		108	95
		Precipitation		103	64
6, 9, 10	7, 8	Temperature	1/Δ Elev.	89	95
		Precipitation		89	45
6, 9, 10	7, 8	Temperature	1/Distance	89	96
		Precipitation		89	66
10	9	Temperature		98	98
		Precipitation		101	55

[1] The station identifiers are defined in Table 1.

University statistical laboratory based on the Biomedical computer program for step-wise multiple regression. The monthly weather data were summarized to obtain mean seasonal temperatures and total seasonal precipitations. It was decided that the seasonal weather, temperature and/or precipitation, from the winter two years prior to the year of establishment through the autumn two years following the year of establishment should be used in the analysis, this sequence is hereafter referred to as the "weather period". Two reasons for using weather from time prior to the year of establishment are: 1. The time prior to the year of establishment, particularly the preceding autumn, may be important in storing soil moisture which could aid establishment the subsequent growing season, 2. The weather of the preceding seasons may influence the size and activity of the rodent populations which are responsible for the caches from which most bitterbrush are established. The reason for using data from time subsequent to the year of establishment is that the moisture stress encountered by the young seedlings was hypothesized to have a serious effect on their chances for survival and that an index to this stress is the weather regime encountered.

Initially the establishment response to temperature and precipitation were analyzed separately. Later both temperature and precipitation were included in the same analysis and also combinations of these factors were used in an attempt to determine some biologically meaningful variable which may be used to predict establishment.

Using precipitation as the independent variables over the weather period indicated above and using the observed number of plants in each year class as the dependent variable over the period starting with 1902 through 1967 I was able to obtain a coefficient of determination of 1% indicating a random relationship between seasonal rainfall and the number of individuals observed in each year class. Using temperature as the independent variable for these same seasons and the observed number of plants in each year class as the dependent variable over the same period I was able to obtain a coefficient of determination of 3%, again indicating a random relationship. An analysis using mean seasonal temperature and precipitation, i.e., mean spring precipitation would be the mean of the precipitation received during the five spring seasons of the weather period etc., as the independent variables and the number of plants established in each year class, the number observed corrected for mortality, as the dependent variable over the period starting with 1902 through 1967 was performed. Thus, I was able to obtain a coefficient of determination of 70% in four regression steps, with 57% of the variability being explained by spring temperature alone. The other variables included in the regression equation were spring, summer and autumn precipitation.

An attempt to introduce a variable with biological meaning was made by dividing mean seasonal temperature by total seasonal

precipitation thus the variable (T/R) would become larger in hot, dry months and become smaller in cool, moist months. With T/R as the independent variable over the weather period and the number of plants established as the dependent variable over the period starting with 1902 through 1967 I was able to obtain a coefficient of determination of 45% with eight variables entered in the regression. Using the same combination of variables over the period starting with 1902 through 1951, this being the period of relatively high establishment as opposed to the period of distinctly poor establishment since 1951, I was able to obtain a coefficient of determination of only 7%. Thus it was decided that this variable was not useful in this analysis.

The mean precipitation of four consecutive seasons starting with autumn (BR) divided by the mean temperature (BT) for the spring and summer of that year is another variable which was used as a hypothesized index of moisture stress. This variable (BR/BT) was used as an independent variable starting with two years prior to the year of establishment through two years after the year of establishment for a total of five independent variables. With the number of plants established as the dependent variable for the period starting with 1903 through 1967 a coefficient of determination of 3% was obtained. Using these same variables over the period starting with 1903 through 1952 produces a coefficient of determination of 14%. Thus it was determined that this formulation of a moisture stress variable was not useful either.

Finally a series of analyses with the seasonal values for both mean temperature and total precipitation over the weather period as independent variables was performed (Table 11). Using the above-mentioned independent variables with the number of plants established in each year class as the dependent variable over the period starting with 1902 through 1967 (Analysis 1, Table 11) I was able to obtain a coefficient of determination of 68% with eight independent variables in the regression equation, however, the first five variables, which explained 62% of the variability, were all seasonal temperature values. It is interesting that temperature rather than precipitation should be a better predictor of bitterbrush establishment. The fact that the inherent variability of precipitation is much greater than that of temperature may explain why the expected prediction ability of precipitation is not realized. From this analysis it would appear that high temperatures the first summer and the autumn of the year following the year of establishment would reduce the probability of survival for a bitterbrush seedling, perhaps due to temperature/moisture stress during those periods. It would also appear that high temperatures during the spring and autumn of the year preceding establishment would reduce the probability of establishment, perhaps due to either low rainfall correlated with the high temperatures or higher evaporation and transpiration rates. Either of these possibilities could result in decreased soil moisture available for use by

Table 11. Summary of bitterbrush establishment analyses. Multiple step-wise regression of numbers per year class on seasonal temperature and precipitation.*

Independent[1] Variables	Dependent[2] Variable	Period of Analysis	Coefficient of Determination (Percent)
Analysis I			
00Sum Temp	NESTAB	1902-1967	33
-2Spr Temp			50
-1Spr Temp			56
-1Aut Temp			58
+1Aut Temp			62
-2Sum PPT			64
+2Spr Temp			66
+1Spr Temp			68
Analysis II			
00Sum Temp	NESTAB	1902-1950	33
-2Sum Temp			48
+1Spr PPT			53
-2Spr Temp			57
-2Sum PPT			59
-1Sum PPT			63
Analysis III			
-1Sum Temp	NESTAB	1951-1967	27
+2Sum Temp			48
00Aut PPT			58
Analysis IV			
-2Aut PPT	NOBS	1902-1967	9
+2Sum PPT			14
-1Aut Temp			18

*The 'F' value to enter and delete was set at 2.79 in all cases.

[1]The notation used to identify seasons is as follows: winter two years prior to the year of establishment is designated as -2Win, summer of the year of establishment is designated as 00Sum, and the autumn of the year following the year of establishment is designated as +1Aut.

Temp -- mean seasonal temperature.

PPT -- total seasonal precipitation.

[2]NOBS--Number of plants observed per year class.
NESTAB--Number of plants established per year class. (Number observed corrected for mortality)

the germinating seed on the year of establishment. The spring two years prior to establishment is entered as an important variable, perhaps as an influence on the rodent populations important for the subsequent caching of bitterbrush seed or perhaps only due to random correlation. The remaining three variables, while entered by the computer routine into the regression model, add little to its predictability.

Similar analyses were run separately on the period of good establishment prior to about 1950 and the period of poor establishment since 1950. The variables entered into the regression equation for the period of good establishment (Analysis II, Table 11) are similar to the variables entered in Analysis I although precipitation plays a more important role. The variables entered into the regression equation for the period of poor establishment (Analysis III, Table 11) are entirely different from those entered in Analysis I and Analysis II. These comparisons indicate that different weather variables are correlated with establishment during the two time periods. No significant differences were found in the weather variables between the two time periods. I conclude from this that changes in weather are probably not the cause for the decline in bitterbrush establishment.

Another analysis using the same 40 independent variables was run with the observed number of plants per year class rather than

the number of plants established as the dependent variable (Analysis IV, Table 11). I was able to obtain a coefficient of only 18%. This lends some support to the mortality correction assumed earlier. Comparing Analysis I and Analysis IV it is apparent that a higher porportion of the variability in the number of bitterbrush per year class is explained by temperature and precipitation if the number observed per year class is corrected for mortality in the fashion indicated above rather than simply using the number observed.

Recommendations for Further Research

This project uncovered as many questions as it has answered. Further investigation needs to be done on:

1. The effect of rodents and other small animals on the establishment of bitterbrush, both from the stand-point of seed consumption and seed caching.
2. The relationship between production, i.e., current annual growth, on ring width.
3. The effect of age on production.
4. The effect of site, i.e., elevation, slope and aspect etc., on production.
5. The examination of areas that have had a history of heavy use by large herbivores as compared to areas with a history of light use in order to compare age structure and determine the effects of intensity of use on establishment.

SUMMARY AND CONCLUSIONS

The primary objectives of this study were to determine the effects of weather and topographical site factors on the establishment, growth and vigor of bitterbrush in the northern Colorado Front Range. Subordinate objectives were the determination of the relative importance of vegetative reproduction as opposed to sexual reproduction and the impact of rodents on the recruitment of bitterbrush into the shrub population.

The field work for this study was performed during the summer months of 1969. The 25 plots sampled are located in a study area 12 to 35 miles west of Fort Collins, Colorado. The topographic site factors ranged as follows: elevations from 5900 to 8750 feet above sea level, aspects in all directions except for the northwest quadrant and slopes from 7% to 64%. The laboratory work of stem preparation, dating, and measurement was performed during the winter of 1969-70.

Fifty bitterbrush plants from each of the 25 plots were selected on a random sampling scheme. Each plant was measured for crown height, crown maximum diameter, and crown minimum diameter; in addition the percent dead material in the crown was estimated and the 'A' soil horizon depth was measured. The 'A' soil horizon was found not to be statistically significant at $p=0.05$ for all effects on

bitterbrush investigated. Vigor and growth were found to be influenced by both topography and age. Vegetative regeneration and multiple plants at a point as indices of sexual reproduction as aided by rodent caches were noted. It was apparent that reproduction from seeds is more important in establishment than is vegetative layering. Rodents affect an approximately constant proportion of the establishment during any time period. The age structure and stem diameter measurements were obtained from stem sections collected for laboratory analysis.

It was shown that elevation, slope, and aspect all have an important influence on growth of bitterbrush. The vigor however is affected primarily by elevation. The establishment is influenced by all three topographic variables.

The growth response of bitterbrush and ponderosa pine to seasonal temperature and precipitation was estimated. Bitterbrush does not appear to be seriously moisture limited however high spring temperature may have an inhibitory effect on growth. Ponderosa pine appears to be slightly limited by early winter moisture conditions but more seriously limited by high autumn temperatures.

The influence of seasonal temperature and precipitation on the establishment of bitterbrush was also investigated. Multiple stepwise regression analysis indicated that spring temperature is the best single predictor of bitterbrush establishment. This was an

interesting result since it was hypothesized that moisture was the most important weather factor effecting establishment. There appeared to be no differential weather effects between the period of good establishment prior to 1950 and the period of poor establishment since that time. A severe lack of establishment during the period since 1950 casts considerable doubt on the ability of bitterbrush to maintain its populations in this region under recent "natural" conditions.

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APPENDICES

APPENDIX 1

Plot descriptions

Plot 1.

Plot 1 is located west of the road from Rustic, Colorado, north to Red Feather Lakes, Colorado, an estimated 2 miles north of Rustic. The vegetation on plot 1 is dominated by grasses and other herbaceous plants dense to the point of forming sod. Forbs are varied but second in abundance to grasses. The major shrub species is big sagebrush followed by mallow ninebark. Bitterbrush is third and last in importance of the shrubs. Some small ponderosa pine and Douglas-fir are invading the plot with larger trees around the edges. The soil is relatively deep and well developed.

Plot 2.

Plot 2 is located west of Seven Mile Creek about one mile above its junction with the Poudre River at Rustic, Colorado. Situated on the lower extremity of a relatively flat area, the center of the plot is on the break-line between the flatter slope on the bench itself and the steeper shoulder of the bench as it falls off into Seven Mile Creek. Big sagebrush is the only woody species of note on the upper two thirds of the bench. Ponderosa pine trees up to about 8 feet tall are invading the area from the lower end, now they cover about one third the area. It is within these small pines that the bitterbrush is found. The 'A' soil horizon is less deep on the steeper shoulder of the bench than on the flatter top portion where in some placed the soil is very stony.

Plot 3.

Plot 3 is located on the east side of Hewlett Gulch. Trees include Douglas-fir and ponderosa pine with some large Rocky Mountain juniper. The main shrub is true mountain mahogany; squaw currant, bitterbrush, and skunkbush are of lesser importance. Herbaceous vegetation consists of a moderate cover of grasses and forbs. The forbs are more abundant with the primary one being fringed sagebrush. The soil is generally well developed with abundant stones. There is very little evidence of grazing by domestic livestock which is probably due to the steepness of the slope.

Plot 4.

Plot 4 is located on a SE facing slope of uniform slope and aspect on the north rim of the Seven Mile Creek drainage. The eastern 3/4 of

the plot is dominated by big sagebrush and bitterbrush in equal abundance but is being invaded by some small to medium sized ponderosa pine. Herbaceous cover is sparse to moderate in density with grasses being most important. The remaining western 1/4 of the area is under large ponderosa pine trees where the ground surface is generally barren of vegetation and covered with pine needles and cones. Sparsely scattered under this canopy one finds bitterbrush, common juniper, and kinikinik. Soils are generally better developed in the pure shrub portion than under the ponderosa pine canopy. Bitterbrush appears to be somewhat depressed in the shade, probably due to grazing pressure, but the leaders appear normal.

Plot 5.

Plot 5 is located on the north rim of the Seven Mile Creek drainage under a fairly thin stand of ponderosa pine. The area is of uniform slope and aspect. Bitterbrush is the dominant shrub on the site with big sagebrush second. Herbaceous vegetation is sparse except for localized patches where grasses are dominant. The soil is generally stony and only a few centimeters deep.

Plot 6.

Plot 6 is located on the north side of Buckhorn Canyon across from the Crystal Mountain road. The site is dominated by ponderosa pine. The primary shrub is bitterbrush with a moderate amount of squaw currant, and lesser abundance of wild raspberry and common juniper. The area shows no signs of domestic grazing although deer pellets are in fair abundance. The soil is generally stony and moderately well developed. The understory is sparse and about equally divided between grasses and forbs.

Plot 7.

Plot 7 is located on the east side of Hewlett Gulch on a steep southeasterly facing area of uniform slope and aspect. The only trees are a few ponderosa pine at the lower edge. True mountain mahogany dominates the plot, bitterbrush is of secondary importance and the few squaw currant are widely scattered. The herbaceous understory is quite dense and consists primarily of grasses. The coarse sandy soil is interspersed with 1 to 2 inch stones.

Plot 8.

Plot 8 is located along the Old Flowers Wagon Road 200 meters east of the point at which it crosses the Little South Fork of the Poudre River. The area is of uniform slope and aspect. The canopy consists of a moderately dense stand of ponderosa pine, many of which are only 20 to 25 feet tall. Fallen logs and charred stumps give evidence of a past fire in the area. Herbaceous understory is sparse except in open glades where it is moderately dense. The bitterbrush, the dominent shrub, is relatively dense (1-2 meters being an average spacing), common juniper is sparse. Bitterbrush is by far the most productive understory species and probably more productive than all the rest combined. The bitterbrush on this plot is relatively vigorous with an amazing number of small (supposedly young) plants and an exceptionally high proportion of multiple plant locations. None of the bitterbrush are large, however the larger ones exhibit the characteristic die-back pattern. While the area is only 1/4 mile from the Little South Fork of the Poudre River there is no evidence of grazing by domestic livestock. The 'A' soil horizon is thin and very stony.

Plot 9.

Plot 9 is located north of Colorado Highway 14 about 1 mile east of Kinikinik, Colorado. This relatively level area is dominated by big sagebrush, bitterbrush is second in importance with Rocky Mountain juniper and squaw currant widely scattered. The herbaceous understory is composed chiefly of grasses varying from moderately dense to dense. A few ponderosa pine trees skirt the area on the north side. Grazing by domestic livestock does not appear to occur although the area is only about 3/8 mile from the Poudre River at a 10% slope. The upper soil is uniformly sandy and dark colored through-out.

Plot 10.

Plot 10 is located on an easterly facing slope west of an unnamed gulch north from Homesite, Colorado. The area, immediately south of an east-west fence line across the gulch, is dominated by big sagebrush with bitterbrush second in abundance. Scattered Rocky Mountain juniper and squaw currant with very sparse skunkbush are also present. The herbaceous understory consists primarily of dense grasses. A half dozen large ponderosa pine are located near the edges on the plot. There are numerous small bitterbrush and most of the bitterbrush appears quite vigorous with well developed leaders. There appears to be little or no grazing by domestic

livestock on this plot. The soils generally appear fairly deep (15 cm) and fairly stony.

Plot 11.

Plot 11 is located on a gently sloping area south of Colorado Highway 14 approximately 2.5 miles east of Rustic, Colorado. The site is dominated by ponderosa pine with some small fir trees and large Rocky Mountain juniper. The wide variety of shrubs present includes bitterbrush, true mountain mahogany, squaw currant, mallow ninebark, skunkbush, big sagebrush, and waxflower. The herbaceous understory varies from sparse to dense and consists primarily of grasses. The soil generally has a fairly well defined 'A' horizon of fine sandy material underlain by a much coarser material. There is evidence of past use by domestic livestock but no water source is apparent near at hand. There is a surprisingly large number of small bitterbrush among other very large plants which have spread radially but not vertically and contain a high percent of dead material in the crown.

Plot 12.

Plot 12 is located north of Colorado Highway 14 about 1 mile east of Kinikinik, Colorado. This plot is on a steep southerly facing area north of plot number 9. This site is dominated by big sagebrush, bitterbrush, and squaw currant in order of importance. Rocky Mountain juniper is sparse. The herbaceous vegetation is moderately dense and is composed primarily of grasses. The southern edge of the plot contains a few ponderosa pine trees. The soil is fairly deep, being sifted in between the loose rocks of the talus slope. There is no evidence of grazing although the area is only an estimated 1/2 mile from the Poudre River.

Plot 13.

Plot 13 is located on a uniform slope immediately east of the jeep trail running north from Kelly Flats. The site is dominated by a moderate to dense stand of bitterbrush, squaw currant is of secondary importance, and scattered skunkbush and Rocky Mountain juniper are also present. The herbaceous understory is moderately dense to dense and predominantly grasses. Ponderosa pines are present along the lower northern and eastern edges of the plot. Although open to grazing this plot shows no evidence of grazing by domestic

livestock. The soil is generally moderately deep and stony although some places have only fine textured material.

Plot 14.

Plot 14 is located on the north facing slope of the draw east across Colorado Highway 14 from the Kelly Flats Campground. The site is dominated by true mountain mahogany, bitterbrush, squaw currant, skunkbush and Rocky Mountain juniper in order of abundance. Ponderosa pine, although sparse, is the dominant tree. These trees are generally not more than 20 feet tall. The herbaceous understory consists primarily of moderately dense grasses. Grazing by domestic livestock is evident on the grasses and forbs but not on the shrubs. The soil is generally stony and of moderate depth underlain by rotten granite.

Plot 15.

Plot 15 is located on a small bench which protrudes out from the hill, east across Colorado Highway 14 from the Big Narrows Picnic Ground. The bench is dominated by true mountain mahogany, bitterbrush, skunkbush, squaw currant, serviceberry, medium to large Rocky Mountain juniper, and mallow ninebark in order of abundance. The northern half of the bench has no ponderosa pine and no bitterbrush but true mountain mahogany is abundant. The plot is located on the southern half of the bench where both ponderosa pine and bitterbrush are present. The herbaceous understory consists of sparse to moderately dense cover of grass with some forbs. The canopy consists primarily of sparse ponderosa pine with a few Douglas-fir. The soil is poorly developed and extremely stony for the most part. Although only 1/4 mile from the Poudre there appears to be no grazing by domestic livestock.

Plot 16.

Plot 16 is located east of the Little South Fork road about 1 mile from its junction with Colorado Highway 14. The site is dominated by ponderosa pine. Bitterbrush is the main shrub species with true mountain mahogany and squaw currant present in small amounts. The herbaceous understory is sparse to non-existent with grasses being most abundant. The area is evidently lightly utilized by livestock although it is far from water. The soil is generally thin and poorly developed although not excessively stony.

Plot 17.

Plot 17 is located on a steep slope across the Poudre River from the Mountain Park Campground. The site is dominated by bitterbrush with fringed sagebrush, skunkbush, true mountain mahogany, and squaw currant also present. The bitterbrush is in fair condition with long numerous leaders. The herbaceous understory is moderately dense to dense, consisting primarily of grasses. A few small ponderosa pine and large Rocky Mountain juniper are scattered over the plot. It appears that domestic livestock do not utilize the area although deer utilization is apparent. The soil is variable in depth, being developed on a rotten micaceous granite parent material.

Plot 18.

Plot 18 is located on Seven Mile Creek about 2 miles from Colorado Highway 14 on a fairly flat and level spot directly across the creek from some abandoned mines. The site is of uniform slope and aspect except for a small gully running through it. The site is dominated by big sagebrush, bitterbrush, and squaw currant in order of abundance. A few scattered ponderosa pine as well as a few Douglas-fir are found on the plot. The soil is well developed with stoniness being apparent only in the NE quadrant. The area has a heavy cover of grass and is heavily grazed by domestic cattle resulting in bitterbrush which is hedged, sometimes severely. This may explain the absence of old and dying bitterbrush plants.

Plot 19.

Plot 19 is located along the Moody Hill Pack trail. The site is dominated by lodgepole pine and Douglas-fir with a sparser population of ponderosa pine. The lodgepole pine are very dense in some small groups. Bitterbrush is the predominant shrub, common juniper is of secondary importance and waxflower is present in small quantities. The herbaceous understory is very sparse with isolated small clumps of sedges and widely scattered forbs. Most of the soil surface is covered by needles and cones shed from the canopy. The 'A' soil horizon is very thin with a very stony sublayer which is frequently present to the surface. There is no sign of grazing by domestic livestock. The bitterbrush here is generally less vigorous and more spindly in appearance than are stands in more open areas.

Plot 20.

Plot 20 is located immediately north of the Old Flowers Wagon Trail, 1.3 miles west of the Little South Fork road on an area of uniform slope and aspect. Ponderosa pine dominate the site and range in size from seedlings to mature trees of 14-16 inches DBH. The spacing of the pines is such that an open canopy lets in abundant light and rain. The only shrub of note is bitterbrush which is moderately vigorous and ranges in size from near seedling size to crowns that are over 2 meters long. The herbaceous understory is sparse and consists chiefly of grasses. The area is grazed by domestic livestock and some of the bitterbrush, particularly the lower portion of the plot which borders on the more nearly level valley floor, is moderately to severely hedged. The soil generally has a thin 'A' horizon which is moderately stony with a relatively deep lower horizon. This site has been logged in the past with stumps of 12 inch and larger trees dotting the area.

Plot 21.

Plot 21 is located 200 meters north of Bennet Creek, .2 miles west of the junction of the Bennet Creek road and the Dadd's Gulch trail on an area of uniform slope and aspect. A sparse canopy of ponderosa pine covers the site. The shrub cover consists almost entirely of bitterbrush with a few widely scattered squaw currant. The herbaceous understory is very sparse consisting mostly of grasses. The 'A' soil horizon is generally quite well defined and very thin. There is evidence of very light grazing by domestic livestock with some of the plants showing signs of hedging. The bitterbrush exists in all sizes with a preponderance of small shrubs.

Plot 22.

Plot 22 is located about 300 meters north of Bennet Creek on the west side of Salt Cabin Park on an area of uniform slope and aspect with a very sparse canopy of ponderosa pine. The shrubs are predominated by bitterbrush, scattered squaw currant and common juniper are also present. The herbaceous understory, consisting mostly of grasses, is moderately dense to dense. The soil is variable ranging from a shallow 'A' horizon which is quite stony to a relatively deep 'A' horizon which is free from stones. The bitterbrush shows some signs of light to moderate hedging but is generally in excellent condition with a low percentage of dead crown material and many long leaders.

Plot 23.

Plot 23 is located 155 meters north along the Little South Fork road from its intersection with the Old Flowers Wagon Trail and thence west 85 meters to the center of the plot. The site is of uniform slope and aspect under a moderately dense stand of ponderosa pine. Bitterbrush is the only shrub in abundance but some scattered small common juniper is present. The herbaceous understory is chiefly grasses and varies from sparse to dense. The soil has generally a shallow 'A' horizon but at some points it is beyond 25 cm deep. The bitterbrush is in fair condition with no exceptionally good or poor plants. The area is open to domestic livestock and appears to receive light to moderate utilization. This area also shows evidence of utilization by deer and elk.

Plot 24.

Plot 24 is located 150 meters west of the pass and south of the Little South Fork road as it enters the Bennet Creek drainage from Colorado Highway 14. The site is dominated by ponderosa pine, Douglas-fir is of lesser importance. Scattered Rocky Mountain juniper is also present. Bitterbrush is the primary shrub species although some common juniper is also present. The los understory consists primarily of kinikinik with grasses and forbs sparsely scattered. Overall the understory is moderately dense. The soil is moderately stony with a fairly shallow 'A' horizon. The area is open to grazing by domestic livestock but only lightly utilized. Much of the bitterbrush has good leader growth but the stems are in generally poor condition, especially where litter from the overstory is deep.

Plot 25.

Plot 25 is located on the west side of Dadd's Gulch .2 miles south of the holding corrals at Colorado Highway 14. This site is steep and rocky lying on a slightly curved hill (i.e. with slightly varying aspect). The overstory consists of scattered ponderosa pine and large Rocky Mountain juniper. The primary shrub species is skunkbush with bitterbrush and squaw currant being next in about equal abundance. The herbaceous understory is moderately dense and consists primarily of grasses. The 'A' soil horizon is generally quite deep and stony. Although open to domestic livestock the steepness of the hill evidently precludes their use of it.

APPENDIX 2

Field data form

DATA SHEET FOR Putr

Investigator_____ Date_____/69 Aspect_____°M Soil depth_____ cm
Project Number - CAES315 Plot dia.____ ft Slope_____% Putr density 1 2 3 absolute
Department Number - 1476 Elev._____ft Putr density 1 2 3 4% of shrubs

Plot number	Radial number	Distance number	Height cm	Crown dia. max--cm	Crown dia. min--cm	Stem dia. max--cm	Stem dia. min--cm	Number of layers	Total length of layers--cm	A-horizon depth--cm	% Dead by dry weight	Tree core number	Azimuth to tree--°M	Distance to tree-steps	Number of plants/point		Fungus

APPENDIX 3

Data on individual bitterbrush plants

Key to abbreviations used in Appendix 3

ID--Plant identification number

CHT--Crown height in cm.

CMXD--Crown maximum diameter in cm.

CMND--Crown minimum diameter in cm.

SMXD--Stem maximum diameter in mm.

SMND--Stem minimum diameter in mm.

ADEP--Depth in cm of the 'A' soil horizon at the location of each plant

ISTON--Indication of stony soil: 1-soil stony, 0-not stony

CDED--Ocular estimate of the percent dead material in the crown of each plant

IFUN--Indication of fungus: 1-fungus present, 0-no fungus

ALAY--Number of rooted points on decumbant branches per plant

TOTL--Total length of all layers per plant (See ALAY)

RNUM--Number of plants rooted per point

YOLD--Year of the oldest datable part of the stem

YEST--Estimated year of establishment

NCON--Confidence code on the estimated year of establishment

DATA FOR PUTR PLOT NUMBER 1
COLLECTED 07-14-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR = 2 = ABSOLUTE (1-3)
DENSITY OF PUTR = 2 = RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 40. DEG MAG TREE NUMBER 11 MAGNETIC AZIMUTH TO TREE 32 DISTANCE TO TREE 26 STEPS
SLOPE = 32. PERCENT TREE NUMBER 12 MAGNETIC AZIMUTH TO TREE 130 DISTANCE TO TREE 30 STEPS
ELEVATION= 7850. FEET(MSL) TREE NUMBER 13 MAGNETIC AZIMUTH TO TREE 162 DISTANCE TO TREE 24 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
113	56.	56.	50.	10.	7.	10.	0	0.	0	0.	0.	1.	1951.	1951.	1
118	33.	34.	16.	5.	4.	7.	0	5.	0	0.	0.	1.	1949.	1949.	1
119	24.	62.	40.	9.	7.	8.	0	15.	0	0.	0.	1.	1949.	1949.	1
121	60.	100.	77.	17.	14.	10.	0	10.	0	0.	0.	1.	1923.	1914.	2
122	55.	69.	53.	20.	11.	8.	0	40.	0	0.	0.	1.	1950.	1950.	1
123	46.	56.	52.	27.	15.	21.	0	40.	0	0.	0.	1.	1923.	1923.	1
126	52.	107.	67.	27.	24.	13.	0	35.	1	3.	54.	1.	1918.	1918.	2
128	44.	78.	65.	18.	15.	7.	0	80.	1	0.	0.	1.	1927.	1927.	1
130	43.	103.	57.	8.	8.	17.	0	70.	0	0.	0.	1.	1945.	1945.	1
131	39.	59.	48.	16.	12.	18.	0	35.	0	0.	0.	1.	1950.	1941.	2
133	38.	52.	44.	24.	17.	8.	0	75.	0	1.	38.	1.	1930.	1918.	2
138	45.	87.	66.	27.	20.	14.	0	65.	0	0.	0.	1.	1946.	1946.	1
130	37.	38.	25.	34.	27.	12.	0	40.	1	0.	0.	1.	1943.	1938.	2
140	63.	109.	122.	34.	27.	13.	0	55.	0	0.	0.	1.	1943.	1938.	2
141	88.	157.	146.	39.	33.	16.	0	40.	0	0.	0.	1.	1926.	1926.	1
142	46.	52.	27.	12.	9.	15.	0	40.	1	0.	0.	1.	1945.	1945.	1
143	22.	28.	15.	10.	7.	15.	0	5.	0	0.	0.	1.	1949.	1938.	2
144	25.	25.	23.	8.	7.	22.	0	10.	0	0.	0.	1.	1959.	1959.	1
147	39.	82.	65.	18.	17.	9.	0	35.	0	0.	0.	1.	1937.	1931.	2
148	28.	78.	67.	28.	21.	9.	0	85.	1	0.	0.	1.	1933.	1926.	2
149	19.	42.	20.	13.	11.	10.	0	65.	0	0.	0.	1.	1936.	1931.	2
153	25.	45.	30.	10.	8.	9.	0	25.	0	0.	0.	1.	1950.	1950.	1
154	16.	26.	12.	5.	4.	15.	0	50.	0	0.	0.	1.	1950.	1950.	1
156	36.	55.	37.	11.	8.	8.	0	25.	0	0.	0.	1.	1926.	1926.	2
157	19.	40.	17.	7.	6.	12.	0	60.	1	0.	0.	1.	1951.	1951.	1
158	6.	3.	2.	1.	1.	10.	0	0.	0	0.	0.	1.	1968.	1968.	1
159	41.	103.	85.	20.	17.	8.	0	60.	0	0.	0.	1.	1920.	1920.	1
162	52.	53.	51.	11.	9.	10.	0	70.	1	0.	0.	1.	1948.	1948.	1
163	24.	15.	14.	16.	15.	12.	0	0.	0	0.	0.	1.	1924.	1924.	1
160	44.	56.	42.	3.	3.	10.	0	10.	0	0.	0.	1.	1950.	1950.	2
171	30.	44.	24.	13.	8.	8.	0	20.	0	0.	0.	1.	1955.	1946.	2
172	54.	87.	61.	14.	11.	11.	0	10.	1	0.	0.	1.	1950.	1937.	2
174	24.	32.	28.	9.	6.	5.	0	85.	0	0.	0.	1.	1950.	1950.	1
175	41.	65.	54.	21.	16.	10.	0	40.	0	0.	0.	1.	1948.	1930.	2
176	28.	60.	28.	8.	7.	8.	0	15.	0	0.	0.	1.	1946.	1946.	1
177	22.	33.	18.	5.	5.	7.	0	5.	0	0.	0.	1.	1957.	1957.	1
179	24.	51.	46.	11.	9.	8.	0	65.	1	0.	0.	1.	1942.	1924.	2
184	47.	49.	70.	21.	18.	4.	0	45.	0	0.	0.	1.	1947.	1930.	2
186	39.	104.	51.	15.	14.	5.	0	40.	1	1.	13.	1.	1926.	1921.	2
191	72.	119.	78.	28.	23.	13.	0	40.	0	0.	0.	1.	1924.	1920.	2
192	21.	39.	25.	4.	3.	15.	0	10.	1	0.	0.	1.	1952.	1952.	1
194	35.	39.	22.	12.	7.	20.	0	20.	0	0.	0.	1.	1952.	1949.	1
196	43.	77.	69.	15.	15.	9.	0	60.	1	1.	16.	1.	1935.	1930.	2
197	27.	59.	42.	7.	6.	8.	0	20.	0	1.	7.	1.	1950.	1950.	1
198	62.	88.	67.	30.	20.	8.	0	75.	0	0.	0.	1.	1944.	1936.	2
102	87.	147.	139.	30.	26.	9.	0	55.	0	0.	0.	1.	1924.	1924.	2
104	62.	74.	41.	10.	9.	10.	0	5.	0	0.	0.	1.	1952.	1952.	1
105	34.	35.	28.	11.	9.	11.	0	10.	0	0.	0.	1.	1947.	1937.	2
107	49.	48.	48.	19.	15.	15.	0	15.	0	0.	0.	1.	1948.	1948.	1
108	32.	43.	30.	9.	7.	9.	0	65.	0	0.	0.	1.	1948.	1948.	1

DATA FOR PUTR PLOT NUMBER 2
COLLECTED 07-16-69 PLOT RADIUS = 75. FEET
DENSITY OF PUTR - 3 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 80. DEG MAG TREE NUMBER 21 MAGNETIC AZIMUTH TO TREE 9 DISTANCE TO TREE 19 STEPS
SLOPE = 19. PERCENT TREE NUMBER 22 MAGNETIC AZIMUTH TO TREE 213 DISTANCE TO TREE 100 STEPS
ELEVATION= 7500. FEET(MSL) TREE NUMBER 23 MAGNETIC AZIMUTH TO TREE 328 DISTANCE TO TREE 60 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	AOEP	ISTON	COED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
210	47.	76.	55.	18.	14.	15.	0	45.	0	0.	0.	1.	1934.	1920.	2
213	61.	92.	63.	27.	24.	11.	0	30.	0	0.	0.	1.	1938.	1938.	1
214	52.	99.	78.	23.	22.	8.	0	40.	0	0.	0.	1.	1941.	1941.	1
217	36.	40.	32.	13.	9.	9.	0	45.	0	0.	0.	1.	1946.	1946.	1
218	51.	51.	50.	13.	12.	10.	0	5.	0	0.	0.	1.	1947.	1947.	1
221	93.	209.	169.	46.	40.	7.	0	65.	0	0.	0.	1.	1911.	1911.	1
229	76.	104.	84.	26.	24.	8.	0	30.	0	0.	0.	1.	1925.	1925.	1
233	24.	18.	13.	14.	6.	12.	0	10.	0	0.	0.	1.	1950.	1950.	1
238	33.	46.	30.	11.	10.	13.	0	20.	1	0.	0.	1.	1948.	1948.	1
239	58.	107.	85.	32.	23.	11.	0	55.	1	0.	0.	1.	1942.	1924.	2
242	56.	107.	102.	30.	22.	7.	0	20.	0	0.	0.	1.	1946.	1920.	3
243	49.	75.	74.	21.	16.	8.	0	15.	0	0.	0.	1.	1939.	1939.	1
247	47.	51.	49.	13.	10.	8.	0	15.	0	0.	0.	1.	1949.	1949.	2
248	37.	93.	69.	19.	16.	17.	0	25.	1	1.	28.	1.	1924.	1924.	1
249	83.	188.	142.	48.	41.	13.	0	60.	0	0.	0.	1.	1912.	1910.	1
251	53.	75.	72.	21.	19.	25.	0	40.	0	0.	0.	1.	1926.	1918.	2
252	59.	109.	67.	24.	19.	8.	0	45.	0	0.	0.	1.	1919.	1919.	2
254	49.	89.	89.	19.	160.	6.	0	60.	0	0.	0.	1.	1934.	1925.	2
259	84.	142.	123.	30.	23.	25.	0	40.	0	0.	0.	1.	1933.	1928.	2
261	84.	126.	110.	38.	31.	25.	0	15.	0	0.	0.	1.	1935.	1935.	1
262	46.	82.	46.	13.	10.	25.	0	20.	0	0.	0.	1.	1950.	1950.	1
263	51.	103.	98.	18.	17.	25.	0	20.	0	0.	0.	1.	1938.	1938.	1
264	84.	140.	130.	32.	27.	20.	0	65.	0	0.	0.	1.	1926.	1926.	1
265	55.	124.	113.	23.	12.	25.	0	30.	0	0.	0.	1.	1931.	1924.	2
267	29.	58.	27.	9.	7.	25.	0	15.	0	0.	0.	3.	1950.	1950.	1
271	71.	151.	109.	36.	29.	25.	0	30.	0	0.	0.	1.	1927.	1927.	1
272	64.	100.	95.	26.	16.	25.	0	30.	0	0.	0.	1.	1940.	1917.	2
274	75.	157.	138.	25.	23.	25.	0	55.	0	0.	0.	1.	1927.	1925.	2
275	68.	122.	96.	27.	22.	25.	0	30.	0	0.	0.	1.	1935.	1924.	2
276	81.	138.	108.	32.	26.	25.	0	30.	0	0.	0.	1.	1933.	1933.	1
279	81.	133.	84.	29.	28.	25.	0	80.	0	0.	0.	1.	1912.	1912.	1
280	107.	126.	106.	44.	38.	14.	0	65.	0	0.	0.	1.	1914.	1914.	1
281	54.	74.	71.	8.	6.	10.	0	15.	0	0.	0.	1.	1951.	1951.	1
282	36.	53.	30.	11.	10.	10.	0	15.	0	0.	0.	1.	1947.	1947.	1
284	41.	80.	62.	11.	10.	25.	0	20.	0	0.	0.	1.	1951.	1951.	1
285	53.	90.	74.	13.	11.	25.	0	25.	1	1.	25.	1.	1949.	1949.	1
286	76.	229.	173.	41.	40.	19.	0	45.	0	1.	25.	1.	1916.	1916.	1
288	43.	97.	85.	17.	15.	25.	0	10.	0	0.	0.	1.	1947.	1947.	1
289	55.	120.	99.	23.	19.	25.	0	20.	0	0.	0.	1.	1923.	1923.	1
290	27.	158.	153.	17.	14.	25.	0	95.	0	0.	0.	1.	1933.	1933.	1
292	79.	117.	85.	31.	24.	11.	0	45.	0	0.	0.	1.	1934.	1934.	1
293	89.	105.	91.	-1.	-1.	15.	0	40.	0	0.	0.	1.	-1.	-1.	-1
294	91.	200.	149.	33.	29.	25.	0	40.	0	0.	0.	1.	1924.	1924.	1
295	49.	71.	61.	10.	8.	25.	0	5.	0	0.	0.	1.	1943.	1943.	1
296	60.	106.	100.	20.	19.	25.	0	40.	0	0.	0.	1.	1943.	1943.	1
298	44.	72.	36.	10.	9.	25.	0	20.	0	0.	0.	1.	1950.	1950.	1
201	28.	39.	37.	6.	5.	25.	0	15.	0	0.	0.	1.	1952.	1952.	1
207	27.	30.	27.	6.	5.	12.	0	10.	0	0.	0.	1.	1946.	1946.	2
208	25.	45.	31.	6.	5.	11.	0	20.	0	0.	0.	1.	1959.	1953.	2
209	55.	83.	79.	13.	12.	16.	0	5.	0	0.	0.	1.	1950.	1950.	1

DATA FOR PUTR PLOT NUMBER 3
COLLECTED 07-21-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 1 - ABSOLUTE (1-3)
DENSITY OF PUTR - 1 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 250. DEG MAG TREE NUMBER 31 MAGNETIC AZIMUTH TO TREE 168 DISTANCE TO TREE 40 STEPS
SLOPE = 55. PERCENT TREE NUMBER 32 MAGNETIC AZIMUTH TO TREE 225 DISTANCE TO TREE 32 STEPS
ELEVATION= 6000. FEET(MSL) TREE NUMBER 33 MAGNETIC AZIMUTH TO TREE 330 DISTANCE TO TREE 49 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
310	96.	242.	182.	53.	34.	15.	0	40.	0	0.	0.	1.	1929.	1918.	2
312	136.	220.	119.	36.	34.	25.	0	30.	0	0.	0.	1.	1927.	1927.	1
313	64.	88.	54.	14.	10.	11.	0	20.	0	0.	0.	1.	1949.	1949.	1
314	62.	118.	115.	15.	13.	25.	0	20.	0	0.	0.	1.	1940.	1940.	1
315	65.	118.	116.	22.	19.	9.	0	5.	0	1.	16.	1.	1945.	1945.	1
316	51.	85.	61.	14.	12.	10.	0	10.	0	0.	0.	1.	1949.	1949.	1
319	100.	187.	163.	35.	31.	10.	0	20.	0	0.	0.	1.	1948.	1948.	1
321	67.	165.	115.	38.	34.	8.	0	20.	0	0.	0.	1.	1946.	1915.	3
325	115.	186.	139.	52.	46.	6.	0	55.	0	0.	0.	1.	1950.	1926.	2
326	95.	136.	128.	32.	23.	10.	0	15.	0	0.	0.	1.	1945.	1945.	1
327	47.	53.	35.	7.	5.	5.	0	10.	0	0.	0.	1.	1951.	1951.	1
330	42.	43.	23.	4.	4.	6.	0	5.	0	0.	0.	1.	1957.	1957.	1
332	64.	63.	42.	12.	8.	-0.	0	5.	0	0.	0.	1.	1952.	1952.	1
334	63.	146.	69.	25.	20.	8.	0	30.	0	0.	0.	1.	1944.	1924.	2
336	49.	78.	57.	12.	10.	12.	0	5.	1	0.	0.	1.	1942.	1942.	1
338	126.	414.	250.	113.	109.	12.	0	60.	0	0.	0.	1.	1889.	1850.	4
340	81.	144.	131.	57.	42.	15.	0	80.	0	0.	0.	1.	1900.	1885.	2
341	80.	290.	193.	77.	42.	16.	0	70.	0	0.	0.	1.	1888.	1860.	3
342	47.	92.	52.	14.	11.	7.	1	20.	0	0.	0.	1.	1946.	1944.	2
347	67.	115.	86.	21.	17.	15.	0	80.	0	1.	60.	1.	1943.	1930.	2
348	67.	156.	149.	37.	28.	10.	0	60.	0	3.	176.	1.	1917.	1913.	2
351	88.	204.	122.	39.	29.	17.	0	40.	0	0.	0.	1.	1934.	1926.	2
356	57.	105.	84.	16.	15.	9.	0	40.	0	0.	0.	1.	1942.	1942.	2
357	117.	184.	157.	42.	29.	25.	0	80.	0	0.	0.	1.	1916.	1907.	2
360	45.	148.	123.	52.	36.	15.	0	85.	0	0.	0.	1.	1902.	1875.	3
365	82.	221.	173.	39.	30.	11.	1	25.	0	0.	0.	1.	1913.	1907.	2
366	59.	132.	89.	18.	16.	17.	0	25.	0	0.	0.	1.	1950.	1943.	2
368	50.	112.	81.	15.	14.	9.	0	45.	1	0.	0.	1.	1944.	1944.	1
370	68.	203.	110.	37.	36.	13.	0	25.	0	0.	0.	1.	1919.	1913.	2
371	59.	207.	106.	44.	35.	16.	0	65.	0	0.	0.	1.	1882.	1882.	1
373	23.	48.	32.	12.	6.	-0.	1	15.	0	0.	0.	1.	1963.	1953.	2
374	69.	94.	97.	24.	19.	7.	0	15.	0	0.	0.	1.	1948.	1948.	1
376	85.	104.	158.	35.	29.	20.	0	60.	0	0.	0.	2.	1932.	1924.	2
378	85.	139.	158.	29.	24.	20.	0	60.	0	0.	0.	1.	1941.	1936.	2
379	112.	179.	163.	52.	45.	12.	0	75.	0	0.	0.	1.	1936.	1920.	2
383	86.	168.	137.	28.	26.	11.	0	20.	0	0.	0.	2.	1945.	1945.	1
388	66.	185.	128.	-1.	-1.	25.	1	50.	0	0.	0.	1.	-1.	-1.	-1
390	63.	90.	83.	16.	14.	12.	1	15.	0	0.	0.	1.	1948.	1948.	1
391	119.	287.	191.	60.	43.	25.	1	25.	0	1.	45.	1.	1916.	1916.	1
393	115.	154.	140.	31.	28.	8.	1	15.	0	2.	22.	1.	1945.	1945.	1
396	129.	226.	178.	54.	43.	25.	1	35.	0	0.	0.	1.	1936.	1936.	1
398	42.	82.	70.	13.	10.	5.	0	0.	0	0.	0.	1.	1962.	1962.	1
300	56.	109.	87.	16.	15.	12.	0	20.	0	0.	0.	1.	1946.	1946.	1
301	106.	152.	133.	39.	29.	25.	0	40.	0	0.	0.	1.	1935.	1915.	2
302	86.	182.	85.	28.	20.	25.	1	25.	0	0.	0.	1.	1945.	1945.	1
303	68.	77.	68.	23.	11.	10.	1	15.	0	0.	0.	1.	1945.	1945.	1
304	76.	189.	165.	41.	33.	12.	0	40.	0	0.	0.	1.	1932.	1911.	2
305	88.	113.	95.	19.	15.	9.	0	15.	0	0.	0.	1.	1945.	1945.	1
306	71.	92.	73.	19.	13.	8.	0	15.	0	0.	0.	1.	1949.	1949.	1
308	77.	132.	109.	36.	21.	9.	0	50.	0	0.	0.	1.	1933.	1923.	2

DATA FOR PUTR PLOT NUMBER 4
COLLECTED 07-22-69 PLOT RADIUS = 125. FEET
DENSITY OF PUTR - 3 - ABSOLUTE (1-3)
DENSITY OF PUTR - 3 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 130. DEG MAG TREE NUMBER 41 MAGNETIC AZIMUTH TO TREE 20 DISTANCE TO TREE 2 STEPS
SLOPE = 26. PERCENT TREE NUMBER 42 MAGNETIC AZIMUTH TO TREE 250 DISTANCE TO TREE 5 STEPS
ELEVATION= 8750. FEET(MSL) TREE NUMBER 43 MAGNETIC AZIMUTH TO TREE 175 DISTANCE TO TREE 9 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
411	43.	93.	88.	31.	22.	25.	0	25.	0	0.	0.	1.	1932.	1932.	1
412	43.	121.	114.	30.	25.	25.	1	25.	0	1.	31.	1.	1931.	1920.	2
414	27.	99.	76.	20.	18.	14.	1	25.	0	1.	28.	1.	1917.	1917.	2
415	33.	96.	68.	31.	25.	25.	0	30.	0	1.	54.	1.	1914.	1914.	1
417	17.	48.	28.	8.	6.	16.	0	10.	0	0.	0.	1.	1947.	1947.	1
422	71.	222.	91.	36.	26.	11.	0	70.	0	0.	0.	1.	1917.	1902.	2
423	68.	186.	21.	31.	23.	14.	0	40.	0	0.	0.	1.	1903.	1903.	1
425	59.	166.	125.	39.	32.	25.	0	25.	0	0.	0.	1.	1930.	1900.	3
426	38.	57.	32.	9.	8.	25.	0	40.	0	0.	0.	1.	1943.	1934.	2
427	51.	88.	69.	26.	22.	18.	0	45.	0	0.	0.	1.	1919.	1919.	1
431	37.	58.	41.	20.	12.	12.	0	50.	0	0.	0.	1.	1939.	1930.	2
432	29.	57.	48.	12.	12.	11.	0	10.	0	0.	0.	1.	1947.	1947.	1
434	29.	91.	76.	35.	25.	7.	1	15.	0	2.	74.	1.	1909.	1909.	2
435	28.	75.	66.	23.	13.	25.	1	20.	0	0.	0.	1.	1930.	1930.	1
436	10.	19.	17.	6.	5.	25.	1	60.	0	0.	0.	1.	1955.	1955.	1
440	58.	107.	88.	32.	31.	11.	0	35.	0	0.	0.	1.	1896.	1896.	2
445	26.	49.	47.	16.	10.	6.	1	15.	0	0.	0.	1.	1924.	1924.	2
446	54.	140.	86.	38.	29.	7.	0	50.	0	0.	0.	1.	1900.	1897.	2
448	30.	68.	61.	21.	18.	4.	0	10.	1	0.	0.	1.	1933.	1933.	1
449	57.	101.	75.	35.	25.	25.	1	55.	0	0.	0.	1.	1903.	1903.	1
453	43.	138.	112.	38.	34.	7.	0	40.	0	3.	109.	1.	1916.	1890.	3
454	45.	158.	109.	33.	28.	4.	1	90.	0	0.	0.	1.	1925.	1904.	3
455	17.	42.	28.	15.	9.	9.	0	5.	0	0.	0.	1.	1952.	1947.	2
456	45.	122.	103.	31.	29.	10.	0	15.	0	0.	0.	1.	1930.	1930.	1
457	63.	168.	105.	32.	21.	14.	0	60.	0	2.	71.	1.	1909.	1897.	3
458	22.	44.	29.	15.	9.	12.	0	35.	0	0.	0.	1.	1937.	1937.	2
461	35.	114.	63.	29.	26.	25.	0	45.	0	1.	28.	1.	1946.	1920.	4
464	20.	51.	51.	16.	15.	10.	0	20.	0	0.	0.	1.	1917.	1917.	2
466	28.	73.	64.	16.	10.	12.	1	15.	0	0.	0.	1.	1916.	1916.	1
467	42.	144.	133.	44.	31.	9.	0	25.	0	1.	46.	1.	1913.	1908.	2
468	64.	162.	106.	62.	55.	7.	0	30.	0	0.	0.	1.	1904.	1894.	2
471	38.	110.	89.	19.	14.	25.	1	60.	0	2.	58.	1.	1922.	1919.	2
474	38.	76.	67.	19.	14.	5.	0	30.	0	0.	0.	1.	1913.	1903.	2
475	48.	168.	153.	59.	43.	25.	0	65.	0	0.	0.	1.	1888.	1874.	3
476	22.	70.	47.	10.	8.	25.	0	20.	0	1.	27.	1.	1938.	1920.	2
478	21.	60.	41.	22.	10.	25.	0	15.	0	0.	0.	1.	1950.	1930.	2
479	27.	79.	55.	14.	14.	25.	0	15.	0	1.	30.	1.	1917.	1905.	2
483	22.	73.	45.	17.	16.	25.	0	40.	0	0.	0.	1.	1940.	1940.	1
487	37.	58.	55.	30.	26.	13.	1	50.	0	0.	0.	1.	1908.	1908.	2
488	36.	98.	88.	41.	27.	17.	0	65.	0	0.	0.	1.	1906.	1906.	1
490	33.	61.	51.	22.	14.	7.	0	25.	0	0.	0.	1.	1937.	1922.	2
492	21.	34.	26.	6.	5.	7.	0	5.	0	0.	0.	1.	1952.	1952.	1
493	27.	57.	45.	11.	9.	8.	0	10.	0	0.	0.	1.	1932.	1932.	1
496	49.	126.	93.	30.	28.	25.	1	15.	1	1.	56.	1.	1910.	1907.	2
498	54.	75.	66.	38.	24.	25.	0	80.	0	0.	0.	1.	1894.	1894.	2
400	27.	53.	33.	8.	7.	9.	0	15.	0	0.	0.	1.	1945.	1945.	1
403	20.	42.	26.	5.	5.	10.	1	5.	0	0.	0.	1.	1946.	1946.	2
407	21.	39.	33.	10.	10.	25.	1	25.	0	0.	0.	1.	1908.	1908.	2
408	21.	61.	47.	18.	17.	25.	1	20.	1	0.	0.	1.	1925.	1925.	1
409	35.	112.	87.	28.	25.	5.	1	30.	0	0.	0.	1.	1916.	1916.	1

DATA FOR PUTR PLOT NUMBER 5
COLLECTED 07-23-69 PLOT RADIUS = 125. FEET
DENSITY OF PUTR - 3 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 155. DEG MAG TREE NUMBER 51 MAGNETIC AZIMUTH TO TREE 123 DISTANCE TO TREE 17 STEPS
SLOPE = 13. PERCENT TREE NUMBER 52 MAGNETIC AZIMUTH TO TREE 257 DISTANCE TO TREE 17 STEPS
ELEVATION= 8500. FEET(MSL) TREE NUMBER 53 MAGNETIC AZIMUTH TO TREE 336 DISTANCE TO TREE 17 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
510	46.	107.	86.	32.	27.	6.	0	65.	1	0.	0.	1.	1908.	1908.	2
511	54.	217.	126.	31.	17.	16.	0	50.	0	0.	0.	1.	1920.	1905.	3
512	55.	176.	173.	54.	50.	15.	0	70.	0	2.	178.	1.	1907.	1907.	2
514	38.	77.	73.	38.	34.	6.	1	30.	0	0.	0.	1.	1900.	1900.	3
515	56.	105.	103.	33.	28.	10.	0	25.	1	0.	0.	1.	1906.	1906.	1
517	21.	77.	45.	15.	9.	8.	1	75.	0	0.	0.	2.	1948.	1930.	2
518	19.	49.	31.	7.	6.	8.	0	10.	0	0.	0.	1.	1944.	1944.	1
522	48.	125.	98.	30.	28.	25.	0	40.	0	0.	0.	1.	1904.	1904.	1
523	58.	110.	103.	34.	19.	9.	0	75.	0	0.	0.	1.	1890.	1890.	3
526	22.	59.	48.	9.	8.	10.	0	20.	0	0.	0.	1.	1940.	1940.	1
527	48.	138.	79.	31.	23.	11.	0	55.	0	0.	0.	1.	1893.	1893.	3
531	24.	56.	29.	21.	16.	11.	0	80.	0	0.	0.	1.	1911.	1911.	1
532	63.	123.	122.	19.	12.	16.	0	25.	1	0.	0.	2.	1918.	1918.	2
534	64.	123.	111.	35.	31.	10.	0	40.	0	0.	0.	1.	1905.	1905.	1
535	57.	144.	136.	53.	28.	12.	0	60.	0	0.	0.	1.	1928.	1885.	4
536	37.	67.	44.	13.	10.	6.	0	30.	0	0.	0.	1.	1912.	1912.	2
540	23.	42.	33.	11.	9.	6.	1	5.	0	0.	0.	1.	1946.	1946.	1
545	34.	82.	77.	22.	17.	7.	1	90.	0	0.	0.	1.	1930.	1921.	2
546	13.	22.	11.	9.	4.	5.	1	30.	0	0.	0.	2.	1941.	1941.	2
548	39.	103.	48.	21.	14.	14.	0	90.	0	0.	0.	1.	1932.	1932.	1
549	58.	125.	119.	29.	27.	14.	0	40.	0	0.	0.	1.	1921.	1921.	1
553	67.	107.	67.	33.	24.	22.	0	35.	0	0.	0.	1.	1935.	1914.	2
554	28.	51.	34.	8.	7.	10.	0	5.	0	0.	0.	1.	1942.	1942.	1
555	21.	32.	20.	5.	4.	6.	0	0.	0	0.	0.	1.	1950.	1950.	1
556	25.	45.	37.	16.	8.	7.	0	25.	0	0.	0.	1.	1931.	1931.	2
557	25.	27.	22.	8.	6.	3.	0	30.	0	0.	0.	1.	1932.	1932.	1
558	28.	44.	30.	14.	12.	14.	1	30.	0	0.	0.	1.	1917.	1917.	2
561	34.	96.	69.	15.	14.	10.	1	25.	0	0.	0.	1.	1942.	1942.	1
564	22.	52.	38.	19.	16.	7.	0	20.	0	0.	0.	1.	1902.	1896.	2
566	39.	64.	29.	15.	14.	5.	0	25.	0	0.	0.	1.	1915.	1915.	2
567	53.	146.	111.	46.	32.	25.	1	65.	0	0.	0.	1.	1881.	1877.	2
568	25.	49.	79.	29.	22.	8.	0	70.	0	0.	0.	1.	1905.	1905.	2
571	26.	38.	32.	5.	5.	4.	0	10.	0	0.	0.	1.	1952.	1952.	1
574	20.	54.	43.	14.	10.	5.	0	65.	0	0.	0.	1.	1914.	1914.	2
575	42.	67.	38.	19.	9.	6.	1	30.	0	0.	0.	1.	1927.	1905.	3
576	25.	33.	25.	12.	9.	7.	1	20.	0	0.	0.	1.	1952.	1952.	1
578	16.	17.	11.	9.	7.	6.	0	20.	0	0.	0.	1.	1936.	1922.	2
583	40.	77.	59.	20.	14.	5.	0	70.	0	0.	0.	1.	1914.	1906.	2
587	33.	61.	73.	23.	15.	11.	0	60.	0	0.	0.	1.	1917.	1917.	2
588	27.	46.	42.	10.	5.	16.	0	40.	0	0.	0.	1.	1942.	1942.	1
589	38.	86.	62.	13.	12.	25.	0	30.	0	0.	0.	1.	1915.	1915.	2
590	24.	30.	17.	12.	8.	6.	0	35.	1	0.	0.	1.	1910.	1910.	2
592	25.	77.	52.	22.	19.	10.	0	80.	0	0.	0.	1.	1917.	1917.	1
593	31.	47.	23.	10.	9.	17.	0	15.	0	0.	0.	1.	1920.	1917.	2
596	44.	135.	121.	41.	36.	6.	0	85.	0	0.	0.	1.	1899.	1899.	2
598	33.	66.	49.	22.	14.	4.	0	15.	0	0.	0.	1.	1925.	1900.	3
500	39.	60.	40.	19.	15.	7.	0	50.	1	0.	0.	2.	1902.	1902.	2
507	64.	151.	128.	37.	35.	7.	0	30.	0	1.	22.	1.	1920.	1906.	2
508	19.	34.	30.	8.	5.	5.	0	10.	0	0.	0.	1.	1951.	1951.	1
509	48.	87.	82.	29.	18.	5.	0	20.	0	0.	0.	1.	1918.	1918.	1

DATA FOR PUTR PLOT NUMBER 6
COLLECTED 07-29-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 3 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 145. DEG MAG TREE NUMBER 61 MAGNETIC AZIMUTH TO TREE 17 DISTANCE TO TREE 18 STEPS
SLOPE = 64. PERCENT TREE NUMBER 62 MAGNETIC AZIMUTH TO TREE 154 DISTANCE TO TREE 27 STEPS
ELEVATION= 7750. FEET(MSL) TREE NUMBER 63 MAGNETIC AZIMUTH TO TREE 289 DISTANCE TO TREE 14 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	COED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
611	70.	140.	116.	30.	26.	14.	0	25.	0	0.	0.	1.	1945.	1945.	1
612	56.	151.	136.	19.	15.	9.	0	40.	0	0.	0.	1.	1937.	1937.	2
614	59.	133.	123.	19.	15.	6.	0	15.	0	0.	0.	1.	1948.	1948.	1
615	63.	200.	119.	44.	30.	5.	0	50.	0	0.	0.	1.	1946.	1943.	2
616	47.	128.	102.	24.	20.	25.	0	15.	0	0.	0.	1.	1941.	1933.	2
617	55.	113.	108.	20.	14.	9.	0	40.	0	0.	0.	1.	1940.	1933.	2
621	75.	175.	127.	28.	28.	6.	0	5.	0	0.	0.	1.	1948.	1948.	1
623	85.	191.	151.	31.	26.	16.	0	10.	0	0.	0.	1.	1919.	1919.	1
624	69.	179.	145.	25.	24.	10.	0	20.	0	1.	48.	1.	1938.	1933.	2
626	56.	202.	178.	32.	25.	20.	0	50.	0	0.	0.	1.	1939.	1939.	2
628	62.	132.	97.	17.	16.	14.	1	20.	0	0.	0.	1.	1947.	1947.	1
632	26.	33.	26.	8.	7.	9.	1	5.	0	0.	0.	1.	1946.	1946.	1
636	55.	130.	128.	20.	16.	25.	0	5.	1	0.	0.	1.	1951.	1951.	1
637	34.	142.	104.	29.	23.	25.	0	15.	0	0.	0.	1.	1945.	1945.	1
642	68.	151.	142.	20.	19.	15.	0	25.	0	2.	35.	1.	1934.	1934.	1
643	81.	181.	143.	22.	18.	11.	0	15.	0	0.	0.	1.	1945.	1945.	1
645	49.	90.	83.	21.	15.	14.	0	5.	0	0.	0.	2.	1941.	1927.	2
646	50.	126.	117.	15.	15.	7.	0	15.	0	0.	0.	1.	1943.	1943.	1
648	61.	152.	95.	19.	16.	9.	0	25.	0	0.	0.	1.	1946.	1942.	2
650	75.	107.	87.	21.	17.	9.	0	35.	0	0.	0.	2.	1942.	1928.	2
651	48.	55.	39.	12.	11.	25.	0	10.	0	0.	0.	1.	1947.	1947.	1
653	53.	124.	83.	13.	11.	25.	0	20.	0	0.	0.	1.	1934.	1932.	2
657	22.	42.	29.	6.	5.	20.	1	0.	0	0.	0.	1.	1957.	1957.	1
660	45.	97.	57.	20.	15.	15.	1	30.	0	0.	0.	1.	1946.	1946.	1
661	86.	130.	158.	32.	25.	10.	0	35.	0	0.	0.	2.	1943.	1943.	1
662	86.	130.	89.	18.	15.	10.	0	35.	0	0.	0.	1.	1943.	1943.	1
663	49.	80.	61.	13.	10.	12.	0	5.	0	0.	0.	1.	1957.	1957.	1
664	48.	106.	58.	19.	14.	25.	0	10.	0	0.	0.	1.	1942.	1942.	1
666	49.	101.	53.	20.	20.	14.	1	40.	0	0.	0.	3.	1945.	1945.	1
667	42.	73.	62.	18.	14.	17.	0	70.	0	0.	0.	1.	1949.	1949.	1
671	25.	31.	27.	5.	4.	16.	1	0.	0	0.	0.	1.	1964.	1964.	1
672	52.	100.	59.	16.	16.	25.	0	35.	0	0.	0.	2.	1940.	1928.	2
674	59.	115.	94.	13.	12.	19.	1	20.	0	0.	0.	1.	1948.	1948.	1
676	71.	156.	130.	45.	37.	19.	0	65.	0	0.	0.	2.	1926.	1926.	2
677	45.	72.	45.	18.	13.	17.	1	45.	0	0.	0.	1.	1936.	1936.	2
680	57.	207.	169.	69.	59.	-0.	0	40.	0	0.	0.	1.	1926.	1926.	1
681	23.	62.	27.	9.	7.	6.	0	10.	0	0.	0.	1.	1945.	1945.	1
686	46.	56.	36.	12.	8.	10.	0	40.	0	0.	0.	1.	1940.	1940.	2
688	70.	212.	176.	67.	51.	7.	0	50.	0	0.	0.	1.	1926.	1926.	1
689	66.	161.	120.	31.	21.	7.	0	40.	0	0.	0.	1.	1933.	1933.	2
691	62.	213.	142.	33.	21.	5.	0	90.	0	0.	0.	1.	1942.	1920.	3
692	54.	119.	114.	18.	18.	15.	0	25.	0	0.	0.	1.	1944.	1944.	1
693	60.	143.	106.	14.	10.	10.	0	10.	1	0.	0.	1.	1943.	1943.	2
695	65.	134.	108.	19.	13.	11.	1	65.	0	0.	0.	1.	1942.	1935.	2
698	74.	163.	161.	37.	31.	8.	0	55.	0	0.	0.	1.	1936.	1910.	3
699	35.	83.	71.	10.	9.	7.	0	25.	0	0.	0.	1.	1943.	1943.	2
602	63.	162.	135.	34.	32.	9.	0	65.	0	0.	0.	1.	1928.	1928.	2
603	67.	175.	131.	32.	26.	9.	0	80.	0	0.	0.	1.	1913.	1913.	2
606	95.	187.	149.	22.	20.	10.	0	20.	0	0.	0.	1.	1940.	1940.	1
608	67.	128.	110.	16.	14.	25.	0	60.	0	0.	0.	1.	1939.	1939.	2

DATA FOR PUTR PLOT NUMBER 7
COLLECTED 07-30-69 PLOT RADIUS = 125. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 140. DEG MAG TREE NUMBER 71 MAGNETIC AZIMUTH TO TREE 90 DISTANCE TO TREE -0 STEPS
SLOPE = 50. PERCENT TREE NUMBER 72 MAGNETIC AZIMUTH TO TREE 123 DISTANCE TO TREE -0 STEPS
ELEVATION= 5900. FEET(MSL) TREE NUMBER 73 MAGNETIC AZIMUTH TO TREE 147 DISTANCE TO TREE -0 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
712	62.	70.	65.	17.	13.	20.	1	80.	0	0.	0.	1.	1936.	1936.	1
716	87.	190.	124.	37.	28.	25.	1	30.	0	0.	0.	1.	1925.	1925.	2
717	125.	156.	131.	54.	37.	25.	0	30.	0	0.	0.	1.	1910.	1910.	2
718	74.	122.	111.	34.	25.	25.	1	60.	0	0.	0.	2.	1914.	1914.	2
720	72.	246.	125.	67.	56.	25.	1	75.	0	0.	0.	1.	1905.	1905.	2
725	102.	174.	135.	46.	37.	25.	0	80.	0	0.	0.	1.	1911.	1903.	2
727	83.	238.	126.	47.	37.	25.	1	60.	0	0.	0.	1.	1910.	1910.	2
728	91.	222.	133.	38.	36.	25.	1	80.	0	0.	0.	1.	1922.	1922.	2
730	75.	185.	110.	14.	24.	25.	1	45.	0	1.	75.	1.	1923.	1923.	1
736	46.	87.	65.	19.	15.	25.	1	75.	0	0.	0.	1.	1932.	1921.	2
737	87.	139.	133.	39.	35.	25.	1	45.	0	0.	0.	1.	1911.	1908.	2
738	75.	158.	87.	45.	32.	25.	1	75.	0	1.	75.	1.	1921.	1921.	2
740	85.	211.	132.	43.	38.	25.	0	45.	0	0.	0.	1.	1930.	1930.	1
741	72.	110.	91.	25.	23.	25.	1	80.	0	0.	0.	1.	1950.	1950.	1
742	78.	144.	123.	52.	41.	25.	0	45.	0	0.	0.	1.	1895.	1895.	3
748	91.	130.	128.	32.	25.	25.	1	60.	0	0.	0.	2.	1938.	1938.	1
749	65.	125.	95.	30.	22.	25.	0	40.	0	0.	0.	1.	1933.	1933.	1
751	33.	117.	90.	33.	23.	25.	1	85.	0	0.	0.	1.	1944.	1930.	2
757	115.	140.	85.	28.	26.	25.	0	25.	0	0.	0.	2.	1933.	1933.	1
758	54.	165.	108.	36.	21.	25.	1	25.	0	0.	0.	1.	1931.	1922.	2
760	70.	129.	68.	40.	30.	25.	0	70.	0	0.	0.	1.	1926.	1920.	2
761	102.	162.	157.	40.	38.	25.	1	50.	0	0.	0.	1.	1925.	1925.	1
763	128.	174.	138.	45.	41.	25.	0	60.	0	0.	0.	1.	1922.	1917.	2
764	91.	138.	114.	40.	21.	25.	0	60.	0	0.	0.	1.	1911.	1911.	2
766	52.	117.	70.	21.	16.	25.	0	80.	0	0.	0.	1.	1947.	1947.	2
767	92.	136.	99.	57.	36.	25.	0	75.	0	0.	0.	1.	1912.	1912.	1
768	102.	189.	174.	24.	24.	25.	1	20.	0	0.	0.	1.	1926.	1926.	2
769	75.	173.	117.	37.	33.	25.	0	50.	0	0.	0.	1.	1923.	1915.	2
770	73.	96.	72.	24.	24.	25.	0	30.	0	1.	51.	1.	1940.	1940.	1
774	94.	158.	146.	45.	42.	25.	0	40.	0	0.	0.	1.	1909.	1909.	1
775	78.	118.	105.	27.	19.	25.	0	75.	0	0.	0.	2.	1912.	1912.	2
776	61.	83.	75.	27.	26.	25.	0	60.	0	0.	0.	1.	1933.	1922.	2
777	89.	140.	108.	47.	43.	25.	0	55.	0	0.	0.	4.	1913.	1913.	2
780	81.	228.	153.	41.	30.	25.	0	30.	0	1.	64.	1.	1927.	1927.	1
781	75.	141.	129.	27.	22.	25.	0	65.	0	0.	0.	2.	1915.	1915.	2
785	86.	158.	110.	29.	20.	25.	0	40.	0	2.	108.	2.	1924.	1924.	2
786	71.	123.	87.	34.	18.	25.	0	75.	0	0.	0.	1.	1907.	1907.	2
787	15.	107.	67.	30.	18.	25.	0	90.	0	0.	0.	1.	1922.	1922.	2
788	86.	159.	58.	21.	18.	25.	1	35.	0	0.	0.	1.	1926.	1926.	2
789	57.	83.	80.	12.	10.	25.	0	45.	0	0.	0.	1.	1946.	1946.	1
791	44.	91.	75.	33.	26.	25.	0	20.	0	0.	0.	1.	1924.	1924.	2
793	66.	81.	68.	19.	17.	25.	0	40.	0	0.	0.	2.	1925.	1918.	2
794	82.	196.	133.	41.	33.	25.	1	35.	0	0.	0.	1.	1910.	1910.	1
795	76.	210.	188.	31.	21.	25.	0	25.	0	2.	165.	1.	1927.	1927.	2
796	144.	164.	132.	65.	38.	25.	0	60.	0	0.	0.	1.	1926.	1926.	1
700	30.	82.	54.	24.	23.	25.	0	95.	0	0.	0.	2.	1920.	1920.	2
701	98.	142.	131.	23.	23.	25.	0	70.	0	0.	0.	1.	1916.	1909.	2
703	73.	149.	115.	70.	53.	25.	0	80.	0	0.	0.	1.	1904.	1885.	3
706	55.	84.	72.	25.	20.	25.	0	50.	0	0.	0.	1.	1930.	1907.	3
708	63.	149.	115.	32.	24.	25.	0	60.	0	0.	0.	2.	1920.	1905.	2

DATA FOR PUTR PLOT NUMBER 8
COLLECTED 07-30-69 PLOT RADIUS = 125. FEET
DENSITY OF PUTR - 3 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 190. DEG MAG TREE NUMBER 81 MAGNETIC AZIMUTH TO TREE 33 DISTANCE TO TREE 23 STEPS
SLOPE = 29. PERCENT TREE NUMBER 82 MAGNETIC AZIMUTH TO TREE 155 DISTANCE TO TREE 15 STEPS
ELEVATION= 8050. FEET(MSL) TREE NUMBER 83 MAGNETIC AZIMUTH TO TREE 347 DISTANCE TO TREE 22 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
810	46.	131.	108.	27.	22.	8.	0	60.	0	0.	0.	1.	1918.	1918.	2
813	41.	89.	68.	14.	13.	4.	1	15.	0	0.	0.	1.	1926.	1923.	2
814	49.	113.	103.	39.	30.	6.	1	25.	0	0.	0.	1.	1908.	1908.	2
815	39.	95.	54.	25.	22.	5.	1	40.	0	0.	0.	1.	1920.	1920.	1
816	44.	94.	77.	26.	14.	12.	1	15.	0	0.	0.	1.	1915.	1915.	2
818	47.	75.	63.	17.	7.	9.	1	80.	0	0.	0.	1.	1950.	1910.	5
820	37.	37.	34.	9.	4.	7.	1	25.	0	0.	0.	1.	1936.	1925.	3
821	67.	129.	85.	21.	19.	6.	1	30.	0	0.	0.	1.	1920.	1920.	2
823	41.	81.	49.	12.	12.	9.	1	55.	0	0.	0.	1.	1924.	1924.	2
825	42.	52.	46.	13.	12.	12.	1	50.	0	0.	0.	1.	1942.	1915.	3
827	39.	60.	42.	14.	12.	7.	1	30.	0	0.	0.	1.	1928.	1928.	2
828	43.	89.	55.	14.	13.	6.	1	55.	0	0.	0.	1.	1915.	1915.	2
830	56.	149.	90.	27.	21.	9.	1	70.	0	0.	0.	1.	1926.	1926.	2
837	29.	53.	31.	10.	10.	5.	1	15.	0	0.	0.	1.	1935.	1935.	1
839	17.	21.	14.	3.	3.	5.	1	5.	0	0.	0.	1.	1952.	1952.	1
841	65.	132.	90.	29.	22.	6.	1	75.	0	0.	0.	2.	1906.	1906.	2
844	58.	132.	88.	30.	20.	7.	1	65.	0	3.	24.	2.	1912.	1912.	2
845	34.	66.	63.	12.	11.	6.	1	55.	0	1.	43.	2.	1926.	1926.	2
846	53.	131.	101.	36.	35.	6.	1	75.	0	0.	0.	1.	1908.	1908.	2
847	77.	62.	52.	17.	14.	7.	1	20.	0	0.	0.	2.	1919.	1919.	2
849	60.	115.	94.	14.	11.	8.	1	25.	0	0.	0.	1.	1935.	1935.	1
851	55.	116.	85.	22.	19.	7.	1	35.	0	0.	0.	1.	1918.	1918.	2
857	20.	26.	15.	4.	4.	7.	1	5.	0	0.	0.	5.	1958.	1958.	1
859	49.	63.	39.	9.	9.	9.	1	20.	0	0.	0.	5.	1933.	1933.	2
862	68.	148.	128.	40.	35.	9.	1	75.	0	0.	0.	1.	1904.	1904.	2
865	35.	60.	43.	10.	9.	8.	1	30.	0	0.	0.	1.	1923.	1923.	2
866	49.	71.	34.	22.	20.	10.	1	30.	0	0.	0.	2.	1916.	1916.	2
867	58.	102.	80.	21.	18.	6.	1	35.	0	0.	0.	1.	1912.	1912.	1
868	42.	48.	46.	18.	12.	3.	1	40.	0	0.	0.	1.	1920.	1920.	2
870	36.	42.	38.	9.	7.	5.	1	25.	0	0.	0.	1.	1943.	1943.	1
871	49.	74.	52.	19.	16.	7.	1	35.	0	0.	0.	1.	1911.	1911.	1
873	54.	102.	101.	30.	24.	7.	1	45.	0	0.	0.	1.	1896.	1896.	1
875	61.	102.	79.	28.	27.	9.	1	30.	0	0.	0.	2.	1904.	1904.	1
876	59.	90.	48.	10.	8.	10.	1	45.	0	0.	0.	2.	1940.	1940.	2
878	91.	131.	102.	25.	25.	8.	1	35.	1	0.	0.	1.	1927.	1927.	1
882	52.	114.	91.	32.	28.	7.	1	70.	0	0.	0.	1.	1899.	1899.	1
885	68.	124.	106.	23.	21.	5.	1	65.	0	0.	0.	1.	1905.	1905.	2
889	36.	64.	60.	12.	9.	5.	1	40.	0	0.	0.	1.	1944.	1944.	1
891	42.	56.	54.	15.	12.	5.	1	20.	0	0.	0.	3.	1937.	1937.	1
892	54.	124.	65.	35.	25.	5.	1	30.	0	0.	0.	1.	1895.	1893.	2
894	66.	166.	129.	27.	24.	5.	1	60.	0	0.	0.	1.	1923.	1912.	2
895	62.	157.	77.	22.	15.	11.	1	80.	0	0.	0.	1.	1923.	1923.	1
896	55.	87.	64.	31.	25.	6.	1	65.	0	0.	0.	1.	1917.	1917.	1
898	49.	67.	32.	15.	13.	7.	1	60.	0	0.	0.	2.	1934.	1920.	2
899	39.	44.	35.	15.	11.	7.	1	70.	0	0.	0.	1.	1942.	1942.	1
800	73.	130.	104.	21.	18.	8.	1	30.	1	0.	0.	1.	1923.	1923.	2
801	68.	94.	87.	32.	26.	5.	1	40.	0	0.	0.	1.	1908.	1908.	1
803	42.	64.	44.	15.	13.	7.	1	50.	0	0.	0.	1.	1931.	1931.	2
804	48.	105.	63.	17.	14.	7.	1	25.	0	1.	26.	3.	1918.	1918.	2
807	50.	112.	75.	44.	26.	10.	1	30.	0	0.	0.	1.	1942.	1915.	4

DATA FOR PUTR PLOT NUMBER 9
COLLECTED 08-03-69 PLOT RADIUS = 150. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 170. DEG MAG TREE NUMBER 91 MAGNETIC AZIMUTH TO TREE 15 DISTANCE TO TREE 186 STEPS
SLOPE = 7. PERCENT TREE NUMBER 92 MAGNETIC AZIMUTH TO TREE 30 DISTANCE TO TREE 80 STEPS
ELEVATION= 7750. FEET(MSL) TREE NUMBER 93 MAGNETIC AZIMUTH TO TREE 62 DISTANCE TO TREE 120 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	AGEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
910	89.	152.	109.	52.	43.	25.	0	25.	0	1.	55.	1.	1870.	1870.	1
911	70.	102.	69.	27.	22.	25.	1	10.	0	0.	0.	1.	1906.	1906.	2
916	71.	104.	91.	22.	18.	25.	0	15.	1	0.	0.	1.	1938.	1938.	1
923	81.	167.	148.	29.	22.	25.	0	20.	0	0.	0.	1.	1918.	1918.	1
930	56.	105.	80.	14.	13.	25.	0	5.	0	1.	18.	1.	1953.	1953.	1
931	89.	165.	139.	29.	28.	25.	0	10.	0	0.	0.	1.	1941.	1941.	1
932	84.	116.	92.	22.	19.	25.	0	25.	0	0.	0.	3.	1924.	1924.	2
934	56.	79.	52.	21.	15.	25.	0	25.	1	0.	0.	1.	1937.	1937.	1
935	78.	117.	69.	43.	31.	25.	0	30.	0	0.	0.	2.	1912.	1900.	4
936	82.	124.	59.	21.	13.	25.	0	40.	0	0.	0.	1.	1916.	1916.	1
938	84.	136.	109.	38.	29.	25.	0	35.	0	0.	0.	1.	1908.	1906.	2
939	65.	109.	70.	15.	13.	25.	0	5.	0	0.	0.	1.	1941.	1941.	1
942	77.	116.	85.	25.	23.	25.	0	20.	0	0.	0.	1.	1909.	1909.	2
943	93.	170.	106.	56.	45.	25.	0	75.	0	0.	0.	1.	1913.	1870.	3
944	36.	67.	44.	8.	7.	25.	0	0.	0	0.	0.	1.	1957.	1957.	1
945	70.	133.	112.	43.	37.	25.	0	65.	0	0.	0.	1.	1932.	1890.	4
947	64.	92.	89.	20.	18.	25.	0	25.	0	0.	0.	1.	1915.	1915.	2
949	82.	129.	106.	44.	30.	25.	0	85.	0	0.	0.	1.	1915.	1915.	1
951	71.	173.	171.	49.	37.	25.	0	25.	0	0.	0.	1.	1915.	1911.	2
952	80.	142.	93.	24.	23.	25.	0	20.	0	0.	0.	1.	1940.	1940.	1
956	80.	107.	92.	24.	19.	25.	0	25.	0	0.	0.	1.	1939.	1939.	1
957	71.	85.	77.	46.	26.	25.	0	55.	0	0.	0.	2.	1909.	1909.	2
960	83.	134.	129.	27.	26.	25.	0	40.	1	0.	0.	1.	1924.	1924.	1
962	48.	64.	56.	11.	8.	25.	0	10.	0	0.	0.	1.	1953.	1953.	1
964	63.	154.	117.	29.	24.	25.	0	20.	0	0.	0.	1.	1903.	1903.	1
965	87.	195.	167.	33.	25.	25.	0	20.	0	0.	0.	1.	1916.	1916.	1
969	47.	97.	95.	14.	11.	25.	0	5.	1	1.	14.	1.	1944.	1944.	1
970	64.	155.	150.	39.	31.	25.	0	30.	0	0.	0.	1.	1930.	1900.	4
971	102.	153.	119.	42.	33.	25.	0	75.	0	0.	0.	1.	1926.	1910.	2
972	80.	139.	109.	52.	32.	25.	0	40.	0	0.	0.	1.	1893.	1885.	2
973	30.	57.	54.	9.	8.	25.	0	0.	0	0.	0.	1.	1958.	1958.	1
974	78.	133.	108.	27.	12.	25.	0	15.	0	0.	0.	1.	1939.	1939.	1
975	68.	139.	134.	40.	35.	25.	0	60.	0	0.	0.	1.	1895.	1880.	3
976	70.	132.	105.	28.	27.	25.	0	10.	0	0.	0.	1.	1936.	1936.	1
977	69.	103.	81.	40.	20.	25.	0	40.	0	0.	0.	1.	1882.	1876.	2
978	73.	116.	93.	36.	31.	25.	0	35.	0	0.	0.	1.	1910.	1905.	4
980	74.	121.	92.	35.	33.	25.	0	40.	0	0.	0.	2.	1903.	1903.	1
982	71.	99.	77.	11.	10.	25.	0	10.	1	0.	0.	1.	1946.	1946.	1
984	80.	131.	67.	27.	21.	25.	0	60.	0	0.	0.	2.	1919.	1919.	1
986	83.	101.	89.	33.	25.	25.	0	35.	0	0.	0.	1.	1906.	1896.	2
993	78.	176.	159.	33.	29.	25.	0	20.	0	0.	0.	1.	1927.	1927.	1
994	54.	133.	127.	14.	14.	25.	1	10.	1	1.	28.	1.	1950.	1950.	1
996	32.	29.	22.	9.	6.	25.	0	0.	0	0.	0.	1.	1962.	1962.	1
998	78.	127.	101.	51.	44.	25.	0	70.	0	0.	0.	1.	1900.	1896.	2
999	68.	100.	86.	25.	23.	25.	0	15.	0	0.	0.	2.	1917.	1917.	2
902	50.	99.	59.	8.	7.	25.	0	10.	0	0.	0.	1.	1951.	1951.	1
906	77.	160.	127.	27.	23.	25.	0	15.	0	0.	0.	1.	1927.	1927.	2
907	88.	178.	152.	78.	58.	25.	0	35.	0	0.	0.	1.	1905.	1900.	2
908	76.	148.	112.	30.	27.	25.	0	25.	0	0.	0.	1.	1943.	1935.	2
909	58.	105.	104.	20.	18.	25.	1	45.	0	0.	0.	1.	1922.	1922.	2

DATA FOR PUTR PLOT NUMBER 10
COLLECTED 08-05-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 80. DEG MAG TREE NUMBER 101 MAGNETIC AZIMUTH TO TREE 140 DISTANCE TO TREE 45 STEPS
SLOPE = 40. PERCENT TREE NUMBER 102 MAGNETIC AZIMUTH TO TREE 260 DISTANCE TO TREE 38 STEPS
ELEVATION= 7950. FEET(MSL) TREE NUMBER 103 MAGNETIC AZIMUTH TO TREE 340 DISTANCE TO TREE 37 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CRED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1011	67.	90.	88.	24.	21.	14.	0	20.	0	0.	0.	1.	1947.	1910.	3
1012	43.	83.	53.	13.	12.	25.	1	20.	0	0.	0.	1.	1919.	1919.	2
1015	84.	113.	91.	23.	18.	13.	1	40.	0	0.	0.	1.	1933.	1933.	1
1016	46.	101.	77.	23.	17.	25.	1	30.	0	2.	66.	1.	1894.	1894.	2
1017	37.	93.	41.	14.	11.	25.	1	20.	0	1.	31.	1.	1930.	1920.	2
1023	61.	68.	59.	12.	10.	25.	1	25.	0	0.	0.	1.	1945.	1945.	1
1024	50.	79.	61.	14.	11.	25.	1	60.	0	0.	0.	1.	1918.	1918.	2
1028	92.	162.	76.	33.	28.	25.	1	60.	0	0.	0.	2.	1894.	1894.	2
1031	63.	120.	84.	29.	22.	12.	0	20.	0	0.	0.	1.	1951.	1951.	1
1033	78.	98.	69.	31.	25.	25.	1	50.	0	0.	0.	1.	1913.	1912.	2
1034	49.	122.	94.	13.	11.	10.	0	20.	0	1.	26.	1.	1945.	1945.	1
1036	72.	167.	156.	23.	21.	18.	1	15.	0	0.	0.	1.	1916.	1916.	2
1037	74.	120.	118.	35.	23.	14.	1	30.	0	0.	0.	1.	1908.	1908.	2
1042	76.	133.	124.	35.	29.	25.	1	75.	0	0.	0.	1.	1902.	1895.	2
1045	42.	65.	49.	15.	11.	8.	0	25.	0	0.	0.	1.	1920.	1920.	2
1046	74.	100.	99.	24.	22.	12.	0	25.	0	0.	0.	1.	1916.	1916.	2
1048	51.	90.	77.	24.	16.	14.	0	60.	0	0.	0.	1.	1939.	1933.	2
1050	36.	46.	37.	9.	7.	12.	0	0.	0	0.	0.	1.	1950.	1950.	1
1053	64.	129.	116.	29.	20.	15.	0	45.	0	1.	20.	1.	1900.	1900.	3
1057	53.	56.	47.	11.	10.	10.	0	15.	1	0.	0.	1.	1946.	1946.	1
1059	49.	76.	71.	23.	20.	16.	0	15.	0	0.	0.	1.	1926.	1926.	2
1060	83.	157.	104.	39.	30.	25.	0	60.	0	0.	0.	1.	1925.	1912.	2
1061	40.	79.	77.	13.	10.	25.	0	80.	0	0.	0.	1.	1931.	1928.	2
1062	37.	74.	65.	16.	11.	9.	0	15.	0	0.	0.	1.	1935.	1932.	2
1063	39.	87.	67.	15.	13.	10.	0	20.	0	0.	0.	1.	1934.	1930.	2
1064	28.	23.	23.	3.	3.	7.	0	0.	0	0.	0.	1.	1962.	1962.	1
1066	48.	54.	42.	10.	7.	9.	1	10.	0	0.	0.	2.	1950.	1950.	1
1067	60.	124.	100.	31.	20.	10.	0	25.	0	0.	0.	1.	1923.	1923.	1
1071	30.	59.	33.	8.	7.	9.	0	5.	0	0.	0.	1.	1947.	1947.	1
1072	41.	78.	53.	13.	8.	6.	0	5.	0	0.	0.	1.	1934.	1934.	2
1074	20.	50.	43.	13.	10.	25.	1	5.	1	0.	0.	1.	1946.	1946.	1
1076	31.	51.	47.	12.	10.	9.	0	10.	0	0.	0.	1.	1935.	1935.	1
1077	40.	66.	57.	16.	12.	15.	0	20.	0	0.	0.	1.	1924.	1924.	2
1080	62.	91.	85.	25.	18.	9.	0	25.	0	0.	0.	1.	1921.	1910.	2
1081	47.	94.	64.	10.	9.	12.	0	15.	0	1.	15.	1.	1919.	1917.	2
1082	40.	73.	63.	14.	10.	13.	0	20.	0	0.	0.	1.	1936.	1923.	3
1084	57.	86.	85.	23.	17.	25.	1	25.	0	0.	0.	1.	1909.	1909.	2
1089	44.	58.	36.	12.	10.	16.	1	15.	0	0.	0.	1.	1934.	1926.	2
1091	45.	99.	66.	26.	12.	8.	0	20.	0	0.	0.	1.	1911.	1911.	2
1092	46.	85.	54.	14.	12.	7.	0	15.	0	0.	0.	1.	1940.	1940.	2
1093	39.	127.	71.	30.	21.	12.	0	65.	0	1.	41.	1.	1938.	1938.	1
1095	40.	65.	56.	10.	8.	25.	1	10.	0	0.	0.	1.	1946.	1946.	1
1096	45.	61.	42.	8.	7.	13.	0	5.	0	0.	0.	1.	1951.	1951.	1
1098	38.	79.	48.	17.	11.	13.	0	20.	0	0.	0.	1.	1945.	1935.	2
1099	53.	86.	67.	14.	10.	9.	0	20.	0	0.	0.	1.	1942.	1940.	2
1002	57.	124.	90.	33.	19.	25.	0	60.	0	0.	0.	1.	1910.	1895.	3
1003	52.	74.	66.	16.	11.	25.	1	40.	0	0.	0.	3.	1948.	1948.	1
1004	24.	40.	40.	18.	10.	25.	0	30.	0	0.	0.	1.	1932.	1932.	2
1006	57.	125.	83.	20.	16.	25.	1	60.	0	0.	0.	1.	1936.	1931.	2
1008	39.	67.	59.	24.	20.	25.	1	40.	0	0.	0.	1.	1929.	1920.	2

DATA FOR PUTR PLOT NUMBER 11
COLLECTED 08-06-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 55. DEG MAG TREE NUMBER 111 MAGNETIC AZIMUTH TO TREE 30 DISTANCE TO TREE 4 STEPS
SLOPE = 10. PERCENT TREE NUMBER 112 MAGNETIC AZIMUTH TO TREE 156 DISTANCE TO TREE 44 STEPS
ELEVATION= 7000. FEET(MSL) TREE NUMBER 113 MAGNETIC AZIMUTH TO TREE 216 DISTANCE TO TREE 6 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1110	70.	165.	121.	25.	22.	25.	1	60.	0	0.	0.	1.	1927.	1927.	1
1112	73.	122.	71.	18.	14.	11.	0	20.	0	1.	69.	1.	1944.	1944.	2
1113	70.	93.	73.	20.	19.	13.	0	30.	0	0.	0.	1.	1945.	1945.	1
1115	37.	78.	55.	8.	8.	14.	1	10.	0	0.	0.	1.	1958.	1958.	1
1116	28.	27.	16.	3.	3.	12.	0	5.	0	0.	0.	3.	1962.	1962.	1
1118	41.	30.	27.	8.	5.	14.	0	5.	0	0.	0.	1.	1961.	1961.	1
1119	39.	29.	15.	4.	3.	14.	0	5.	0	0.	0.	1.	1957.	1957.	1
1121	48.	77.	58.	16.	13.	14.	0	20.	0	0.	0.	1.	1951.	1951.	1
1123	55.	77.	77.	25.	24.	8.	0	90.	0	0.	0.	1.	1930.	1930.	2
1126	49.	81.	78.	14.	8.	10.	0	50.	0	0.	0.	1.	1942.	1942.	1
1127	24.	31.	25.	4.	3.	11.	0	0.	0	0.	0.	1.	1961.	1961.	1
1128	34.	45.	33.	9.	7.	11.	0	5.	0	0.	0.	1.	1960.	1960.	1
1129	40.	91.	80.	16.	15.	10.	0	40.	0	0.	0.	1.	1946.	1946.	1
1130	29.	26.	15.	4.	4.	12.	0	0.	0	0.	0.	1.	1961.	1961.	1
1133	70.	125.	102.	28.	18.	7.	0	20.	0	0.	0.	1.	1950.	1944.	2
1136	87.	250.	245.	51.	44.	14.	1	60.	0	1.	80.	1.	1940.	1925.	3
1137	70.	73.	63.	16.	13.	9.	0	15.	0	0.	0.	1.	1957.	1957.	1
1139	121.	192.	178.	54.	43.	9.	1	60.	0	2.	74.	1.	1928.	1928.	1
1140	67.	95.	84.	15.	15.	8.	0	10.	0	0.	0.	1.	1952.	1952.	1
1141	52.	86.	60.	15.	13.	6.	0	45.	0	0.	0.	1.	1940.	1940.	2
1142	25.	36.	24.	5.	4.	7.	0	0.	0	0.	0.	1.	1963.	1963.	1
1143	57.	96.	69.	30.	18.	8.	0	30.	0	0.	0.	1.	1950.	1948.	2
1144	97.	119.	100.	19.	19.	8.	0	25.	0	0.	0.	1.	1947.	1947.	1
1145	86.	116.	107.	19.	16.	8.	0	20.	0	0.	0.	1.	1952.	1952.	1
1146	102.	156.	122.	22.	21.	6.	0	10.	0	0.	0.	1.	1953.	1953.	1
1148	70.	207.	170.	45.	38.	8.	0	25.	0	0.	0.	1.	1931.	1931.	1
1149	94.	131.	109.	22.	19.	6.	0	25.	0	0.	0.	2.	1945.	1945.	1
1159	82.	133.	99.	18.	18.	10.	0	60.	0	0.	0.	2.	1935.	1935.	2
1161	58.	115.	97.	25.	17.	11.	0	30.	0	0.	0.	1.	1929.	1929.	1
1162	49.	90.	60.	13.	12.	25.	1	70.	0	0.	0.	1.	1948.	1948.	2
1165	51.	54.	40.	12.	10.	13.	0	70.	0	0.	0.	1.	1946.	1946.	1
1166	67.	215.	179.	34.	30.	7.	0	75.	0	1.	58.	1.	1931.	1931.	1
1167	52.	85.	68.	20.	15.	7.	0	50.	0	0.	0.	1.	1941.	1941.	1
1168	16.	25.	20.	4.	4.	11.	0	5.	0	0.	0.	1.	1960.	1960.	1
1169	23.	28.	23.	4.	3.	10.	0	0.	0	0.	0.	1.	1962.	1962.	1
1171	35.	65.	54.	11.	10.	9.	1	25.	0	0.	0.	1.	1930.	1930.	2
1172	30.	34.	25.	6.	6.	15.	1	15.	0	0.	0.	1.	1952.	1952.	1
1173	49.	67.	65.	14.	11.	8.	0	20.	0	0.	0.	1.	1944.	1944.	1
1178	60.	81.	59.	22.	16.	9.	1	20.	0	0.	0.	1.	1935.	1935.	2
1182	96.	166.	156.	34.	28.	6.	0	20.	0	1.	28.	1.	1943.	1943.	1
1183	30.	35.	29.	6.	6.	12.	0	0.	0	0.	0.	1.	1962.	1962.	1
1187	33.	27.	20.	6.	4.	16.	0	5.	0	0.	0.	1.	1961.	1961.	1
1191	46.	96.	56.	17.	15.	12.	0	25.	0	0.	0.	1.	1944.	1944.	1
1194	57.	116.	91.	24.	22.	5.	1	70.	0	0.	0.	1.	1918.	1918.	2
1199	8.	10.	5.	22.	22.	12.	0	0.	0	0.	0.	1.	1961.	1961.	1
1100	55.	81.	80.	24.	23.	12.	0	50.	0	0.	0.	1.	1931.	1931.	2
1103	13.	17.	15.	4.	4.	15.	0	10.	0	0.	0.	1.	1958.	1958.	1
1106	85.	148.	114.	38.	35.	11.	0	60.	0	0.	0.	1.	1937.	1937.	2
1108	23.	22.	20.	6.	4.	9.	0	5.	0	0.	0.	1.	1961.	1961.	1
1109	23.	20.	17.	5.	4.	12.	0	5.	0	0.	0.	1.	1961.	1961.	1

DATA FOR PUTR PLOT NUMBER 12
COLLECTED 08-07-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 215. DEG MAG TREE NUMBER 121 MAGNETIC AZIMUTH TO TREE 182 DISTANCE TO TREE -0 STEPS
SLOPE = 55. PERCENT TREE NUMBER -0 MAGNETIC AZIMUTH TO TREE -0 DISTANCE TO TREE -0 STEPS
ELEVATION= 8000. FEET(MSL) TREE NUMBER -0 MAGNETIC AZIMUTH TO TREE -0 DISTANCE TO TREE -0 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1214	86.	171.	122.	65.	40.	25.	1	60.	0	0.	0.	1.	1910.	1875.	4
1218	55.	143.	120.	33.	25.	25.	1	45.	0	0.	0.	2.	1884.	1884.	1
1220	92.	137.	109.	23.	18.	25.	1	25.	0	0.	0.	2.	1912.	1912.	2
1221	82.	156.	94.	17.	15.	25.	0	35.	1	0.	0.	1.	1919.	1919.	2
1222	27.	60.	57.	12.	9.	25.	1	20.	0	0.	0.	1.	1937.	1937.	2
1223	63.	132.	117.	23.	21.	25.	1	15.	0	0.	0.	1.	1922.	1922.	1
1224	59.	137.	104.	33.	13.	25.	1	15.	0	0.	0.	1.	1922.	1915.	2
1225	72.	193.	162.	32.	31.	25.	0	35.	0	0.	0.	1.	1919.	1919.	2
1226	57.	165.	85.	36.	25.	25.	1	30.	0	0.	0.	1.	1912.	1912.	1
1228	60.	144.	119.	24.	18.	25.	1	30.	1	0.	0.	1.	1930.	1930.	2
1229	85.	218.	115.	33.	23.	25.	1	45.	0	0.	0.	1.	1910.	1910.	1
1231	61.	93.	91.	20.	16.	25.	0	20.	0	0.	0.	1.	1935.	1916.	3
1232	67.	93.	78.	26.	21.	25.	1	25.	0	0.	0.	1.	1923.	1923.	1
1234	58.	114.	110.	41.	36.	25.	1	70.	0	0.	0.	1.	1894.	1894.	2
1236	91.	137.	111.	50.	36.	25.	1	85.	0	0.	0.	1.	1908.	1908.	2
1238	28.	50.	34.	8.	5.	25.	1	20.	0	0.	0.	1.	1944.	1937.	2
1239	42.	91.	75.	13.	13.	25.	1	40.	0	0.	0.	2.	1915.	1915.	2
1240	43.	86.	71.	10.	8.	25.	1	10.	0	0.	0.	2.	1939.	1939.	1
1246	28.	73.	59.	56.	42.	6.	1	50.	0	0.	0.	1.	1917.	1917.	2
1250	53.	86.	63.	18.	17.	25.	1	5.	0	0.	0.	1.	1933.	1925.	2
1251	81.	145.	103.	33.	27.	25.	1	60.	0	0.	0.	2.	1912.	1912.	2
1252	40.	76.	62.	22.	14.	25.	1	55.	0	0.	0.	1.	1903.	1903.	2
1253	58.	138.	130.	33.	22.	25.	1	20.	0	0.	0.	1.	1922.	1922.	1
1254	68.	102.	81.	30.	26.	25.	1	50.	0	0.	0.	1.	1911.	1911.	1
1257	48.	78.	65.	17.	17.	25.	1	25.	0	0.	0.	1.	1941.	1941.	1
1259	74.	112.	98.	34.	25.	25.	1	35.	0	0.	0.	1.	1931.	1931.	1
1260	58.	111.	71.	20.	18.	4.	0	55.	0	0.	0.	1.	1916.	1916.	2
1261	51.	97.	73.	13.	11.	25.	1	25.	0	0.	0.	1.	1933.	1933.	2
1262	44.	74.	65.	16.	11.	25.	1	55.	0	0.	0.	1.	1917.	1917.	2
1264	95.	183.	138.	77.	65.	25.	1	90.	0	0.	0.	1.	1902.	1902.	1
1268	45.	60.	58.	13.	10.	25.	1	10.	0	0.	0.	1.	1932.	1932.	3
1271	78.	171.	121.	53.	51.	25.	1	50.	0	0.	0.	1.	1903.	1903.	2
1275	55.	138.	103.	20.	17.	25.	0	20.	0	2.	51.	1.	1934.	1934.	2
1276	78.	167.	111.	33.	26.	25.	0	60.	0	0.	0.	1.	1937.	1920.	4
1277	68.	192.	141.	47.	33.	25.	0	20.	0	1.	24.	1.	1902.	1902.	1
1278	22.	47.	24.	7.	5.	25.	1	30.	0	0.	0.	1.	1935.	1935.	2
1280	69.	89.	72.	24.	18.	25.	1	20.	0	0.	0.	2.	1920.	1920.	2
1281	49.	79.	75.	34.	18.	25.	0	60.	0	0.	0.	3.	1893.	1893.	1
1284	84.	190.	182.	40.	39.	25.	1	40.	0	0.	0.	3.	1905.	1905.	2
1287	57.	146.	100.	49.	33.	25.	0	70.	0	0.	0.	1.	1909.	1909.	1
1293	44.	154.	144.	22.	18.	25.	1	55.	0	0.	0.	1.	1915.	1915.	3
1294	75.	127.	108.	36.	34.	10.	0	60.	0	0.	0.	1.	1890.	1890.	1
1295	74.	160.	124.	55.	52.	12.	0	50.	0	0.	0.	1.	1895.	1895.	1
1297	63.	158.	126.	39.	38.	25.	1	30.	0	0.	0.	1.	1903.	1885.	3
1298	47.	130.	118.	51.	41.	25.	1	55.	0	0.	0.	1.	1895.	1895.	2
1299	63.	129.	109.	30.	28.	25.	1	40.	0	0.	0.	1.	1902.	1902.	1
1301	72.	113.	72.	34.	30.	25.	1	65.	0	0.	0.	1.	1902.	1902.	2
1302	67.	113.	35.	16.	11.	9.	0	30.	0	0.	0.	1.	1938.	1922.	2
1206	78.	174.	144.	46.	28.	25.	1	15.	1	0.	0.	1.	1917.	1917.	1
1209	38.	101.	65.	24.	23.	25.	1	50.	0	0.	0.	1.	1916.	1916.	1

DATA FOR PUTR PLOT NUMBER 13
COLLECTED 08-11-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 3 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 65. DEG MAG TREE NUMBER 131 MAGNETIC AZIMUTH TO TREE 74 DISTANCE TO TREE 36 STEPS
SLOPE = 37. PERCENT TREE NUMBER 132 MAGNETIC AZIMUTH TO TREE 84 DISTANCE TO TREE 37 STEPS
ELEVATION= 7100. FEET(MSL) TREE NUMBER 133 MAGNETIC AZIMUTH TO TREE 347 DISTANCE TO TREE 60 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1314	59.	158.	98.	38.	29.	14.	0	50.	0	0.	0.	1.	1933.	1933.	2
1316	93.	175.	162.	57.	47.	24.	0	80.	0	0.	0.	1.	1920.	1920.	2
1320	25.	15.	12.	3.	2.	25.	1	5.	0	0.	0.	1.	1962.	1962.	1
1321	44.	79.	77.	12.	11.	25.	1	25.	0	0.	0.	1.	1943.	1930.	3
1325	43.	98.	92.	16.	13.	11.	1	5.	0	0.	0.	1.	1953.	1953.	1
1327	34.	83.	59.	31.	23.	16.	1	25.	0	0.	0.	1.	1934.	1926.	3
1328	81.	195.	137.	35.	33.	25.	1	15.	0	0.	0.	1.	1910.	1910.	2
1329	60.	110.	101.	32.	22.	25.	0	40.	0	0.	0.	1.	1917.	1917.	2
1331	43.	59.	46.	22.	16.	25.	0	40.	0	0.	0.	1.	1939.	1930.	2
1332	93.	127.	106.	35.	30.	25.	0	40.	0	0.	0.	1.	1922.	1919.	2
1333	50.	102.	93.	25.	22.	25.	0	25.	0	0.	0.	1.	1932.	1932.	1
1335	67.	161.	119.	31.	27.	25.	1	40.	0	1.	71.	1.	1930.	1930.	1
1337	31.	34.	20.	3.	3.	25.	0	0.	0	0.	0.	1.	1961.	1961.	1
1339	67.	146.	99.	48.	37.	25.	0	30.	0	0.	0.	1.	1929.	1929.	1
1341	74.	99.	79.	44.	32.	25.	0	60.	0	0.	0.	1.	1912.	1912.	2
1343	85.	135.	105.	23.	20.	25.	0	50.	0	1.	28.	2.	1925.	1925.	2
1344	75.	154.	130.	34.	30.	25.	0	45.	0	0.	0.	1.	1918.	1918.	2
1346	61.	53.	50.	13.	11.	8.	0	20.	0	0.	0.	1.	1935.	1935.	2
1347	66.	114.	73.	25.	21.	13.	0	35.	0	0.	0.	1.	1941.	1941.	1
1351	58.	94.	80.	36.	23.	25.	0	80.	0	0.	0.	1.	1922.	1922.	2
1356	51.	169.	146.	30.	22.	16.	0	45.	0	4.	125.	1.	1931.	1931.	2
1357	39.	62.	57.	11.	8.	25.	0	15.	0	0.	0.	1.	1942.	1942.	1
1359	56.	190.	123.	17.	14.	25.	0	70.	0	0.	0.	1.	1932.	1932.	2
1360	51.	161.	92.	36.	34.	25.	0	40.	0	0.	0.	3.	1910.	1910.	2
1362	62.	87.	83.	28.	21.	23.	0	50.	0	0.	0.	1.	1933.	1926.	2
1364	67.	79.	77.	23.	17.	25.	0	35.	0	0.	0.	1.	1956.	1945.	3
1365	47.	87.	57.	15.	14.	25.	0	10.	0	0.	0.	1.	1946.	1946.	1
1366	62.	67.	65.	42.	19.	25.	0	60.	0	0.	0.	1.	1909.	1909.	3
1367	73.	137.	129.	32.	29.	17.	0	40.	0	0.	0.	1.	1914.	1914.	2
1370	59.	127.	98.	30.	27.	22.	0	25.	0	0.	0.	1.	1932.	1932.	2
1371	62.	159.	142.	29.	23.	25.	1	50.	0	0.	0.	1.	1925.	1925.	1
1373	63.	172.	111.	23.	18.	17.	0	90.	0	0.	0.	1.	1946.	1930.	3
1378	60.	86.	49.	43.	34.	16.	0	20.	0	0.	0.	1.	1922.	1922.	2
1382	34.	64.	43.	11.	10.	25.	0	5.	0	1.	20.	1.	1949.	1949.	1
1383	60.	72.	62.	30.	19.	25.	1	40.	0	0.	0.	1.	1935.	1920.	3
1385	84.	173.	169.	65.	50.	25.	0	25.	0	0.	0.	1.	1918.	1918.	1
1389	62.	120.	101.	23.	20.	25.	0	20.	0	0.	0.	1.	1931.	1931.	1
1392	79.	183.	147.	38.	36.	25.	0	75.	0	0.	0.	1.	1910.	1910.	2
1393	62.	114.	110.	30.	24.	25.	0	35.	0	0.	0.	1.	1928.	1928.	1
1394	52.	62.	51.	22.	19.	25.	0	60.	0	0.	0.	1.	1926.	1926.	1
1395	34.	62.	40.	10.	7.	25.	1	75.	0	0.	0.	1.	1943.	1943.	2
1396	49.	52.	39.	20.	18.	25.	0	75.	0	0.	0.	1.	1925.	1925.	2
1397	51.	98.	66.	26.	24.	22.	0	60.	0	0.	0.	1.	1928.	1928.	2
1398	59.	164.	129.	32.	29.	25.	0	70.	0	0.	0.	1.	1942.	1942.	1
1399	46.	79.	69.	24.	16.	25.	0	40.	0	0.	0.	1.	1933.	1933.	1
1300	68.	73.	66.	18.	14.	18.	1	30.	0	0.	0.	1.	1946.	1946.	2
1301	69.	171.	118.	54.	45.	17.	0	70.	0	0.	0.	1.	1915.	1915.	2
1304	64.	113.	79.	44.	26.	25.	0	95.	0	0.	0.	1.	1920.	1920.	2
1307	50.	114.	69.	34.	28.	25.	0	80.	0	0.	0.	1.	1923.	1923.	2
1309	89.	142.	99.	34.	33.	25.	0	55.	0	0.	0.	1.	1916.	1916.	2

DATA FOR PUTR PLOT NUMBER 14
COLLECTED 08-12-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 3 - ABSOLUTE (1-3)
DENSITY OF PUTR - 2 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 280. DEG MAG TREE NUMBER 141 MAGNETIC AZIMUTH TO TREE 77 DISTANCE TO TREE 54 STEPS
SLOPE = 24. PERCENT TREE NUMBER 142 MAGNETIC AZIMUTH TO TREE 165 DISTANCE TO TREE 7 STEPS
ELEVATION= 6900. FEET(MSL) TREE NUMBER 143 MAGNETIC AZIMUTH TO TREE 340 DISTANCE TO TREE 35 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	COED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1410	67.	103.	76.	18.	17.	12.	0	50.	0	0.	0.	1.	1941.	1941.	1
1411	127.	189.	136.	37.	28.	12.	0	30.	0	0.	0.	1.	1920.	1920.	1
1412	23.	32.	27.	6.	4.	21.	0	5.	0	0.	0.	1.	1958.	1958.	1
1413	60.	103.	52.	16.	15.	11.	0	10.	0	0.	0.	1.	1949.	1949.	1
1414	63.	119.	67.	26.	19.	7.	0	25.	0	0.	0.	1.	1940.	1940.	1
1416	91.	206.	197.	58.	50.	10.	0	65.	0	0.	0.	1.	1908.	1908.	3
1418	50.	57.	40.	12.	10.	10.	0	20.	0	0.	0.	1.	1940.	1940.	1
1419	67.	122.	103.	24.	21.	7.	0	80.	0	0.	0.	1.	1933.	1933.	1
1422	97.	180.	176.	49.	45.	9.	0	20.	0	0.	0.	1.	1937.	1937.	1
1423	55.	93.	90.	17.	16.	9.	0	10.	0	0.	0.	1.	1949.	1949.	1
1426	72.	148.	133.	30.	28.	8.	0	15.	0	0.	0.	1.	1939.	1939.	1
1429	24.	25.	12.	4.	4.	17.	1	5.	0	0.	0.	1.	1961.	1961.	1
1433	39.	80.	69.	10.	8.	25.	1	5.	0	0.	0.	1.	1957.	1957.	1
1434	66.	108.	99.	20.	14.	15.	0	20.	0	0.	0.	1.	1950.	1950.	1
1435	61.	101.	90.	19.	15.	8.	1	15.	0	0.	0.	1.	1945.	1945.	2
1437	61.	85.	82.	16.	16.	18.	0	50.	0	0.	0.	1.	1940.	1940.	1
1442	50.	70.	69.	16.	14.	9.	1	35.	0	0.	0.	1.	1938.	1938.	1
1445	47.	76.	70.	10.	8.	25.	0	20.	0	0.	0.	1.	1942.	1942.	2
1446	24.	40.	29.	7.	6.	25.	0	10.	0	0.	0.	1.	1957.	1957.	1
1448	103.	203.	178.	43.	42.	25.	1	20.	0	0.	0.	1.	1944.	1944.	1
1454	85.	101.	80.	26.	20.	6.	1	25.	0	0.	0.	1.	1929.	1929.	1
1455	89.	121.	107.	33.	31.	7.	1	70.	0	0.	0.	1.	1925.	1925.	1
1457	98.	209.	175.	61.	42.	25.	1	60.	0	0.	0.	2.	1922.	1922.	2
1458	77.	86.	52.	18.	15.	3.	1	30.	0	0.	0.	1.	1940.	1940.	1
1460	20.	13.	13.	4.	3.	9.	0	5.	0	0.	0.	1.	1961.	1961.	1
1461	88.	129.	117.	30.	27.	10.	0	50.	0	0.	0.	1.	1940.	1930.	3
1462	111.	149.	102.	60.	50.	6.	0	75.	0	0.	0.	3.	1910.	1910.	1
1463	48.	108.	59.	13.	13.	9.	0	35.	0	0.	0.	1.	1940.	1940.	1
1464	36.	65.	41.	14.	9.	24.	0	10.	0	0.	0.	1.	1940.	1940.	1
1471	100.	185.	164.	64.	62.	17.	1	60.	0	0.	0.	1.	1924.	1924.	2
1472	95.	107.	105.	31.	26.	13.	0	40.	0	0.	0.	1.	1925.	1925.	1
1474	37.	34.	34.	7.	5.	12.	0	5.	0	0.	0.	1.	1951.	1951.	2
1475	80.	142.	117.	23.	23.	10.	0	20.	0	0.	0.	1.	1944.	1944.	1
1476	52.	44.	32.	7.	7.	12.	0	5.	0	0.	0.	1.	1949.	1949.	1
1477	70.	116.	103.	25.	20.	8.	0	5.	0	0.	0.	1.	1949.	1949.	1
1478	58.	86.	70.	20.	15.	11.	0	5.	0	0.	0.	1.	1949.	1949.	1
1479	88.	190.	181.	38.	31.	15.	0	25.	0	0.	0.	1.	1942.	1942.	1
1480	90.	138.	104.	31.	22.	11.	0	30.	0	1.	61.	1.	1917.	1917.	2
1482	90.	204.	171.	40.	32.	12.	0	65.	0	0.	0.	1.	1926.	1926.	1
1486	64.	79.	46.	11.	9.	25.	0	5.	0	0.	0.	1.	1960.	1960.	1
1488	29.	19.	18.	2.	2.	25.	0	5.	0	0.	0.	1.	1963.	1963.	1
1490	66.	103.	84.	21.	19.	14.	0	60.	0	0.	0.	1.	1931.	1931.	1
1491	43.	131.	104.	24.	18.	12.	0	40.	0	0.	0.	1.	1930.	1930.	1
1495	26.	31.	30.	11.	8.	12.	0	45.	0	0.	0.	1.	1939.	1939.	1
1496	90.	177.	111.	48.	43.	15.	0	25.	0	0.	0.	1.	1933.	1933.	1
1499	12.	16.	9.	3.	2.	18.	0	0.	0	0.	0.	4.	1965.	1965.	1
1401	79.	134.	122.	49.	44.	9.	0	60.	0	0.	0.	1.	1912.	1912.	1
1404	5.	11.	3.	22.	22.	7.	0	5.	0	0.	0.	1.	1962.	1962.	1
1406	68.	89.	76.	19.	16.	13.	0	30.	0	0.	0.	1.	1931.	1931.	1
1407	41.	32.	29.	6.	5.	25.	0	10.	0	0.	0.	1.	1949.	1949.	2

DATA FOR PUTR PLOT NUMBER 15
COLLECTED 08-14-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 1 - ABSOLUTE (1-3)
DENSITY OF PUTR - 1 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 235. DEG MAG TREE NUMBER 151 MAGNETIC AZIMUTH TO TREE 26 DISTANCE TO TREE 43 STEPS
SLOPE = 13. PERCENT TREE NUMBER 152 MAGNETIC AZIMUTH TO TREE 123 DISTANCE TO TREE 34 STEPS
ELEVATION= 6500. FEET(MSL) TREE NUMBER 153 MAGNETIC AZIMUTH TO TREE 295 DISTANCE TO TREE 29 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDEO	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1510	93.	212.	177.	62.	43.	25.	1	90.	0	2.	128.	1.	1944.	1935.	2
1511	21.	29.	19.	11.	8.	25.	1	90.	0	0.	0.	1.	1956.	1956.	1
1512	69.	129.	111.	23.	17.	25.	1	40.	0	1.	31.	2.	1945.	1945.	2
1513	120.	157.	109.	37.	30.	15.	1	65.	0	0.	0.	1.	1938.	1920.	5
1514	85.	200.	156.	50.	32.	14.	1	60.	0	0.	0.	1.	1938.	1915.	5
1516	34.	93.	87.	29.	23.	13.	1	95.	0	0.	0.	1.	1936.	1936.	2
1518	112.	170.	76.	32.	27.	12.	1	65.	0	0.	0.	1.	1916.	1916.	1
1519	87.	163.	111.	38.	34.	15.	1	70.	0	0.	0.	1.	1930.	1930.	2
1521	13.	34.	25.	6.	4.	9.	1	20.	0	0.	0.	2.	1961.	1961.	1
1522	85.	169.	135.	40.	39.	13.	1	50.	0	2.	60.	1.	1939.	1939.	2
1523	33.	79.	49.	13.	7.	25.	1	20.	0	0.	0.	1.	1938.	1938.	1
1525	32.	56.	25.	9.	8.	25.	1	20.	0	0.	0.	2.	1944.	1944.	1
1528	60.	72.	51.	13.	12.	25.	1	30.	0	0.	0.	2.	1942.	1942.	2
1531	63.	150.	124.	36.	33.	10.	1	80.	0	0.	0.	1.	1927.	1927.	1
1532	108.	(233.	156.	42.	33.	12.	1	70.	0	0.	0.	1.	1917.	1917.	1
1535	53.	107.	96.	25.	20.	7.	1	70.	0	0.	0.	1.	1930.	1930.	2
1537	59.	96.	73.	15.	12.	14.	1	90.	0	0.	0.	1.	1925.	1925.	2
1538	56.	82.	56.	18.	16.	4.	1	80.	0	0.	0.	1.	1935.	1935.	2
1539	52.	92.	85.	32.	11.	11.	1	90.	0	0.	0.	1.	1936.	1936.	2
1541	39.	116.	83.	30.	29.	25.	1	90.	0	0.	0.	1.	1927.	1927.	3
1544	103.	187.	166.	38.	28.	8.	1	70.	0	0.	0.	1.	1934.	1934.	2
1545	80.	177.	111.	18.	18.	12.	1	60.	0	0.	0.	3.	1926.	1926.	1
1546	45.	83.	51.	15.	11.	16.	1	55.	0	0.	0.	1.	1946.	1946.	2
1547	101.	170.	144.	26.	25.	6.	1	75.	0	0.	0.	1.	1922.	1922.	2
1552	77.	167.	139.	35.	23.	17.	1	75.	0	0.	0.	2.	1930.	1930.	1
1554	77.	170.	150.	36.	28.	17.	1	75.	0	0.	0.	1.	1924.	1924.	1
1555	87.	144.	74.	21.	20.	7.	1	45.	0	0.	0.	1.	1945.	1940.	2
1558	79.	157.	90.	17.	14.	4.	1	20.	0	2.	59.	1.	1934.	1934.	2
1559	58.	123.	69.	17.	13.	7.	1	35.	0	0.	0.	1.	1927.	1927.	3
1560	32.	55.	52.	14.	13.	13.	1	90.	0	0.	0.	1.	1939.	1939.	1
1565	101.	214.	158.	49.	40.	10.	1	75.	0	0.	0.	1.	1925.	1925.	2
1567	66.	155.	74.	26.	18.	9.	1	80.	0	2.	40.	1.	1924.	1924.	1
1568	55.	157.	86.	27.	20.	13.	1	45.	0	0.	0.	1.	1944.	1935.	4
1571	79.	187.	173.	38.	36.	25.	1	45.	0	0.	0.	1.	1943.	1943.	1
1573	74.	137.	74.	24.	19.	11.	1	30.	0	0.	0.	1.	1922.	1922.	1
1574	64.	121.	84.	15.	14.	9.	1	25.	0	0.	0.	1.	1935.	1925.	3
1575	108.	198.	129.	25.	16.	9.	1	50.	0	0.	0.	1.	1931.	1931.	2
1577	86.	181.	150.	35.	33.	7.	1	80.	0	0.	0.	1.	1920.	1920.	1
1578	65.	86.	66.	29.	9.	14.	1	75.	0	0.	0.	1.	1922.	1922.	1
1580	120.	264.	244.	63.	55.	10.	1	40.	0	2.	68.	1.	1945.	1945.	1
1581	59.	87.	81.	17.	15.	13.	1	20.	0	0.	0.	1.	1940.	1940.	3
1586	62.	112.	108.	19.	16.	12.	1	25.	0	1.	22.	1.	1954.	1947.	3
1588	89.	173.	159.	29.	28.	14.	1	40.	0	0.	0.	2.	1930.	1930.	1
1591	69.	110.	82.	25.	19.	11.	1	55.	0	0.	0.	1.	1946.	1933.	3
1594	73.	159.	114.	28.	17.	9.	1	20.	0	0.	0.	1.	1950.	1935.	4
1595	32.	70.	44.	16.	13.	9.	1	60.	0	0.	0.	1.	1959.	1940.	3
1599	74.	130.	88.	22.	20.	6.	1	35.	0	0.	0.	1.	1939.	1933.	3
1503	10.	11.	8.	3.	2.	9.	1	0.	0	0.	0.	1.	1962.	1962.	1
1504	85.	173.	97.	30.	24.	11.	1	60.	0	0.	0.	1.	1919.	1919.	1
1508	39.	34.	27.	6.	6.	7.	1	10.	0	0.	0.	1.	1961.	1961.	1

DATA FOR PUTR PLOT NUMBER 16
COLLECTED 08-18-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 3 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 290. DEG MAG TREE NUMBER 161 MAGNETIC AZIMUTH TO TREE 127 DISTANCE TO TREE 32 STEPS
SLOPE = 25. PERCENT TREE NUMBER 162 MAGNETIC AZIMUTH TO TREE 237 DISTANCE TO TREE 24 STEPS
ELEVATION= 7300. FEET(MSL) TREE NUMBER 163 MAGNETIC AZIMUTH TO TREE 322 DISTANCE TO TREE 27 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1610	56.	82.	65.	18.	12.	6.	0	20.	0	0.	0.	1.	1913.	1912.	1
1611	31.	79.	67.	11.	10.	9.	0	25.	0	0.	0.	1.	1930.	1930.	2
1612	46.	135.	59.	17.	12.	8.	0	35.	0	0.	0.	1.	1925.	1925.	2
1613	72.	121.	74.	20.	15.	11.	0	70.	0	0.	0.	1.	1923.	1923.	2
1617	34.	52.	43.	11.	8.	6.	0	55.	0	0.	0.	1.	1929.	1929.	2
1619	45.	65.	43.	10.	9.	5.	0	10.	0	0.	0.	2.	1947.	1947.	1
1621	57.	122.	85.	20.	19.	5.	0	45.	0	0.	0.	1.	1916.	1916.	2
1623	32.	55.	38.	12.	9.	4.	0	35.	0	0.	0.	1.	1926.	1926.	2
1625	57.	132.	91.	12.	12.	11.	0	25.	0	0.	0.	1.	1926.	1926.	1
1627	154.	61.	59.	25.	22.	7.	0	60.	0	0.	0.	1.	1929.	1920.	4
1628	77.	205.	176.	40.	34.	21.	0	45.	0	3.	88.	1.	1918.	1918.	1
1631	51.	90.	66.	14.	12.	25.	0	40.	0	0.	0.	1.	1927.	1927.	2
1632	33.	76.	57.	10.	10.	6.	0	40.	0	0.	0.	1.	1927.	1927.	2
1633	51.	100.	61.	16.	14.	6.	0	60.	0	0.	0.	1.	1926.	1926.	2
1635	51.	76.	61.	18.	16.	25.	0	65.	0	0.	0.	2.	1921.	1921.	2
1638	19.	20.	12.	3.	3.	4.	0	5.	0	0.	0.	2.	1950.	1950.	2
1640	56.	99.	76.	22.	22.	5.	0	75.	0	0.	0.	1.	1918.	1918.	1
1641	55.	86.	80.	21.	21.	10.	0	20.	0	0.	0.	1.	1928.	1928.	1
1642	85.	162.	142.	31.	28.	6.	0	35.	0	0.	0.	1.	1918.	1918.	1
1643	64.	105.	100.	23.	20.	7.	0	20.	0	0.	0.	1.	1927.	1927.	1
1645	28.	57.	29.	11.	9.	10.	0	10.	0	0.	0.	1.	1957.	1957.	1
1646	30.	41.	32.	7.	6.	7.	0	5.	0	0.	0.	1.	1953.	1953.	1
1648	97.	299.	120.	40.	38.	8.	0	60.	0	0.	0.	1.	1873.	1873.	2
1653	31.	79.	45.	17.	14.	6.	0	55.	0	0.	0.	1.	1921.	1915.	2
1654	63.	113.	88.	29.	22.	5.	0	40.	0	0.	0.	1.	1922.	1922.	1
1655	79.	171.	152.	41.	36.	10.	0	40.	0	0.	0.	1.	1912.	1912.	1
1656	65.	123.	107.	31.	27.	6.	0	55.	0	0.	0.	1.	1907.	1907.	2
1661	74.	140.	112.	25.	23.	5.	0	80.	0	0.	0.	3.	1916.	1916.	2
1662	76.	180.	131.	32.	32.	7.	0	35.	0	1.	25.	1.	1912.	1912.	1
1663	75.	120.	82.	30.	27.	7.	0	30.	0	0.	0.	1.	1926.	1926.	1
1664	41.	49.	47.	12.	10.	25.	0	40.	0	0.	0.	1.	1927.	1927.	2
1666	63.	71.	67.	12.	11.	5.	0	15.	0	0.	0.	1.	1932.	1932.	2
1667	48.	57.	38.	16.	11.	4.	0	20.	0	1.	34.	1.	1938.	1938.	1
1669	49.	202.	139.	23.	20.	25.	1	20.	0	1.	69.	1.	1918.	1918.	2
1670	28.	50.	31.	7.	7.	4.	0	5.	0	0.	0.	1.	1942.	1942.	1
1672	89.	159.	138.	36.	27.	8.	0	45.	0	0.	0.	1.	1914.	1914.	1
1673	63.	120.	96.	22.	20.	7.	0	40.	0	0.	0.	4.	1917.	1917.	2
1678	29.	60.	39.	10.	6.	7.	0	10.	0	0.	0.	1.	1945.	1915.	1
1679	47.	104.	77.	21.	18.	6.	0	40.	0	1.	45.	1.	1923.	1923.	2
1682	55.	97.	57.	16.	12.	3.	0	45.	0	0.	0.	3.	1924.	1924.	2
1686	55.	109.	86.	21.	14.	7.	0	15.	0	0.	0.	1.	1938.	1930.	3
1689	57.	125.	73.	23.	16.	6.	0	15.	0	0.	0.	1.	1915.	1915.	2
1691	46.	74.	66.	9.	8.	6.	0	25.	0	0.	0.	1.	1946.	1946.	1
1694	52.	79.	41.	17.	13.	8.	0	35.	0	0.	0.	3.	1923.	1923.	2
1695	49.	82.	60.	16.	14.	14.	0	25.	0	0.	0.	1.	1928.	1928.	2
1698	48.	113.	84.	17.	15.	8.	0	50.	0	0.	0.	1.	1915.	1915.	2
1600	44.	63.	64.	12.	9.	9.	0	10.	0	0.	0.	1.	1930.	1930.	2
1602	35.	72.	49.	13.	9.	5.	0	25.	0	0.	0.	1.	1933.	1933.	2
1604	37.	62.	57.	17.	11.	25.	1	60.	0	0.	0.	1.	1922.	1922.	2
1609	65.	116.	92.	23.	17.	13.	0	65.	0	0.	0.	1.	1929.	1929.	1

DATA FOR PUTR PLOT NUMBER 17
COLLECTED 08-19-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 3 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 180. DEG MAG TREE NUMBER 171 MAGNETIC AZIMUTH TO TREE 130 DISTANCE TO TREE 110 STEPS
SLOPE = 42. PERCENT TREE NUMBER 172 MAGNETIC AZIMUTH TO TREE 284 DISTANCE TO TREE 47 STEPS
ELEVATION= 6750. FEET(MSL) TREE NUMBER 173 MAGNETIC AZIMUTH TO TREE 350 DISTANCE TO TREE 51 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1712	43.	59.	49.	8.	7.	25.	0	40.	0	0.	0.	1.	1958.	1930.	4
1713	67.	83.	66.	25.	19.	25.	0	35.	0	0.	0.	1.	1914.	1914.	2
1715	52.	71.	43.	20.	12.	25.	0	65.	0	0.	0.	1.	1936.	1930.	3
1718	78.	151.	136.	69.	55.	12.	0	95.	0	0.	0.	1.	1924.	1924.	2
1719	76.	76.	71.	29.	18.	9.	0	55.	0	0.	0.	1.	1939.	1910.	5
1720	59.	102.	94.	25.	21.	10.	0	50.	0	0.	0.	1.	1918.	1918.	2
1726	49.	79.	70.	21.	17.	9.	0	50.	0	0.	0.	1.	1918.	1918.	2
1727	16.	26.	15.	5.	4.	8.	0	10.	0	0.	0.	1.	1960.	1960.	1
1728	37.	28.	20.	9.	6.	9.	0	40.	0	0.	0.	1.	1942.	1942.	1
1729	56.	139.	84.	34.	33.	16.	0	80.	0	1.	81.	1.	1909.	1909.	2
1737	48.	92.	76.	35.	29.	7.	0	60.	0	0.	0.	1.	1926.	1920.	2
1738	23.	56.	33.	21.	18.	10.	1	90.	0	0.	0.	1.	1956.	1940.	3
1739	56.	84.	77.	25.	23.	20.	1	45.	0	0.	0.	1.	1915.	1915.	2
1740	44.	88.	61.	24.	15.	24.	0	60.	0	1.	60.	1.	1927.	1927.	1
1741	59.	161.	88.	51.	34.	12.	0	65.	0	0.	0.	1.	1918.	1918.	2
1743	33.	36.	23.	15.	8.	12.	0	40.	0	0.	0.	1.	1942.	1942.	2
1744	30.	71.	51.	16.	16.	13.	0	20.	0	0.	0.	1.	1917.	1917.	2
1745	49.	80.	79.	18.	12.	25.	0	60.	0	0.	0.	1.	1934.	1934.	1
1746	47.	85.	58.	16.	10.	11.	0	15.	0	0.	0.	1.	1946.	1938.	3
1748	40.	73.	72.	15.	13.	10.	0	85.	0	0.	0.	1.	1926.	1926.	2
1750	41.	123.	73.	16.	16.	8.	0	65.	0	0.	0.	1.	1918.	1918.	2
1755	42.	74.	59.	14.	10.	25.	0	15.	0	0.	0.	1.	1934.	1934.	2
1763	49.	88.	66.	22.	19.	16.	0	40.	0	0.	0.	1.	1920.	1920.	2
1765	38.	77.	70.	15.	10.	13.	0	65.	0	0.	0.	1.	1952.	1943.	5
1767	43.	64.	51.	20.	14.	25.	1	70.	0	0.	0.	1.	1948.	1938.	4
1769	42.	141.	98.	10.	9.	11.	0	95.	0	0.	0.	1.	1950.	1950.	2
1770	82.	109.	62.	32.	20.	25.	0	60.	0	0.	0.	1.	1950.	1925.	5
1774	38.	124.	95.	26.	24.	25.	0	55.	0	0.	0.	1.	1920.	1915.	2
1775	39.	72.	52.	15.	12.	25.	0	40.	0	0.	0.	1.	1921.	1921.	2
1776	51.	82.	45.	16.	14.	25.	0	55.	0	0.	0.	1.	1929.	1929.	2
1779	74.	157.	137.	40.	34.	17.	1	95.	0	0.	0.	4.	1912.	1908.	3
1781	71.	127.	101.	27.	22.	5.	0	50.	0	0.	0.	1.	1933.	1929.	2
1782	79.	182.	133.	27.	19.	13.	0	55.	0	0.	0.	1.	1912.	1912.	2
1783	42.	60.	50.	22.	12.	20.	0	60.	0	0.	0.	1.	1935.	1929.	3
1784	55.	105.	75.	19.	15.	9.	0	60.	0	0.	0.	1.	1915.	1915.	2
1785	44.	74.	67.	24.	15.	11.	0	65.	0	0.	0.	1.	1932.	1920.	5
1788	57.	82.	73.	24.	21.	25.	0	80.	0	0.	0.	2.	1937.	1920.	3
1789	49.	86.	63.	22.	17.	14.	0	60.	0	0.	0.	1.	1930.	1920.	3
1790	55.	79.	55.	18.	11.	25.	1	55.	0	0.	0.	1.	1932.	1932.	2
1791	43.	128.	74.	37.	25.	25.	1	45.	0	0.	0.	1.	1926.	1919.	2
1793	60.	106.	91.	31.	29.	25.	0	60.	0	0.	0.	2.	1929.	1920.	3
1794	73.	106.	93.	50.	30.	18.	1	75.	0	0.	0.	1.	1914.	1914.	2
1795	35.	50.	42.	23.	18.	17.	1	60.	0	0.	0.	2.	1915.	1910.	3
1796	68.	94.	79.	18.	18.	25.	0	80.	0	0.	0.	1.	1923.	1923.	1
1797	60.	90.	79.	22.	15.	25.	0	85.	0	0.	0.	1.	1924.	1900.	5
1799	99.	135.	123.	38.	29.	25.	0	50.	0	0.	0.	1.	1907.	1907.	1
1700	32.	81.	61.	23.	23.	25.	1	70.	0	0.	0.	1.	1915.	1915.	2
1701	35.	60.	29.	14.	6.	23.	0	50.	0	0.	0.	2.	1929.	1929.	2
1705	55.	62.	52.	19.	15.	25.	0	65.	0	0.	0.	1.	1916.	1916.	2
1706	36.	68.	54.	21.	16.	8.	0	55.	0	0.	0.	1.	1940.	1934.	2

DATA FOR PUTR PLOT NUMBER 18
COLLECTED 08-20-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 1 - ABSOLUTE (1-3)
DENSITY OF PUTR - 1 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 10. DEG MAG TREE NUMBER 181 MAGNETIC AZIMUTH TO TREE 3 DISTANCE TO TREE 49 STEPS
SLOPE = 14. PERCENT TREE NUMBER 182 MAGNETIC AZIMUTH TO TREE 26 DISTANCE TO TREE 26 STEPS
ELEVATION= 7700. FEET(MSL) TREE NUMBER 183 MAGNETIC AZIMUTH TO TREE 105 DISTANCE TO TREE 25 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1811	49.	88.	42.	11.	9.	18.	0	10.	0	0.	0.	1.	1949.	1949.	2
1812	37.	39.	35.	7.	6.	21.	0	5.	0	0.	0.	1.	1957.	1957.	1
1813	39.	29.	33.	4.	4.	14.	0	10.	0	0.	0.	1.	1952.	1952.	2
1814	32.	72.	58.	8.	7.	15.	0	20.	0	0.	0.	1.	1952.	1952.	1
1818	31.	64.	42.	11.	9.	25.	0	15.	0	0.	0.	1.	1945.	1945.	1
1819	22.	24.	21.	5.	5.	25.	0	5.	0	0.	0.	1.	1949.	1949.	1
1820	39.	61.	47.	13.	11.	13.	0	5.	0	0.	0.	1.	1957.	1957.	1
1821	40.	74.	63.	8.	8.	16.	0	5.	0	0.	0.	1.	1958.	1958.	1
1823	54.	101.	82.	12.	11.	10.	0	20.	0	0.	0.	1.	1950.	1950.	1
1824	89.	110.	93.	-1.	-1.	11.	0	30.	0	0.	0.	1.	-1.	-1.	-1
1826	58.	122.	79.	11.	9.	25.	0	25.	0	0.	0.	1.	1947.	1947.	1
1827	29.	59.	46.	21.	15.	25.	0	5.	0	0.	0.	1.	1930.	1927.	2
1831	44.	44.	43.	7.	7.	11.	0	10.	0	0.	0.	1.	1949.	1949.	1
1832	64.	123.	81.	18.	14.	9.	0	75.	0	0.	0.	1.	1930.	1930.	1
1833	26.	46.	30.	4.	4.	17.	0	0.	0	0.	0.	1.	1963.	1963.	1
1834	29.	75.	49.	9.	9.	25.	0	5.	0	0.	0.	1.	1957.	1957.	1
1835	22.	63.	48.	9.	7.	25.	0	10.	1	0.	0.	1.	1949.	1949.	1
1841	38.	68.	61.	12.	11.	14.	0	5.	0	0.	0.	1.	1930.	1920.	3
1842	50.	62.	54.	8.	8.	25.	0	25.	0	0.	0.	1.	1957.	1957.	1
1844	38.	57.	33.	7.	6.	25.	0	30.	0	0.	0.	1.	1953.	1953.	1
1846	15.	42.	16.	7.	7.	25.	0	10.	0	0.	0.	1.	1949.	1949.	1
1852	11.	15.	8.	5.	4.	7.	0	20.	0	0.	0.	1.	1958.	1958.	1
1853	11.	15.	13.	6.	5.	15.	0	5.	0	0.	0.	1.	1957.	1957.	1
1855	29.	43.	24.	6.	5.	6.	0	5.	0	0.	0.	2.	1958.	1958.	1
1856	22.	28.	19.	5.	4.	5.	0	5.	0	0.	0.	1.	1957.	1957.	1
1858	21.	27.	25.	7.	6.	7.	0	5.	0	0.	0.	1.	1952.	1952.	2
1859	45.	62.	38.	11.	9.	12.	0	10.	0	0.	0.	1.	1944.	1944.	1
1860	75.	103.	71.	22.	15.	25.	0	50.	0	0.	0.	1.	1945.	1945.	1
1861	41.	80.	49.	18.	13.	25.	0	40.	0	0.	0.	1.	1950.	1950.	1
1862	36.	83.	65.	12.	12.	15.	0	10.	0	0.	0.	1.	1948.	1948.	1
1865	23.	50.	39.	9.	9.	15.	0	20.	0	0.	0.	1.	1944.	1944.	2
1866	36.	53.	25.	9.	9.	11.	0	5.	1	0.	0.	1.	1949.	1949.	1
1867	28.	29.	21.	5.	5.	25.	0	0.	0	0.	0.	1.	1956.	1956.	1
1872	20.	45.	20.	7.	6.	7.	0	15.	0	0.	0.	1.	1957.	1957.	1
1873	25.	22.	16.	9.	8.	7.	0	10.	0	0.	0.	1.	1945.	1945.	1
1874	29.	39.	25.	6.	6.	15.	0	5.	0	0.	0.	1.	1959.	1959.	1
1877	19.	34.	20.	10.	8.	13.	0	10.	0	0.	0.	1.	1953.	1949.	2
1881	22.	30.	15.	4.	3.	9.	0	5.	0	0.	0.	1.	1958.	1958.	1
1884	44.	59.	52.	15.	11.	6.	0	15.	0	0.	0.	1.	1923.	1923.	2
1886	59.	81.	64.	13.	11.	9.	0	10.	0	0.	0.	1.	1948.	1948.	2
1887	26.	40.	19.	5.	5.	18.	0	20.	0	0.	0.	1.	1957.	1957.	1
1889	49.	80.	65.	24.	22.	9.	0	30.	0	0.	0.	2.	1920.	1920.	2
1890	20.	31.	22.	8.	7.	9.	0	10.	0	0.	0.	1.	1957.	1957.	1
1894	17.	26.	21.	6.	6.	9.	0	5.	0	0.	0.	1.	1957.	1957.	1
1896	50.	54.	31.	9.	9.	16.	0	80.	0	0.	0.	1.	1947.	1947.	1
1800	38.	88.	49.	14.	10.	25.	0	5.	0	0.	0.	1.	1950.	1950.	1
1805	33.	53.	44.	8.	7.	25.	0	5.	0	0.	0.	1.	1957.	1957.	1
1806	38.	54.	47.	10.	9.	18.	0	20.	0	0.	0.	1.	1947.	1947.	2
1807	38.	67.	48.	10.	9.	25.	0	5.	0	0.	0.	1.	1941.	1941.	2
1809	28.	36.	25.	7.	7.	22.	0	5.	0	0.	0.	1.	1952.	1952.	1

DATA FOR PUTR PLOT NUMBER 19
COLLECTED 08-25-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 3 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 30. DEG MAG
SLOPE = 13. PERCENT
ELEVATION= 7300. FEET(MSL)

TREE NUMBER 191 MAGNETIC AZIMUTH TO TREE 20 DISTANCE TO TREE 39 STEPS
TREE NUMBER 192 MAGNETIC AZIMUTH TO TREE 165 DISTANCE TO TREE 6 STEPS
TREE NUMBER 193 MAGNETIC AZIMUTH TO TREE 278 DISTANCE TO TREE 12 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
1910	60.	130.	118.	22.	20.	3.	0	60.	0	0.	0.	1.	1923.	1923.	3
1913	105.	152.	131.	25.	24.	9.	0	20.	0	0.	0.	1.	1910.	1910.	1
1919	63.	141.	140.	21.	11.	13.	0	30.	0	0.	0.	1.	1932.	1930.	2
1921	51.	84.	69.	10.	8.	25.	1	30.	0	0.	0.	1.	1934.	1934.	2
1923	66.	78.	71.	17.	13.	25.	1	80.	0	0.	0.	1.	1916.	1916.	1
1925	63.	103.	64.	20.	19.	5.	0	90.	0	0.	0.	1.	1944.	1930.	3
1926	47.	110.	77.	15.	12.	5.	0	65.	0	0.	0.	1.	1932.	1932.	2
1928	55.	81.	69.	10.	9.	4.	0	20.	0	0.	0.	1.	1936.	1936.	2
1931	76.	166.	106.	31.	25.	3.	0	65.	0	0.	0.	1.	1914.	1914.	2
1933	65.	108.	105.	15.	13.	4.	0	60.	0	0.	0.	1.	1942.	1930.	5
1935	67.	153.	129.	35.	28.	4.	0	35.	0	0.	0.	1.	1922.	1918.	2
1936	71.	104.	56.	9.	8.	5.	0	40.	0	0.	0.	1.	1936.	1936.	2
1938	52.	83.	42.	13.	13.	5.	0	40.	0	0.	0.	2.	1946.	1936.	2
1941	41.	70.	62.	12.	8.	6.	0	10.	0	0.	0.	1.	1948.	1943.	2
1942	32.	84.	50.	25.	21.	5.	0	90.	0	0.	0.	1.	1917.	1917.	2
1944	63.	73.	41.	14.	12.	7.	0	75.	0	0.	0.	1.	1918.	1918.	3
1947	19.	39.	27.	4.	3.	7.	0	5.	0	0.	0.	1.	1960.	1960.	1
1948	51.	123.	111.	18.	14.	7.	0	30.	0	0.	0.	1.	1956.	1948.	2
1949	58.	68.	40.	7.	6.	5.	0	15.	0	0.	0.	1.	1943.	1943.	1
1952	65.	107.	74.	20.	17.	6.	1	40.	0	0.	0.	2.	1932.	1925.	3
1953	66.	103.	58.	19.	16.	4.	1	60.	0	0.	0.	1.	1919.	1919.	2
1954	62.	115.	103.	17.	15.	6.	1	65.	0	0.	0.	1.	1917.	1917.	2
1955	32.	96.	82.	17.	11.	4.	1	70.	0	0.	0.	1.	1947.	1935.	3
1957	91.	247.	184.	36.	32.	5.	0	80.	0	0.	0.	1.	1914.	1914.	2
1958	92.	169.	134.	28.	27.	24.	0	65.	0	0.	0.	1.	1915.	1915.	1
1959	108.	169.	122.	31.	29.	9.	0	50.	0	0.	0.	1.	1916.	1916.	1
1961	89.	139.	125.	25.	23.	4.	0	75.	0	0.	0.	3.	1933.	1933.	3
1962	88.	157.	109.	42.	34.	4.	0	65.	0	0.	0.	2.	1920.	1900.	4
1963	100.	244.	186.	42.	40.	4.	0	60.	0	0.	0.	1.	1921.	1921.	1
1966	46.	133.	116.	16.	14.	5.	0	60.	0	0.	0.	2.	1912.	1912.	3
1967	89.	229.	182.	48.	43.	7.	0	60.	0	0.	0.	1.	1893.	1893.	2
1969	56.	132.	91.	18.	17.	4.	0	45.	0	0.	0.	1.	1940.	1930.	3
1971	108.	151.	97.	38.	26.	8.	1	45.	0	0.	0.	1.	1907.	1904.	2
1972	87.	136.	84.	27.	25.	5.	1	60.	0	0.	0.	1.	1907.	1907.	1
1974	87.	123.	90.	29.	24.	5.	0	65.	0	0.	0.	1.	1900.	1900.	3
1979	66.	136.	136.	32.	20.	5.	0	50.	0	0.	0.	1.	1928.	1915.	3
1980	51.	77.	51.	10.	9.	4.	0	20.	0	0.	0.	1.	1918.	1918.	2
1981	46.	70.	64.	16.	12.	5.	0	30.	0	0.	0.	1.	1923.	1923.	2
1982	108.	203.	179.	51.	51.	6.	0	55.	0	0.	0.	1.	1920.	1920.	1
1983	98.	172.	144.	30.	25.	4.	0	60.	0	0.	0.	1.	1910.	1908.	2
1984	104.	198.	134.	40.	36.	6.	0	70.	0	0.	0.	1.	1890.	1890.	2
1987	49.	168.	145.	50.	45.	3.	0	85.	0	0.	0.	1.	1921.	1921.	1
1988	60.	119.	87.	21.	18.	4.	0	60.	0	0.	0.	1.	1920.	1920.	2
1989	131.	181.	148.	32.	30.	4.	0	40.	0	0.	0.	1.	1923.	1923.	1
1991	68.	105.	76.	18.	17.	5.	0	55.	0	0.	0.	1.	1914.	1914.	2
1993	56.	133.	103.	11.	11.	5.	0	25.	0	0.	0.	1.	1938.	1938.	2
1994	65.	168.	132.	25.	23.	6.	0	75.	0	0.	0.	2.	1916.	1916.	1
1995	64.	153.	158.	31.	30.	4.	0	50.	0	0.	0.	1.	1917.	1910.	2
1998	57.	104.	95.	22.	21.	3.	0	55.	0	0.	0.	1.	1931.	1931.	1
1904	44.	73.	69.	19.	13.	4.	0	65.	0	0.	0.	2.	1920.	1920.	1

DATA FOR PUTR PLOT NUMBER 20
COLLECTED 08-27-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 195. DEG MAG TREE NUMBER 201 MAGNETIC AZIMUTH TO TREE 20 DISTANCE TO TREE 12 STEPS
SLOPE = 27. PERCENT TREE NUMBER 202 MAGNETIC AZIMUTH TO TREE 97 DISTANCE TO TREE 13 STEPS
ELEVATION= 8350. FEET(MSL) TREE NUMBER 203 MAGNETIC AZIMUTH TO TREE 180 DISTANCE TO TREE 15 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
2014	69.	138.	110.	18.	17.	4.	0	15.	1	0.	0.	1.	1937.	1937.	1
2021	60.	70.	46.	12.	12.	9.	0	20.	0	1.	17.	1.	1952.	1950.	2
2023	71.	134.	110.	26.	19.	5.	0	45.	0	0.	0.	1.	1938.	1930.	2
2024	67.	189.	161.	58.	51.	5.	0	35.	0	0.	0.	1.	1925.	1924.	1
2025	50.	57.	31.	10.	8.	7.	0	5.	0	0.	0.	1.	1953.	1953.	1
2026	96.	194.	121.	33.	32.	5.	0	80.	0	0.	0.	1.	1919.	1918.	2
2028	62.	126.	90.	32.	31.	7.	0	35.	0	0.	0.	3.	1914.	1910.	2
2029	13.	36.	16.	3.	3.	7.	0	60.	0	0.	0.	1.	1962.	1962.	1
2031	41.	33.	27.	7.	6.	6.	0	5.	0	0.	0.	2.	1948.	1948.	1
2032	9.	9.	4.	2.	2.	5.	0	55.	0	0.	0.	1.	1961.	1961.	1
2034	66.	80.	69.	15.	14.	6.	0	25.	0	0.	0.	1.	1945.	1945.	1
2036	72.	143.	125.	28.	24.	8.	0	35.	0	0.	0.	1.	1908.	1908.	1
2038	54.	85.	67.	26.	23.	6.	0	25.	0	0.	0.	1.	1913.	1913.	1
2039	37.	30.	15.	5.	4.	7.	0	15.	0	0.	0.	3.	1951.	1951.	1
2040	54.	127.	94.	27.	25.	11.	0	50.	0	0.	0.	1.	1935.	1935.	1
2046	13.	20.	19.	6.	4.	5.	0	5.	0	0.	0.	1.	1947.	1945.	2
2049	46.	35.	32.	7.	7.	6.	0	5.	0	0.	0.	2.	1951.	1951.	1
2050	66.	106.	95.	18.	17.	13.	0	25.	0	0.	0.	1.	1937.	1936.	1
2051	39.	55.	49.	9.	8.	8.	0	10.	0	0.	0.	1.	1952.	1952.	1
2053	11.	9.	8.	4.	3.	7.	0	20.	0	0.	0.	3.	1959.	1959.	1
2056	65.	125.	111.	27.	24.	6.	0	45.	0	0.	0.	1.	1940.	1940.	1
2057	23.	21.	17.	7.	6.	5.	0	5.	0	0.	0.	2.	1960.	1960.	1
2059	24.	61.	40.	14.	13.	8.	0	10.	0	0.	0.	1.	1950.	1950.	1
2061	56.	103.	60.	12.	10.	6.	0	15.	0	0.	0.	1.	1950.	1950.	1
2062	37.	42.	33.	8.	8.	4.	0	15.	0	0.	0.	2.	1951.	1951.	1
2064	24.	74.	61.	17.	15.	3.	0	30.	0	0.	0.	1.	1943.	1943.	1
2066	29.	89.	56.	16.	14.	9.	0	15.	0	0.	0.	1.	1943.	1943.	1
2068	17.	25.	22.	6.	4.	7.	0	5.	1	0.	0.	1.	1949.	1949.	1
2071	59.	69.	60.	18.	16.	6.	0	85.	0	0.	0.	1.	1942.	1942.	1
2073	17.	41.	34.	7.	5.	3.	0	10.	0	0.	0.	1.	1956.	1956.	1
2075	11.	29.	20.	9.	6.	5.	0	5.	0	0.	0.	1.	1956.	1956.	1
2076	56.	115.	113.	18.	16.	12.	0	50.	0	0.	0.	1.	1940.	1940.	1
2077	52.	158.	99.	22.	21.	6.	0	20.	1	2.	85.	2.	1940.	1940.	1
2078	33.	65.	44.	15.	14.	6.	0	40.	0	0.	0.	1.	1944.	1944.	1
2080	24.	28.	26.	9.	8.	4.	0	15.	0	0.	0.	1.	1944.	1944.	1
2081	61.	121.	93.	22.	21.	5.	0	40.	0	0.	0.	1.	1940.	1940.	1
2084	46.	96.	81.	20.	19.	5.	0	60.	0	0.	0.	1.	1938.	1936.	1
2087	39.	32.	27.	8.	7.	25.	0	10.	1	0.	0.	1.	1949.	1949.	1
2089	25.	45.	25.	9.	8.	6.	0	5.	1	0.	0.	1.	1948.	1948.	1
2093	57.	138.	86.	23.	13.	6.	0	30.	0	0.	0.	1.	1931.	1924.	2
2094	57.	124.	101.	34.	31.	7.	0	60.	1	0.	0.	1.	1934.	1929.	2
2095	13.	9.	5.	3.	3.	2.	0	10.	0	0.	0.	1.	1959.	1959.	1
2096	60.	184.	145.	34.	26.	5.	0	55.	0	1.	58.	1.	1925.	1925.	1
2097	41.	76.	66.	15.	13.	7.	0	40.	0	0.	0.	2.	1921.	1918.	2
2099	57.	155.	146.	25.	21.	8.	0	45.	0	1.	80.	1.	1904.	1904.	2
2000	31.	90.	74.	16.	13.	7.	0	45.	0	0.	0.	1.	1943.	1938.	2
2001	25.	36.	28.	7.	6.	4.	0	40.	0	0.	0.	1.	1949.	1949.	1
2005	72.	81.	71.	22.	17.	6.	0	50.	0	0.	0.	1.	1924.	1924.	1
2006	73.	113.	109.	37.	24.	3.	0	40.	0	0.	0.	1.	1901.	1901.	1
2009	56.	94.	74.	11.	10.	5.	0	25.	0	0.	0.	1.	1946.	1946.	1

DATA FOR PUTR PLOT NUMBER 21
COLLECTED 09-03-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 180. DEG MAG TREE NUMBER 211 MAGNETIC AZIMUTH TO TREE 55 DISTANCE TO TREE 12 STEPS
SLOPE = 24. PERCENT TREE NUMBER 212 MAGNETIC AZIMUTH TO TREE 175 DISTANCE TO TREE 23 STEPS
ELEVATION= 8500. FEET(MSL) TREE NUMBER 213 MAGNETIC AZIMUTH TO TREE 295 DISTANCE TO TREE 10 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
2110	39.	32.	26.	10.	7.	7.	0	20.	0	0.	0.	1.	1930.	1920.	2
2111	18.	16.	12.	4.	4.	6.	0	10.	0	0.	0.	2.	1950.	1950.	1
2119	26.	56.	41.	12.	9.	7.	0	35.	1	0.	0.	1.	1943.	1939.	2
2120	20.	24.	17.	5.	5.	6.	0	10.	0	0.	0.	1.	1956.	1950.	2
2122	34.	32.	26.	8.	8.	6.	0	15.	0	0.	0.	1.	1946.	1946.	1
2125	40.	80.	62.	16.	14.	8.	0	20.	0	0.	0.	1.	1942.	1942.	1
2126	64.	136.	102.	22.	22.	6.	0	10.	0	0.	0.	1.	1942.	1942.	1
2127	55.	127.	112.	29.	24.	6.	0	35.	0	0.	0.	1.	1921.	1919.	2
2128	21.	37.	18.	12.	9.	5.	0	15.	0	0.	0.	1.	1951.	1951.	1
2130	38.	118.	95.	25.	23.	9.	0	35.	0	0.	0.	1.	1920.	1920.	1
2131	12.	35.	27.	10.	8.	4.	0	5.	0	0.	0.	1.	1938.	1938.	1
2133	23.	28.	24.	10.	9.	4.	0	20.	0	0.	0.	1.	1947.	1947.	1
2134	64.	106.	79.	24.	23.	7.	0	50.	0	0.	0.	2.	1915.	1915.	2
2135	33.	31.	25.	8.	8.	8.	0	10.	0	0.	0.	1.	1951.	1951.	1
2138	31.	41.	23.	7.	5.	5.	0	5.	0	0.	0.	3.	1945.	1945.	1
2140	22.	41.	30.	9.	8.	6.	0	15.	0	0.	0.	3.	1941.	1941.	1
2143	26.	30.	22.	9.	8.	5.	0	15.	0	0.	0.	1.	1938.	1938.	1
2144	32.	56.	45.	14.	12.	6.	0	40.	0	0.	0.	1.	1941.	1941.	1
2146	28.	43.	36.	8.	8.	4.	0	15.	0	0.	0.	1.	1949.	1949.	1
2148	32.	40.	33.	10.	10.	5.	0	10.	0	0.	0.	1.	1942.	1942.	1
2150	41.	47.	41.	12.	10.	8.	0	15.	0	0.	0.	1.	1942.	1942.	1
2152	44.	165.	147.	24.	23.	9.	0	15.	0	0.	0.	1.	1917.	1917.	1
2154	32.	71.	62.	14.	13.	6.	0	10.	0	0.	0.	2.	1928.	1928.	1
2157	45.	88.	75.	16.	15.	6.	0	10.	0	0.	0.	1.	1935.	1935.	1
2158	36.	52.	28.	12.	10.	7.	0	10.	0	0.	0.	1.	1938.	1938.	1
2159	82.	182.	175.	37.	35.	9.	0	40.	0	0.	0.	1.	1916.	1916.	1
2160	12.	31.	15.	5.	5.	9.	0	5.	0	0.	0.	1.	1958.	1958.	1
2163	33.	38.	30.	10.	10.	14.	0	15.	0	0.	0.	1.	1941.	1941.	1
2164	55.	89.	72.	18.	17.	6.	0	20.	0	0.	0.	2.	1942.	1942.	1
2166	40.	49.	34.	8.	8.	7.	0	5.	0	0.	0.	1.	1950.	1950.	1
2167	48.	58.	54.	10.	10.	6.	0	25.	1	0.	0.	1.	1938.	1938.	1
2168	20.	39.	31.	8.	7.	6.	0	10.	0	0.	0.	1.	1950.	1950.	1
2169	56.	134.	85.	28.	24.	7.	0	35.	0	0.	0.	2.	1912.	1912.	3
2172	64.	107.	88.	24.	22.	12.	0	35.	0	0.	0.	1.	1935.	1935.	1
2173	39.	66.	50.	17.	14.	21.	0	10.	0	0.	0.	1.	1936.	1936.	1
2174	49.	89.	80.	18.	13.	5.	0	70.	0	0.	0.	1.	1944.	1938.	2
2177	31.	50.	43.	18.	16.	5.	0	60.	0	0.	0.	1.	1928.	1928.	1
2180	70.	171.	163.	29.	28.	10.	0	25.	0	1.	44.	1.	1921.	1915.	2
2182	43.	52.	52.	10.	9.	6.	0	5.	0	0.	0.	1.	1951.	1951.	1
2185	17.	22.	18.	6.	4.	11.	0	15.	0	0.	0.	1.	1949.	1949.	1
2187	69.	176.	133.	29.	28.	7.	0	25.	0	1.	55.	1.	1920.	1917.	2
2188	65.	160.	145.	36.	34.	10.	0	15.	0	0.	0.	1.	1915.	1915.	1
2190	45.	111.	61.	26.	25.	7.	0	40.	0	0.	0.	1.	1911.	1911.	2
2192	36.	38.	37.	10.	9.	4.	0	10.	0	0.	0.	1.	1942.	1942.	1
2195	42.	66.	36.	9.	8.	5.	0	15.	0	0.	0.	4.	1941.	1941.	1
2199	28.	45.	24.	13.	10.	6.	0	20.	0	0.	0.	1.	1937.	1937.	1
2100	21.	60.	46.	9.	9.	5.	0	10.	0	0.	0.	1.	1943.	1943.	1
2101	20.	32.	27.	7.	6.	5.	0	15.	0	0.	0.	1.	1949.	1949.	1
2102	47.	73.	67.	17.	15.	6.	0	25.	0	0.	0.	1.	1917.	1917.	1
2105	51.	156.	115.	32.	31.	25.	1	40.	0	0.	0.	1.	1911.	1911.	2

DATA FOR PUTR PLOT NUMBER 22
COLLECTED 09-04-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 3 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 150. DEG MAG TREE NUMBER 221 MAGNETIC AZIMUTH TO TREE 117 DISTANCE TO TREE 38 STEPS
SLOPE = 22. PERCENT TREE NUMBER 222 MAGNETIC AZIMUTH TO TREE 193 DISTANCE TO TREE 35 STEPS
ELEVATION= 8400. FEET(MSL) TREE NUMBER 223 MAGNETIC AZIMUTH TO TREE 256 DISTANCE TO TREE 38 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
2211	69.	49.	39.	10.	8.	9.	0	5.	0	0.	0.	1.	1949.	1949.	1
2212	45.	53.	42.	11.	8.	8.	0	10.	0	0.	0.	1.	1947.	1947.	1
2214	34.	64.	38.	18.	17.	9.	0	10.	1	0.	0.	1.	1929.	1929.	2
2217	26.	18.	15.	3.	3.	7.	0	5.	0	0.	0.	2.	1963.	1963.	1
2220	75.	110.	97.	33.	20.	19.	0	15.	0	0.	0.	1.	1916.	1916.	2
2224	32.	34.	29.	7.	6.	6.	0	20.	0	0.	0.	1.	1951.	1951.	1
2225	15.	20.	9.	2.	2.	8.	1	10.	0	0.	0.	2.	1955.	1955.	2
2226	17.	21.	18.	11.	10.	8.	1	15.	0	0.	0.	1.	1948.	1940.	2
2230	34.	88.	68.	21.	13.	8.	0	40.	0	1.	28.	1.	1948.	1923.	4
2231	41.	123.	103.	24.	19.	7.	1	30.	0	0.	0.	1.	1915.	1915.	2
2233	41.	56.	55.	15.	12.	9.	1	20.	0	0.	0.	1.	1934.	1915.	5
2234	81.	152.	118.	29.	22.	15.	0	35.	0	0.	0.	1.	1920.	1920.	2
2235	37.	64.	44.	9.	8.	7.	0	10.	0	0.	0.	1.	1945.	1945.	1
2240	59.	96.	68.	24.	18.	15.	1	50.	0	0.	0.	1.	1912.	1912.	3
2241	38.	57.	43.	11.	9.	8.	0	20.	0	0.	0.	1.	1944.	1944.	1
2244	76.	124.	112.	32.	25.	17.	0	30.	0	0.	0.	2.	1906.	1906.	2
2245	75.	151.	136.	37.	35.	16.	0	40.	0	2.	55.	1.	1908.	1908.	2
2246	41.	86.	71.	13.	12.	16.	0	10.	0	0.	0.	1.	1947.	1947.	2
2247	92.	201.	192.	34.	27.	19.	0	10.	0	0.	0.	1.	1926.	1926.	1
2248	56.	52.	45.	8.	8.	12.	0	5.	0	0.	0.	2.	1962.	1962.	1
2249	36.	36.	31.	5.	5.	15.	0	5.	0	0.	0.	1.	1962.	1962.	1
2252	68.	91.	89.	18.	14.	12.	0	10.	0	0.	0.	1.	1938.	1938.	2
2255	51.	83.	64.	12.	11.	11.	1	5.	0	0.	0.	2.	1948.	1948.	1
2257	54.	112.	95.	28.	24.	11.	0	10.	0	0.	0.	1.	1887.	1887.	3
2260	61.	97.	69.	14.	12.	11.	1	5.	1	0.	0.	2.	1947.	1947.	1
2261	25.	42.	39.	11.	10.	9.	1	30.	0	0.	0.	1.	1942.	1939.	2
2266	22.	25.	17.	6.	4.	7.	0	5.	0	0.	0.	1.	1951.	1951.	1
2272	78.	171.	125.	28.	24.	11.	0	30.	0	0.	0.	1.	1925.	1925.	2
2275	27.	50.	24.	16.	12.	25.	0	55.	0	0.	0.	1.	1934.	1934.	2
2279	25.	52.	28.	9.	8.	7.	0	5.	0	0.	0.	1.	1927.	1927.	2
2280	28.	47.	40.	7.	7.	13.	0	5.	0	0.	0.	1.	1960.	1960.	1
2281	82.	137.	110.	25.	20.	7.	0	45.	0	0.	0.	1.	1921.	1921.	2
2282	56.	107.	105.	14.	12.	6.	0	20.	0	0.	0.	1.	1940.	1940.	2
2284	72.	157.	102.	24.	21.	6.	0	40.	0	0.	0.	1.	1918.	1918.	2
2285	69.	150.	131.	35.	33.	10.	0	20.	0	0.	0.	1.	1932.	1918.	3
2288	60.	118.	90.	38.	30.	14.	0	25.	0	1.	34.	1.	1925.	1905.	4
2289	40.	58.	48.	11.	11.	14.	0	40.	0	0.	0.	1.	1928.	1928.	2
2290	10.	20.	14.	3.	3.	18.	0	5.	0	0.	0.	2.	1965.	1965.	1
2291	17.	16.	13.	2.	2.	14.	1	5.	0	0.	0.	1.	1963.	1963.	1
2292	38.	27.	25.	5.	4.	14.	0	20.	0	0.	0.	1.	1963.	1963.	1
2294	71.	155.	110.	24.	23.	14.	0	60.	0	0.	0.	1.	1919.	1919.	2
2297	68.	116.	93.	16.	15.	9.	0	10.	0	0.	0.	1.	1945.	1945.	1
2298	79.	134.	127.	19.	17.	6.	0	5.	1	0.	0.	1.	1941.	1941.	1
2299	65.	125.	115.	20.	18.	17.	0	15.	1	0.	0.	1.	1938.	1938.	1
2200	50.	122.	55.	11.	11.	13.	0	5.	0	0.	0.	1.	1939.	1939.	1
2202	25.	28.	26.	5.	5.	15.	0	5.	0	0.	0.	1.	1961.	1961.	1
2204	62.	85.	72.	13.	12.	6.	0	5.	0	0.	0.	2.	1959.	1959.	1
2205	16.	29.	16.	8.	4.	7.	0	5.	0	0.	0.	2.	1962.	1962.	1
2207	95.	93.	69.	12.	12.	6.	0	15.	0	0.	0.	1.	1952.	1952.	1
2208	39.	53.	31.	5.	4.	5.	0	5.	0	0.	0.	1.	1962.	1962.	1

DATA FOR PUTR PLOT NUMBER 23
COLLECTED 09-09-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 1 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 110. DEG MAG TREE NUMBER 231 MAGNETIC AZIMUTH TO TREE 87 DISTANCE TO TREE 13 STEPS
SLOPE = 16. PERCENT TREE NUMBER 232 MAGNETIC AZIMUTH TO TREE 200 DISTANCE TO TREE 21 STEPS
ELEVATION= 8200. FEET(MSL) TREE NUMBER 233 MAGNETIC AZIMUTH TO TREE 315 DISTANCE TO TREE 24 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
2312	71.	175.	147.	22.	21.	3.	0	20.	0	0.	0.	1.	1924.	1924.	2
2313	39.	42.	40.	11.	11.	4.	0	15.	0	0.	0.	1.	1945.	1945.	1
2316	82.	150.	118.	26.	21.	6.	0	65.	0	0.	0.	1.	1917.	1917.	2
2318	67.	157.	131.	30.	25.	6.	0	60.	1	1.	19.	1.	1895.	1895.	3
2320	35.	64.	55.	13.	11.	5.	0	30.	0	0.	0.	1.	1935.	1935.	2
2321	53.	97.	92.	15.	15.	5.	0	35.	0	0.	0.	1.	1930.	1918.	3
2323	55.	117.	48.	16.	14.	5.	0	30.	0	0.	0.	2.	1929.	1929.	3
2325	51.	107.	66.	19.	18.	4.	0	45.	0	1.	40.	1.	1910.	1910.	3
2326	16.	21.	19.	5.	4.	3.	0	5.	0	0.	0.	1.	1956.	1956.	1
2327	53.	125.	114.	23.	16.	3.	0	55.	0	0.	0.	1.	1913.	1913.	2
2329	34.	47.	33.	8.	10.	4.	0	5.	0	0.	0.	1.	1944.	1944.	2
2330	65.	145.	140.	29.	19.	7.	0	20.	0	0.	0.	1.	1911.	1911.	2
2338	23.	22.	13.	4.	4.	5.	0	5.	0	0.	0.	1.	1949.	1949.	2
2339	70.	93.	80.	13.	11.	5.	0	30.	0	0.	0.	1.	1929.	1929.	2
2340	57.	79.	56.	14.	12.	4.	0	10.	0	0.	0.	1.	1940.	1940.	1
2341	51.	127.	79.	16.	15.	5.	0	20.	0	0.	0.	1.	1933.	1933.	2
2345	31.	35.	28.	8.	8.	5.	0	15.	0	0.	0.	1.	1947.	1947.	1
2351	30.	45.	44.	8.	8.	5.	0	10.	0	0.	0.	1.	1945.	1945.	2
2352	74.	157.	125.	24.	23.	10.	0	30.	0	1.	36.	1.	1893.	1893.	3
2353	45.	74.	54.	14.	14.	7.	0	15.	0	0.	0.	1.	1945.	1945.	1
2355	59.	96.	85.	27.	22.	6.	0	35.	0	0.	0.	1.	1930.	1925.	3
2356	24.	23.	19.	4.	4.	6.	0	10.	0	0.	0.	1.	1950.	1950.	1
2358	24.	23.	21.	6.	5.	6.	0	5.	0	0.	0.	1.	1953.	1953.	1
2362	27.	50.	44.	8.	8.	25.	0	25.	0	0.	0.	1.	1939.	1939.	2
2363	26.	52.	45.	9.	8.	5.	0	5.	0	0.	0.	1.	1943.	1943.	1
2364	70.	99.	77.	15.	13.	25.	0	10.	0	0.	0.	1.	1944.	1944.	1
2367	38.	49.	22.	11.	10.	13.	0	5.	0	0.	0.	1.	1944.	1944.	1
2369	37.	114.	82.	24.	20.	17.	1	50.	0	0.	0.	1.	1920.	1920.	2
2370	23.	31.	19.	8.	8.	17.	0	40.	0	0.	0.	1.	1941.	1941.	1
2374	69.	137.	91.	16.	14.	8.	0	25.	0	0.	0.	1.	1934.	1934.	2
2379	10.	17.	10.	2.	2.	10.	0	40.	0	0.	0.	1.	1960.	1960.	1
2382	37.	77.	65.	18.	18.	5.	0	60.	0	0.	0.	1.	1905.	1905.	3
2383	33.	86.	81.	28.	21.	6.	0	20.	1	0.	0.	1.	1931.	1931.	1
2384	16.	47.	39.	8.	7.	6.	0	10.	0	0.	0.	1.	1944.	1944.	1
2385	57.	79.	65.	15.	14.	6.	0	20.	0	0.	0.	1.	1925.	1925.	3
2386	33.	61.	37.	8.	8.	6.	0	5.	0	0.	0.	1.	1950.	1950.	1
2389	25.	30.	26.	18.	15.	24.	0	10.	0	0.	0.	1.	1908.	1908.	3
2391	70.	138.	90.	22.	20.	6.	0	45.	0	0.	0.	1.	1904.	1904.	2
2392	63.	109.	59.	16.	16.	4.	0	30.	0	0.	0.	1.	1928.	1928.	5
2393	54.	104.	80.	16.	14.	6.	0	20.	0	0.	0.	1.	1922.	1922.	2
2395	15.	38.	25.	7.	5.	11.	0	10.	0	0.	0.	1.	1930.	1928.	3
2398	58.	110.	103.	21.	15.	5.	0	65.	0	0.	0.	1.	1898.	1898.	2
2300	29.	51.	38.	10.	10.	7.	0	20.	0	0.	0.	1.	1948.	1948.	2
2302	71.	120.	113.	-1.	-1.	6.	0	60.	0	0.	0.	1.	-1.	-1.	-1
2303	53.	135.	125.	18.	18.	15.	0	25.	0	0.	0.	1.	1922.	1922.	3
2305	43.	55.	22.	11.	9.	5.	0	45.	0	0.	0.	1.	1938.	1938.	3
2306	30.	35.	22.	9.	8.	8.	0	10.	0	0.	0.	1.	1943.	1943.	2
2307	30.	43.	33.	8.	7.	4.	0	5.	0	0.	0.	1.	1953.	1953.	1
2308	35.	58.	53.	14.	10.	25.	0	10.	0	0.	0.	1.	1944.	1944.	1
2309	52.	39.	22.	16.	15.	8.	0	15.	0	0.	0.	1.	1943.	1943.	1

DATA FOR PUTR PLOT NUMBER 24
COLLECTED 09-11-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 2 - ABSOLUTE (1-3)
DENSITY OF PUTR - 4 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 255. DEG MAG TREE NUMBER 241 MAGNETIC AZIMUTH TO TREE 45 DISTANCE TO TREE 22 STEPS
SLOPE = 31. PERCENT TREE NUMBER 242 MAGNETIC AZIMUTH TO TREE 140 DISTANCE TO TREE 7 STEPS
ELEVATION= 7600. FEET(MSL) TREE NUMBER 243 MAGNETIC AZIMUTH TO TREE 322 DISTANCE TO TREE 45 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
2411	64.	104.	88.	22.	19.	5.	0	50.	0	0.	0.	1.	1922.	1922.	1
2414	93.	156.	137.	33.	26.	7.	0	40.	0	0.	0.	1.	1905.	1905.	3
2416	48.	57.	56.	21.	14.	6.	0	25.	0	0.	0.	1.	1932.	1932.	2
2418	55.	92.	62.	18.	15.	5.	0	35.	0	0.	0.	1.	1916.	1916.	2
2419	72.	139.	95.	15.	15.	3.	0	20.	0	0.	0.	1.	1920.	1915.	3
2420	58.	158.	122.	23.	19.	6.	0	30.	0	0.	0.	1.	1915.	1915.	1
2421	32.	86.	69.	10.	9.	3.	0	10.	0	0.	0.	1.	1934.	1934.	2
2425	43.	70.	54.	12.	19.	3.	0	30.	0	0.	0.	1.	1948.	1948.	1
2426	47.	63.	57.	14.	9.	2.	0	25.	0	0.	0.	1.	1954.	1950.	5
2429	56.	108.	66.	15.	13.	4.	0	60.	0	0.	0.	1.	1931.	1931.	2
2433	29.	85.	78.	30.	27.	25.	0	50.	0	0.	0.	1.	1918.	1918.	2
2434	43.	84.	62.	18.	15.	7.	0	50.	0	0.	0.	1.	1920.	1920.	5
2436	79.	164.	116.	22.	20.	7.	0	15.	0	0.	0.	1.	1931.	1931.	1
2438	71.	94.	73.	22.	19.	5.	0	40.	0	1.	31.	1.	1938.	1920.	5
2439	45.	77.	63.	37.	21.	6.	0	55.	0	1.	21.	1.	1912.	1912.	3
2442	58.	79.	52.	18.	14.	4.	0	55.	0	0.	0.	1.	1932.	1920.	4
2445	47.	140.	63.	13.	11.	25.	0	35.	0	1.	40.	1.	1935.	1935.	2
2448	55.	149.	99.	21.	18.	25.	1	35.	0	0.	0.	1.	1909.	1909.	2
2449	77.	101.	66.	16.	11.	5.	0	45.	0	0.	0.	1.	1935.	1935.	2
2451	42.	70.	58.	15.	12.	6.	0	55.	0	0.	0.	1.	1915.	1915.	1
2452	58.	85.	82.	11.	11.	10.	0	10.	0	0.	0.	2.	1945.	1945.	1
2455	68.	86.	52.	12.	10.	7.	0	85.	0	0.	0.	1.	1931.	1931.	1
2457	19.	18.	10.	3.	2.	5.	0	0.	0	0.	0.	1.	1956.	1956.	1
2458	65.	135.	106.	28.	25.	8.	0	30.	0	0.	0.	1.	1908.	1908.	2
2463	58.	119.	90.	19.	16.	8.	0	50.	0	0.	0.	1.	1943.	1938.	2
2464	71.	122.	71.	22.	21.	5.	0	35.	0	0.	0.	1.	1940.	1930.	3
2465	67.	117.	70.	24.	16.	6.	0	25.	0	0.	0.	1.	1927.	1927.	2
2467	14.	21.	9.	2.	2.	6.	0	0.	0	0.	0.	1.	1963.	1963.	1
2468	33.	70.	51.	5.	5.	8.	0	5.	0	0.	0.	1.	1948.	1948.	1
2471	47.	77.	58.	19.	10.	25.	0	65.	0	0.	0.	1.	1928.	1920.	2
2474	80.	131.	91.	20.	16.	7.	0	15.	0	0.	0.	1.	1930.	1915.	4
2475	30.	42.	38.	7.	6.	7.	0	10.	0	0.	0.	1.	1942.	1936.	2
2476	43.	67.	66.	15.	11.	8.	0	70.	0	0.	0.	1.	1907.	1907.	2
2481	30.	94.	63.	11.	10.	5.	0	15.	0	0.	0.	1.	1929.	1920.	3
2487	35.	54.	48.	7.	6.	6.	0	15.	0	0.	0.	1.	1950.	1950.	1
2488	14.	18.	12.	1.	1.	8.	0	5.	0	0.	0.	1.	1962.	1962.	1
2489	29.	59.	48.	9.	6.	5.	0	10.	0	0.	0.	1.	1948.	1948.	1
2490	59.	112.	82.	16.	14.	5.	0	25.	0	0.	0.	2.	1924.	1924.	2
2492	42.	59.	45.	16.	11.	6.	0	25.	1	0.	0.	1.	1950.	1935.	4
2493	61.	111.	78.	21.	15.	4.	0	25.	0	0.	0.	2.	1929.	1929.	1
2494	48.	57.	46.	10.	9.	6.	0	15.	0	0.	0.	1.	1952.	1952.	1
2495	77.	159.	80.	29.	22.	6.	0	80.	0	0.	0.	1.	1918.	1918.	2
2496	65.	85.	62.	20.	15.	9.	0	35.	0	0.	0.	1.	1924.	1924.	2
2497	82.	133.	103.	20.	18.	5.	0	20.	0	0.	0.	1.	1905.	1905.	3
2400	69.	164.	126.	32.	24.	15.	0	60.	0	0.	0.	1.	1920.	1920.	2
2401	56.	94.	80.	19.	19.	7.	0	60.	0	0.	0.	1.	1924.	1924.	2
2403	72.	156.	97.	31.	28.	18.	0	45.	0	0.	0.	1.	1917.	1917.	2
2404	29.	55.	46.	10.	7.	4.	0	70.	0	0.	0.	1.	1926.	1926.	2
2406	42.	63.	58.	11.	8.	3.	0	40.	0	0.	0.	1.	1934.	1934.	3
2408	53.	126.	121.	24.	18.	5.	0	25.	0	0.	0.	1.	1919.	1919.	1

DATA FOR PUTR PLOT NUMBER 25
COLLECTED 09-12-69 PLOT RADIUS = 100. FEET
DENSITY OF PUTR - 1 - ABSOLUTE (1-3)
DENSITY OF PUTR - 1 - RELATIVE TO OTHER BROWSE SPP PRESENT (1-4)

ASPECT = 100. DEG MAG TREE NUMBER 251 MAGNETIC AZIMUTH TO TREE 35 DISTANCE TO TREE 55 STEPS
SLOPE = 52. PERCENT TREE NUMBER 252 MAGNETIC AZIMUTH TO TREE 85 DISTANCE TO TREE 25 STEPS
ELEVATION= 7200. FEET(MSL) TREE NUMBER 253 MAGNETIC AZIMUTH TO TREE 350 DISTANCE TO TREE 65 STEPS

ID	CHT	CMXD	CMND	SMXD	SMND	ADEP	ISTON	CDED	IFUN	ALAY	TOTL	RNUM	YOLD	YEST	NCON
2510	94.	197.	126.	31.	29.	25.	1	40.	0	1.	33.	1.	1941.	1941.	1
2511	59.	210.	149.	42.	36.	25.	1	80.	0	0.	0.	2.	1919.	1919.	2
2514	101.	192.	191.	35.	31.	13.	1	35.	0	0.	0.	1.	1933.	1933.	1
2515	78.	121.	72.	20.	17.	17.	0	70.	0	0.	0.	3.	1930.	1930.	2
2517	52.	120.	104.	13.	10.	23.	0	10.	0	0.	0.	1.	1951.	1951.	1
2518	71.	97.	95.	14.	13.	25.	1	20.	0	0.	0.	2.	1945.	1945.	1
2519	55.	196.	124.	55.	32.	25.	1	80.	0	0.	0.	1.	1908.	1908.	2
2520	39.	53.	45.	6.	6.	25.	1	5.	0	0.	0.	1.	1960.	1960.	1
2521	35.	62.	50.	9.	6.	25.	0	15.	0	0.	0.	1.	1945.	1945.	1
2524	102.	205.	195.	41.	33.	25.	1	35.	0	0.	0.	1.	1908.	1908.	2
2526	132.	214.	163.	43.	38.	12.	1	40.	0	0.	0.	1.	1932.	1932.	1
2527	20.	28.	18.	4.	3.	8.	1	0.	0	0.	0.	1.	1965.	1965.	1
2533	53.	113.	69.	14.	11.	25.	1	30.	0	1.	41.	1.	1944.	1939.	2
2534	49.	104.	78.	15.	14.	13.	1	40.	0	1.	45.	1.	1936.	1936.	1
2536	82.	145.	142.	25.	20.	25.	1	10.	0	0.	0.	1.	1940.	1940.	1
2539	53.	87.	79.	19.	13.	14.	0	25.	0	0.	0.	1.	1944.	1944.	1
2540	67.	98.	85.	26.	19.	25.	0	40.	0	0.	0.	1.	1935.	1935.	1
2542	53.	93.	88.	23.	22.	25.	0	15.	0	0.	0.	1.	1939.	1939.	1
2544	72.	99.	68.	28.	24.	24.	0	40.	0	0.	0.	4.	1922.	1921.	2
2547	78.	165.	129.	27.	22.	25.	1	30.	0	4.	225.	1.	1939.	1939.	1
2548	41.	81.	56.	10.	8.	25.	1	5.	0	0.	0.	1.	1951.	1951.	1
2550	67.	121.	99.	47.	35.	25.	1	70.	0	0.	0.	1.	1914.	1914.	1
2551	57.	173.	148.	32.	23.	5.	1	30.	0	1.	61.	1.	1936.	1936.	1
2553	33.	75.	64.	30.	21.	14.	1	60.	0	0.	0.	1.	1914.	1914.	2
2554	116.	119.	185.	65.	59.	25.	1	50.	0	0.	0.	1.	1916.	1912.	3
2556	97.	154.	135.	42.	25.	25.	1	50.	0	0.	0.	1.	1923.	1921.	2
2558	84.	147.	128.	27.	25.	25.	1	65.	0	0.	0.	1.	1926.	1926.	2
2560	99.	161.	137.	22.	20.	25.	1	20.	0	0.	0.	3.	1924.	1924.	2
2563	49.	96.	76.	21.	21.	21.	0	10.	0	3.	46.	1.	1940.	1940.	1
2565	63.	87.	66.	25.	19.	14.	0	10.	0	0.	0.	1.	1941.	1932.	3
2573	36.	76.	55.	15.	13.	25.	1	75.	0	0.	0.	1.	1942.	1940.	2
2574	22.	46.	31.	7.	7.	25.	1	5.	0	0.	0.	1.	1960.	1960.	1
2576	35.	74.	47.	13.	10.	25.	0	15.	0	0.	0.	1.	1945.	1938.	3
2577	93.	307.	252.	68.	68.	25.	1	50.	0	5.	292.	1.	1930.	1900.	5
2579	62.	138.	109.	27.	18.	25.	0	25.	0	2.	58.	1.	1935.	1925.	3
2580	33.	63.	60.	13.	10.	25.	1	5.	0	0.	0.	1.	1951.	1951.	1
2581	29.	89.	69.	23.	19.	25.	1	20.	0	0.	0.	1.	1940.	1940.	1
2582	68.	141.	134.	32.	25.	25.	0	15.	0	1.	22.	1.	1939.	1926.	3
2583	53.	113.	61.	24.	15.	25.	1	50.	0	0.	0.	1.	1935.	1935.	1
2584	44.	99.	86.	22.	14.	25.	1	35.	0	0.	0.	1.	1938.	1938.	2
2586	48.	138.	95.	26.	18.	25.	0	30.	0	0.	0.	1.	1932.	1932.	2
2588	97.	191.	188.	57.	47.	25.	0	30.	0	0.	0.	1.	1940.	1940.	1
2590	101.	206.	169.	62.	41.	20.	0	30.	0	0.	0.	1.	1933.	1933.	1
2593	108.	338.	264.	63.	62.	12.	0	40.	0	3.	362.	1.	1913.	1913.	1
2595	89.	179.	145.	51.	50.	25.	0	60.	0	0.	0.	1.	1916.	1916.	1
2596	89.	200.	198.	43.	27.	25.	1	30.	0	1.	31.	1.	1929.	1929.	1
2598	84.	224.	211.	59.	24.	25.	0	45.	0	1.	55.	1.	1922.	1900.	5
2599	36.	99.	77.	27.	19.	25.	1	20.	0	0.	0.	1.	1903.	1900.	3
2501	37.	35.	24.	10.	6.	25.	1	20.	0	0.	0.	1.	1944.	1944.	1
2504	98.	153.	147.	35.	33.	25.	1	10.	0	1.	12.	1.	1943.	1943.	1

APPENDIX 4

Ring width measurements

BITTERBRUSH

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
391	1916	0.00	0.00	0.00	0.00	0.00	0.00	.75	.33	.50	.30
391	1920	.16	.18	.24	.20	.30	.61	.43	.21	.39	.30
391	1930	.35	.36	.43	.63	.62	.46	.23	.30	.36	.29
391	1940	.27	.38	.38	.95	1.20	1.33	1.36	1.59	.98	1.33
391	1950	.98	.97	1.45	.64	.23	.57	.35	1.29	1.15	.99
391	1960	.62	.77	.60	.60	.34	.87	.56	.75	.51	.48
1531	1927	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.35	.18	.15
1531	1930	.15	.17	.24	.37	.29	.34	.63	.27	.22	.31
1531	1940	.09	.37	.30	.31	.20	.24	.18	.34	.21	.27
1531	1950	.45	.59	.50	.80	.44	1.07	.79	.82	.73	.89
1531	1960	1.02	.67	.89	.64	.44	.67	.26	.31	.28	.08
1411	1920	.92	.27	.22	.17	.26	.13	.15	.24	.20	.30
1411	1930	.16	.36	.48	.67	.57	.48	.34	.31	.28	.38
1411	1940	.43	.40	.33	.46	.96	.57	.94	.50	1.06	.35
1411	1950	.95	.56	.77	.26	.23	.28	.35	.83	.63	.75
1411	1960	.60	1.08	.72	.29	.47	.72	.54	.66	.55	.94
1422	1937	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	.33	.16
1422	1940	.09	.43	.15	.18	.55	.61	.90	.82	.57	.34
1422	1950	.64	.89	1.65	2.52	.57	.31	.69	1.20	2.23	2.24
1422	1960	1.17	1.30	1.85	1.37	1.37	1.79	.69	.77	.65	1.33
1426	1939	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.10
1426	1940	.12	.18	.30	.20	.22	.44	.25	.41	.35	.18
1426	1950	.40	.52	.76	1.13	.74	1.21	1.42	1.57	1.52	1.50
1426	1960	1.75	1.40	1.89	1.06	1.09	1.51	.71	1.11	.46	1.45
1462	1910	1.03	.51	1.05	.99	1.21	1.39	1.60	1.56	1.56	.43
1462	1920	1.16	1.14	.93	1.02	.99	.45	1.18	.52	1.08	.60
1462	1930	.72	.69	.52	.93	.73	.71	.42	.64	.50	.48
1462	1940	.28	.61	.49	.49	.40	.45	.51	.71	.41	.67
1462	1950	.39	.61	.44	.49	.24	.43	.43	.40	.36	.54
1462	1960	.52	.46	.41	.25	.18	.36	.35	.38	.22	.29
1482	1926	0.00	0.00	0.00	0.00	0.00	0.00	.55	.30	.32	.33
1482	1930	.35	.40	.49	.38	.32	.29	.15	.33	.17	.43
1482	1940	.15	.43	.36	.85	.70	.79	.48	1.05	.81	1.00
1482	1950	.57	1.06	.41	.88	.27	.35	.42	1.03	.71	.76
1482	1960	.73	.93	.40	.21	.28	.51	.26	.34	.58	.25
1496	1933	0.00	0.00	0.00	.10	.21	.20	.22	.43	.35	.28
1496	1940	.26	.50	.72	.85	.94	.83	1.06	1.19	.96	1.15
1496	1950	.35	.28	.67	1.18	.35	.48	.94	1.66	1.90	2.07
1496	1960	2.19	2.32	.42	.33	.51	1.12	.85	1.12	.47	1.31
1148	1931	0.00	.92	.12	.23	.20	.34	1.10	.82	.43	.61
1148	1940	.84	1.01	.72	.69	.40	.59	.67	1.01	.83	.85
1148	1950	.54	.61	.43	.80	.28	.64	.22	.23	.32	.34
1148	1960	.47	.39	.31	.17	.32	.41	.20	.21	.29	.32
1166	1931	0.00	.22	.12	.40	.64	.46	.48	.68	.48	.85
1166	1940	.47	.75	.89	.93	.43	.74	1.08	.65	.27	.82
1166	1950	.82	1.09	1.27	.82	.23	.95	.61	.77	.12	.74
1166	1960	.40	.21	.16	.47	.51	.38	.24	.39	.29	.26

BITTERBRUSH

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
1642	1918	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.28	.16
1642	1920	.18	.13	.21	.21	.15	.30	.50	.20	.16	.14
1642	1930	.17	.22	.24	.27	.38	.34	.28	.49	.43	.39
1642	1940	.40	.73	.82	.99	.90	1.12	.70	1.13	.78	.97
1642	1950	.55	.64	.42	.64	.09	.33	.62	.37	.73	.61
1642	1960	.69	.67	.62	.40	.44	.61	.16	.45	.16	.50
1655	1911	0.00	.12	.06	.18	.34	.21	.20	.22	.28	.14
1655	1920	.32	.37	.15	.34	.42	.27	.88	.48	.36	.16
1655	1930	.48	.42	.56	.42	.57	.52	.49	.49	.36	.48
1655	1940	.42	.51	.38	.50	.31	.42	.33	.49	.34	.42
1655	1950	.42	.54	.39	.29	.20	.35	.27	.43	.45	.43
1655	1960	.43	.64	.66	.34	.48	.72	.21	.38	.18	.44
1663	1926	0.00	0.00	0.00	0.00	0.00	0.00	.21	.07	.10	.16
1663	1930	.29	.38	.44	.29	.58	.65	.78	1.30	.64	.32
1663	1940	.39	.80	.54	.53	.26	.58	.37	.52	.34	.61
1663	1950	.20	.48	.55	.67	.26	.55	.57	.39	.64	.55
1663	1960	.41	.55	.61	.34	.34	.71	.29	.43	.19	.57
1913	1910	.09	.05	.05	.08	.09	.16	.15	.21	.33	.10
1913	1920	.31	.35	.11	.48	.30	.16	.47	.26	.28	.26
1913	1930	.26	.23	.14	.41	.29	.41	.25	.42	.30	.11
1913	1940	.12	.37	.54	.50	.49	.38	.20	.53	.42	.57
1913	1950	.34	.48	.33	.25	.08	.14	.27	.23	.25	.14
1913	1960	.27	.16	.22	.13	.17	.26	.18	.36	.18	.46
1983	1910	.53	.28	.40	.45	.53	.42	.58	.38	.95	.55
1983	1920	.74	.62	.41	.22	.18	.21	.33	.27	.27	.31
1983	1930	.59	.30	.37	.80	.54	.40	.70	.59	.56	.33
1983	1940	.45	.67	.33	.35	.25	.27	.22	.23	.21	.24
1983	1950	.25	.41	.22	.42	.25	.43	.59	.58	.57	.39
1983	1960	.50	.55	.44	.11	.23	.25	.21	.23	.21	.27
1989	1923	0.00	0.00	0.00	.26	.16	.13	.27	.15	.25	.16
1989	1930	.16	.15	.22	.24	.11	.41	.27	.31	.31	.42
1989	1940	.48	.26	.47	.97	.79	.69	.71	.64	.43	.84
1989	1950	.56	.57	.46	.52	.22	.60	.33	.20	.27	.18
1989	1960	.66	.74	.83	.36	.36	.70	.23	.61	.21	.36
221	1910	.21	.10	.10	.09	.15	.14	.08	.10	.39	.02
221	1920	.14	.26	.20	.39	.60	.33	1.12	.43	.54	.26
221	1930	.28	.19	.21	.73	.55	.76	.66	.33	.86	.37
221	1940	.41	.47	.90	.91	.91	.69	.44	.64	.41	.55
221	1950	.57	.62	.33	.16	.14	.26	.21	.40	.50	.36
221	1960	.36	.74	.40	.26	.16	.25	.17	.19	.25	.24
229	1925	0.00	0.00	0.00	0.00	0.00	.20	.10	.08	.17	.11
229	1930	.07	.11	.14	.47	.18	.20	.32	.29	.22	.26
229	1940	.28	.48	.22	.31	.22	.36	.29	.75	.88	.79
229	1950	.26	.31	.24	.24	.29	.24	.09	.67	.92	.66
229	1960	.43	.92	.51	.32	.14	.19	.25	.31	.27	.10
264	1926	0.00	0.00	0.00	0.00	0.00	0.00	.28	.27	.14	.25
264	1930	.07	.23	.14	.13	.25	.21	.66	.36	.33	.46
264	1940	.17	.20	.42	.81	.68	.59	.17	.63	.39	.99
264	1950	.50	.69	.34	.34	.18	.40	.30	.74	.73	.42
264	1960	.36	.87	.70	.22	.18	.42	.25	.18	.30	.39
271	1927	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.16	.10	.45
271	1930	.10	.13	.20	.16	.87	.47	.56	.50	.46	.05
271	1940	.21	.51	.69	.62	.49	.38	.28	.40	.45	.48
271	1950	.34	.54	.48	.19	.14	.33	.50	.59	.60	.51
271	1960	.58	.97	.62	.37	.32	.59	.16	.29	.30	.30

BITTERBRUSH

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
279	1913	0.00	0.00	0.00	.14	.10	.10	.15	.14	.10	.21
279	1920	.22	.28	.14	.48	.52	.15	.51	.21	.35	.27
279	1930	.17	.17	.17	.39	.12	.55	.16	.09	.36	.27
279	1940	.12	.14	.50	.69	.56	.75	.40	1.12	.30	1.00
279	1950	.48	.92	.41	.30	.23	.33	.41	.67	.52	.58
279	1960	.63	.88	.39	.20	.23	.49	.26	.40	.30	.19
286	1916	0.00	0.00	0.00	0.00	0.00	0.00	.14	.20	.23	.17
286	1920	.46	.72	.09	.57	.54	.13	.50	.10	.57	.40
286	1930	.70	.50	.30	.69	.21	.54	.15	.20	.51	.38
286	1940	.59	.56	.56	.43	.26	.48	.34	.88	.36	.62
286	1950	.24	.45	.50	.34	.42	.71	.45	.50	.46	.34
286	1960	.49	.62	.31	.12	.40	.25	.24	.24	.17	.17
289	1923	0.00	0.00	0.00	.08	.10	.19	.33	.12	.29	.30
289	1930	.35	.32	.51	.44	.43	.68	.30	.40	.37	.30
289	1940	.17	.30	.55	.40	.73	.75	.31	.88	.33	.58
289	1950	.45	.57	.27	.29	.14	.18	.20	.38	.31	.32
289	1960	.65	.94	.51	.22	.28	.38	.21	.25	.26	.30
292	1934	0.00	0.00	0.00	0.00	.39	.39	.27	.41	.75	.35
292	1940	.23	.45	.66	.55	.61	1.23	.79	1.40	.74	1.17
292	1950	.65	.80	.69	.50	.23	.46	.71	.86	1.12	.94
292	1960	.55	1.10	.83	.39	.50	.72	.51	.38	.50	.32
294	1922	0.00	0.00	.13	.13	.50	.36	.45	.46	.38	.02
294	1930	.41	.05	.58	.65	.72	.82	.52	.54	.49	.68
294	1940	.63	.90	.72	.70	.36	.47	.59	.88	.73	.61
294	1950	.39	.51	.45	.41	.20	.26	.55	.39	.48	.34
294	1960	.28	.61	.54	.19	.22	.34	.30	.44	.27	.31
623	1919	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.15
623	1920	.64	.35	.10	1.37	.86	.20	.99	.58	.66	.30
623	1930	.38	.36	.11	.17	.21	.34	.17	.40	.45	.13
623	1940	.15	.38	.54	.58	.76	.73	.14	.77	.24	.51
623	1950	.43	.60	.48	.14	.08	.21	.32	.66	.62	.42
623	1960	.50	.75	.33	.18	.26	.69	.15	.69	.14	.45
936	1916	0.00	0.00	0.00	0.00	0.00	0.00	.12	.07	.14	.02
936	1920	.07	.15	.03	.05	.07	.11	.27	.10	.21	.09
936	1930	.08	.19	.14	.14	.20	.29	.14	.33	.41	.31
936	1940	.10	.19	.28	.28	.20	.24	.20	.25	.11	.33
936	1950	.16	.40	.16	.11	.09	.09	.16	.42	.30	.17
936	1960	.25	.47	.43	.16	.16	.38	.16	.16	.22	.26
960	1924	0.00	0.00	0.00	0.00	.09	.09	.20	.17	.13	.11
960	1930	.14	.21	.18	.12	.08	.23	.22	.25	.17	.20
960	1940	.16	.26	.52	.46	.46	.32	.34	.91	.42	.81
960	1950	.56	.76	.65	.17	.15	.11	.39	.80	.75	.36
960	1960	.46	.89	.67	.28	.54	.90	.50	.23	.50	.75
976	1936	0.00	0.00	0.00	0.00	0.00	0.00	.18	.16	.04	.11
976	1940	.07	.14	.16	.34	.18	.25	.24	.46	.33	.50
976	1950	.56	.65	.71	.34	.19	.11	.44	.82	.70	.52
976	1960	.52	.99	1.18	.34	.51	1.07	.64	.33	1.10	.88
993	1927	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.14	.12	.38
993	1930	.08	.13	.14	.14	.14	.04	.06	.03	.08	.13
993	1940	.15	.29	.42	.40	.33	.15	.54	.10	.59	.30
993	1950	.97	.63	.41	.27	.16	.66	1.17	1.40	.46	.71
993	1960	1.91	1.14	.45	.62	1.20	.87	.28	1.25	.01	.84

BITTERBRUSH

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
141	1926	0.00	0.00	0.00	0.00	0.00	0.00	.27	.21	.24	.28
141	1930	.24	.27	.38	.21	.41	.14	.22	.52	.30	.20
141	1940	.21	.59	.67	.66	.70	.31	.92	.44	.68	.17
141	1950	.55	.76	.33	.11	.17	.13	.34	.87	1.10	.76
141	1960	.68	1.09	.98	.29	.22	.66	.32	.24	.27	.20
1218	1884	0.00	0.00	0.00	0.00	.11	.09	.07	.07	.43	.10
1218	1890	.21	.20	.20	.13	.31	.44	.25	.42	.17	.17
1218	1900	.32	.22	.09	.19	.48	.41	.89	.65	.31	.53
1218	1910	.28	.18	.48	.24	.12	.30	.19	.49	.19	.28
1218	1920	.70	.53	.18	.57	.37	.20	.28	.10	.21	.29
1218	1930	.06	.05	.27	.63	.30	.62	.14	.25	.43	.23
1218	1940	.12	.14	.56	.46	.26	.16	.18	.30	.12	.48
1218	1950	.15	.29	.19	.16	.12	.20	.23	.65	.19	.18
1218	1960	.19	.45	.26	.21	.22	.46	.17	.14	.12	.34
1226	1912	0.00	0.00	.10	.08	.06	.07	.04	.05	.05	.19
1226	1920	.09	.28	.06	.23	.16	.12	.31	.12	.16	.24
1226	1930	.09	.17	.20	.21	.27	.33	.20	.25	.20	.21
1226	1940	.18	.15	.47	.48	.38	.32	.29	.41	.22	.45
1226	1950	.36	.62	.41	.26	.22	.23	.23	.37	.40	.24
1226	1960	.18	.48	.42	1.00	.75	1.54	.49	.64	.73	.98
1229	1910	.18	.08	.10	.11	.07	.10	.14	.22	.35	.15
1229	1920	.19	.35	.19	.63	.67	.12	.59	.22	.42	.48
1229	1930	.14	.17	.30	.61	.38	.80	.52	.46	.71	.32
1229	1940	.11	.15	.52	.47	.18	.28	.29	.53	.20	.70
1229	1950	.42	.64	.24	.28	.18	.17	.40	.32	.29	.45
1229	1960	.41	.67	.48	.46	.16	.30	.26	.22	.28	.32
1264	1902	0.00	0.00	.60	.72	.76	.53	1.05	.54	.35	.89
1264	1910	.98	.78	1.12	1.31	.50	1.10	.55	.41	1.11	.50
1264	1920	1.37	.95	.78	1.37	.67	.19	.08	1.20	1.43	.37
1264	1930	1.38	1.12	.62	1.24	.76	.95	1.02	1.13	1.15	1.45
1264	1940	.93	1.76	1.31	1.08	.87	.76	.90	.99	1.21	.79
1264	1950	.69	.45	.68	.67	.61	.44	.55	.36	.39	.21
1264	1960	.15	.45	.58	.42	.56	.71	.59	.42	.33	.48
1287	1909	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.41
1287	1910	.33	.30	1.19	.56	.72	.73	.57	1.16	.61	.30
1287	1920	1.29	1.54	.29	1.69	1.33	.32	1.38	.33	.33	.83
1287	1930	.34	.20	.42	.93	.58	1.27	.46	.61	.90	.49
1287	1940	.43	1.03	1.58	1.05	.88	.69	.44	1.27	.42	1.27
1287	1950	.46	.90	.45	.40	.35	.58	.67	1.25	.67	.68
1287	1960	.81	.93	.84	.78	.67	1.14	.37	.47	.57	.79
1294	1890	.62	.13	.24	.11	.17	.34	.19	.20	.21	.18
1294	1900	.29	.47	.09	.45	.37	.37	.64	.54	.30	.70
1294	1910	.25	.27	.55	.38	.39	.59	.44	.59	.33	.25
1294	1920	.63	.73	.19	.83	.50	.17	.56	.21	.28	.37
1294	1930	.15	.15	.22	.46	.17	.46	.14	.28	.44	.17
1294	1940	.06	.24	.41	.39	.21	.13	.13	.40	.28	.64
1294	1950	.27	.40	.27	.15	.11	.13	.27	.62	.28	.27
1294	1960	.31	.46	.39	.15	.16	.13	.25	.24	.29	.20
1206	1917	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.35	.10	.07
1206	1920	.25	.24	.16	.26	.18	.17	.27	.43	.19	.19
1206	1930	.38	.31	.28	.32	.28	.24	.39	.40	.38	.36
1206	1940	.27	.58	.65	.77	.67	.86	.68	1.21	.47	.91
1206	1950	.44	1.04	.88	.52	.55	.55	.50	1.30	.81	1.01
1206	1960	.76	1.18	.65	.73	.46	1.06	.54	.47	.80	1.09

BITTERBRUSH

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
878	1927	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.22	.08	.13
878	1930	.26	.33	.31	.16	.40	.34	.13	.22	.23	.17
878	1940	.19	.31	.45	.29	.47	.61	.41	.74	.40	.84
878	1950	.82	1.04	.70	.77	.11	.43	.36	.49	.67	.40
878	1960	.45	.81	.51	.18	.17	.45	.28	.31	.18	.30
2040	1935	0.00	0.00	0.00	0.00	0.00	.11	.19	.56	.58	.28
2040	1940	.41	.40	.29	.43	.57	.54	.27	.73	.63	.50
2040	1950	.59	.56	.69	.71	.27	.87	.72	.91	.76	.42
2040	1960	.22	.37	.31	.23	.26	.41	.26	.30	.07	.23
2006	1901	0.00	.10	.05	.12	.13	.12	.26	.24	.28	.46
2006	1910	.13	.08	.25	.17	.44	.21	.16	.30	.47	.15
2006	1920	.48	.57	.40	.70	.83	.34	.70	.28	.23	.20
2006	1930	.19	.56	1.04	.99	.96	.78	.51	.42	.31	.47
2006	1940	.33	.38	.51	.64	.24	.26	.27	.44	.26	.46
2006	1950	.33	.59	.31	.31	.17	.35	.22	.30	.26	.20
2006	1960	.18	.34	.25	.19	.17	.27	.21	.23	.19	.15
2234	1920	.34	.10	.06	.12	.24	.15	.15	.17	.21	.13
2234	1930	.12	.15	.13	.21	.21	.20	.17	.39	.34	.45
2234	1940	.33	.56	.57	.77	.62	.69	.36	.27	.45	.42
2234	1950	.57	.71	.54	.46	.26	.50	.65	.88	.61	.41
2234	1960	.33	.37	.56	.27	.61	.51	.32	.51	.24	.66
2247	1925	0.00	0.00	0.00	0.00	0.00	.28	.11	.12	.11	.13
2247	1930	.18	.20	.38	.48	.59	.47	.48	.47	.55	.68
2247	1940	.71	.88	.70	.87	.51	.53	.24	.19	.62	.56
2247	1950	.94	.67	.48	.93	.35	.72	.73	.76	.58	.14
2247	1960	.21	.51	.51	.39	.78	.58	.44	.54	.52	.63
522	1904	0.00	0.00	0.00	0.00	.32	.16	.21	.15	.12	.17
522	1910	.17	.27	.20	.14	.12	.20	.12	.23	.26	.06
522	1920	.30	.36	.11	.47	.15	.10	.20	.14	.31	.23
522	1930	.25	.35	.14	.30	.27	.36	.22	.44	.29	.13
522	1940	.11	.29	.26	.35	.36	.27	.11	.26	.14	.30
522	1950	.13	.24	.16	.22	.14	.20	.25	.38	.37	.21
522	1960	.18	.41	.23	.23	.19	.33	.24	.23	.20	.17
534	1905	0.00	0.00	0.00	0.00	0.00	.12	.12	.24	.32	.25
534	1910	.23	.20	.20	.13	.44	.29	.20	.35	.20	.11
534	1920	.37	.42	.35	.33	.26	.27	.30	.32	.32	.46
534	1930	.36	.43	.39	.45	.28	.39	.20	.13	.16	.13
534	1940	.17	.21	.26	.20	.28	.37	.24	.45	.40	.31
534	1950	.40	.29	.42	.39	.14	.45	.48	.73	.71	.30
534	1960	.31	.61	.39	.44	.22	.40	.30	.42	.41	.28
2159	1916	0.00	0.00	0.00	0.00	0.00	0.00	.27	.15	.21	.17
2159	1920	.25	.22	.17	.19	.29	.22	.25	.27	.15	.12
2159	1930	.15	.09	.16	.22	.28	.36	.22	.38	.48	.32
2159	1940	.38	.58	.64	1.06	.84	.82	.46	.83	.39	.76
2159	1950	.38	.78	.41	.47	.17	.57	.24	.44	.32	.27
2159	1960	.23	.65	.40	.39	.30	.56	.26	.12	.17	.31
2188	1915	0.00	0.00	0.00	0.00	0.00	.09	.12	.17	.18	.12
2188	1920	.19	.23	.17	.18	.11	.06	.15	.13	.19	.12
2188	1930	.14	.18	.16	.28	.32	.36	.57	.68	.73	.56
2188	1940	.64	.64	.81	1.11	.75	1.07	.39	.92	.65	.80
2188	1950	.53	.80	.58	.45	.14	.51	.51	.59	.51	.47
2188	1960	.28	.54	.53	.58	.39	.81	.27	.40	.25	.45

BITTERBRUSH

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
415	1914	0.00	0.00	0.00	0.00	.96	.16	.17	.13	.25	.04
415	1920	.15	.15	.11	.31	.26	.18	.38	.23	.38	.37
415	1930	.44	.42	.24	.31	.33	.32	.21	.30	.28	.18
415	1940	.14	.22	.29	.32	.29	.56	.19	.36	.20	.28
415	1950	.19	.40	.30	.40	.23	.41	.37	.63	.43	.42
415	1960	.36	.54	.32	.19	.22	.30	.28	.25	.23	.14
449	1903	0.00	0.00	0.00	.14	.07	.07	.10	.05	.10	.15
449	1910	.17	.13	.24	.29	.33	.20	.33	.40	.35	.09
449	1920	.34	.54	.24	.97	.77	.22	.66	.46	.34	.25
449	1930	.37	.18	.25	.27	.21	.47	.21	.35	.37	.27
449	1940	.14	.35	.48	.35	.38	.41	.32	.62	.18	.28
449	1950	.23	.51	.14	.25	.09	.12	.16	.32	.22	.19
449	1960	.17	.30	.24	.14	.13	.25	.16	.22	.18	.15
409	1916	0.00	0.00	0.00	0.00	0.00	0.00	.30	.07	.22	.27
409	1920	.18	.35	.09	.30	.19	.18	.30	.24	.25	.28
409	1930	.25	.13	.13	.12	.21	.27	.17	.28	.25	.23
409	1940	.24	.43	.48	.47	.72	.80	.39	.36	.27	.38
409	1950	.48	.43	.48	.49	.30	.54	.51	.44	.53	.45
409	1960	.36	.48	.23	.30	.20	.25	.28	.22	.15	.08

PONDEROSA PINE

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
112	1880	1.16	1.99	1.62	.47	2.28	1.84	1.49	1.58	1.71	2.02
112	1890	2.41	1.98	.85	.24	2.24	2.97	1.87	2.31	2.87	1.98
112	1900	2.01	2.02	1.52	2.25	2.90	1.86	2.39	2.37	2.53	3.40
112	1910	1.95	1.55	1.87	1.85	2.27	2.72	2.81	2.09	1.83	.55
112	1920	2.20	3.05	1.55	3.01	2.03	1.66	1.86	1.72	1.90	2.39
112	1930	1.70	1.60	1.09	1.64	1.29	1.83	1.04	1.73	1.58	1.52
112	1940	1.34	1.58	2.03	2.12	2.08	2.85	1.79	2.16	1.37	1.91
112	1950	.97	1.58	1.34	1.32	.24	.72	.69	.86	1.17	.72
112	1960	.92	1.03	1.50	.57	.52	1.33	.47	.86	.96	1.25
113	1880	.38	.49	.64	1.13	1.66	1.28	.88	.98	1.09	.98
113	1890	1.35	1.74	.70	.29	.71	1.23	.94	.73	1.10	.53
113	1900	1.00	.53	.87	1.74	1.59	1.62	1.83	2.35	1.16	1.88
113	1910	1.51	1.21	1.28	1.41	1.42	1.92	1.68	1.05	1.05	.62
113	1920	1.07	1.56	1.20	1.41	1.32	1.19	1.21	.56	.86	1.00
113	1930	.62	.84	.57	.81	.76	.68	.46	.67	.69	.58
113	1940	.47	.85	.93	.83	.77	.80	.80	.75	.59	.64
113	1950	.58	.59	.63	.44	.22	.47	.40	.52	.50	.32
113	1960	.58	.54	.50	.37	.21	.47	.29	.50	.45	.54
253	1880	2.02	3.85	2.35	2.12	1.41	1.41	.76	1.85	1.71	2.19
253	1890	2.10	2.45	2.10	.89	2.01	4.54	2.53	2.72	2.27	1.97
253	1900	2.96	2.55	.80	2.30	2.73	2.49	3.46	2.26	2.03	3.72
253	1910	1.49	1.92	3.00	2.67	3.00	3.60	3.08	2.56	2.14	1.04
253	1920	2.67	4.56	1.70	3.59	2.78	1.69	2.38	1.18	1.94	2.17
253	1930	2.21	1.60	.67	2.23	1.20	1.24	.81	1.05	1.47	.70
253	1940	.45	.79	1.13	1.11	1.46	1.27	.84	1.73	1.08	1.17
253	1950	.84	1.37	1.10	1.06	.11	.75	.95	.95	1.02	.90
253	1960	.74	.96	.79	.44	.48	.76	.33	.64	.75	1.16
92	1880	1.14	1.55	.54	1.56	2.16	2.78	2.12	1.81	.83	1.63
92	1890	.85	1.66	.90	.36	1.08	1.62	.96	.83	.73	1.04
92	1900	1.35	1.12	.54	1.40	1.55	1.08	.79	1.16	.66	1.26
92	1910	.79	.95	1.41	1.26	1.15	1.52	1.41	1.88	1.53	.36
92	1920	1.44	1.92	.66	2.19	1.11	.82	1.10	1.04	1.37	1.29
92	1930	.66	.59	1.26	1.19	.50	1.04	.33	1.00	1.04	.23
92	1940	.47	1.04	1.19	1.11	1.16	1.42	.42	1.33	.52	1.32
92	1950	.68	1.15	.69	.98	.47	.62	.68	1.37	.51	.67
92	1960	.74	1.30	.77	.63	.52	1.94	.46	.92	1.04	.91
101	1880	.95	1.62	.71	1.97	1.80	2.38	1.17	1.33	.41	1.61
101	1890	1.07	1.64	.67	.17	.45	1.04	.38	.96	.72	1.43
101	1900	1.52	1.24	.21	.95	1.05	1.02	1.00	1.06	.39	1.22
101	1910	.91	.88	1.37	1.40	2.01	1.93	1.39	1.61	2.41	.46
101	1920	1.95	2.70	1.06	1.79	1.47	.57	1.03	.95	1.10	1.51
101	1930	.90	1.01	1.10	1.30	.94	1.31	.95	1.44	1.61	1.22
101	1940	.58	.94	1.30	1.56	1.45	1.84	.95	1.88	1.33	1.87
101	1950	1.28	2.04	1.58	1.34	.45	.69	1.05	1.93	1.79	1.60
101	1960	1.47	1.49	1.93	.91	.97	1.89	.89	1.16	1.53	1.52

PONDEROSA PINE

RAW RING WIDTH DATA
(VALUES IN MM)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
103	1880	.49	1.06	.58	.72	1.65	1.90	1.00	1.06	.96	1.89
103	1890	1.09	1.32	.64	.14	.67	1.33	.68	.57	.68	.92
103	1900	1.31	1.13	.63	1.22	1.20	1.61	1.77	1.69	.73	1.50
103	1910	.76	.74	.98	.63	1.25	.95	1.03	1.19	1.45	.61
103	1920	1.50	1.83	.53	1.90	1.71	.65	1.53	.57	1.12	1.05
103	1930	.90	.71	.77	.92	.79	1.00	.77	.92	.98	.61
103	1940	.40	.54	.92	1.20	1.06	1.13	.67	.91	.98	1.32
103	1950	.38	1.66	.87	.80	.45	.56	.52	.75	.88	.57
103	1960	.67	.70	.81	.39	.51	.69	.48	.54	.75	.75
233	1880	.59	.88	.92	.77	.76	.86	.87	.94	1.14	1.84
233	1890	1.15	1.24	1.07	.67	1.06	1.06	1.17	1.26	1.36	1.12
233	1900	1.06	1.22	.43	1.33	1.33	.89	1.33	1.04	.87	.82
233	1910	.34	.52	.81	.82	.90	1.04	.84	.59	.64	.30
233	1920	.79	.80	.44	.94	.74	.21	.93	.84	.98	.78
233	1930	.41	.75	.90	.77	.55	.77	.46	.89	.79	.54
233	1940	.48	.68	.81	.77	.74	1.03	.62	.95	.58	.89
233	1950	.50	.85	.76	.67	.32	.31	.45	.55	.30	.40
233	1960	.61	.64	.41	.30	.60	.21	.68	.42	.78	0.00
201	1880	.51	.55	.68	1.04	1.17	1.27	.88	.79	1.53	1.67
201	1890	1.27	1.23	1.19	.60	.74	1.04	1.23	1.27	1.33	1.69
201	1900	1.50	1.35	.84	1.36	1.18	1.42	1.56	1.75	.95	1.30
201	1910	.95	.74	.81	1.05	.90	1.50	1.67	1.24	1.10	.43
201	1920	.63	.88	.88	.94	.94	.75	.84	.77	.78	.43
201	1930	.24	.48	.71	.89	1.15	1.10	1.09	1.60	1.70	1.35
201	1940	1.38	1.54	1.22	1.72	1.53	1.31	1.11	1.36	.73	1.46
201	1950	1.17	1.19	.99	.99	.32	.67	.55	.76	.75	.59
201	1960	.54	.60	.77	.42	.37	.76	.47	.69	.37	.65
202	1880	.31	.34	.41	.61	.61	.71	.51	.59	.79	.95
202	1890	.84	1.01	.68	.28	.51	.73	.60	.55	.94	.57
202	1900	.83	.94	.28	1.05	.96	.83	.78	1.31	.67	.71
202	1910	.31	.39	.68	.72	.91	1.06	.86	.77	.64	.10
202	1920	.35	.42	.32	.76	.94	.73	.86	.86	.68	.41
202	1930	.28	.68	.88	1.21	2.09	1.71	1.58	1.69	1.32	1.26
202	1940	1.35	.98	.97	1.31	1.28	1.48	1.56	1.71	1.37	1.00
202	1950	1.21	1.12	1.58	1.50	.53	.94	.94	.96	1.13	.98
202	1960	.89	1.31	1.71	1.02	1.02	1.17	1.01	.86	.51	1.02
212	1880	.17	.17	.80	.73	.68	.59	.74	.71	.85	.74
212	1890	.89	1.08	.84	.32	.69	1.17	.79	1.00	1.33	.96
212	1900	1.03	1.01	.21	.96	1.15	.89	1.12	1.18	.98	.19
212	1910	.89	.50	.46	.82	1.20	1.61	1.69	1.07	1.03	.82
212	1920	.43	.82	.51	1.31	.59	.61	.87	.72	.68	.53
212	1930	.45	.76	1.21	1.11	2.03	1.63	1.66	2.10	2.32	1.81
212	1940	1.89	1.72	1.42	2.51	2.79	2.53	1.32	2.03	1.25	1.99
212	1950	1.43	1.33	1.20	1.41	.44	.89	.51	1.01	.82	.76
212	1960	1.00	1.24	.73	.54	.48	.96	.84	1.40	.54	1.32

APPENDIX 5

Standardized ring width indices

BITTERBRUSH

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
391	1916	0.000	0.000	0.000	0.000	0.000	0.000	2.143	.916	1.350	.788
391	1920	.409	.449	.584	.475	.695	1.382	.952	.454	.826	.622
391	1930	.711	.716	.839	1.205	1.164	.847	.415	.532	.628	.497
391	1940	.454	.629	.619	1.522	1.892	2.064	2.078	2.392	1.452	1.942
391	1950	1.410	1.375	2.027	.882	.312	.764	.463	1.683	1.481	1.258
391	1960	.778	.954	.734	.725	.406	1.026	.653	.864	.581	.540
1531	1927	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.615	.793	.632
1531	1930	.606	.660	.896	1.331	1.006	1.140	2.042	.847	.669	.914
1531	1940	.257	1.029	.811	.816	.512	.599	.438	.808	.487	.612
1531	1950	.997	1.279	1.060	1.660	.894	2.131	1.542	1.569	1.370	1.639
1531	1960	1.844	1.189	1.552	1.096	.741	1.109	.423	.496	.441	.124
1411	1920	3.157	.900	.713	.536	.798	.388	.437	.682	.555	.814
1411	1930	.424	.933	1.217	1.663	1.385	1.142	.793	.709	.628	.836
1411	1940	.929	.848	.687	.941	1.931	1.127	1.827	.956	1.994	.648
1411	1950	1.731	1.005	1.361	.452	.394	.473	.583	1.363	1.020	1.198
1411	1960	.945	1.680	1.105	.439	.703	1.063	.787	.950	.782	1.321
1422	1937	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.833	.972	.422
1422	1940	.215	.940	.302	.336	.957	.993	1.378	1.184	.779	.441
1422	1950	.790	1.048	1.857	2.716	.589	.308	.660	1.106	1.984	1.926
1422	1960	.973	1.047	1.444	1.038	1.008	1.280	.480	.521	.428	.855
1462	1910	.923	.463	.968	.926	1.148	1.339	1.565	1.549	1.573	.440
1462	1920	1.207	1.206	1.000	1.116	1.101	.509	1.360	.610	1.291	.730
1462	1930	.893	.873	.671	1.225	.981	.975	.589	.917	.733	.720
1462	1940	.430	.960	.790	.810	.679	.784	.914	1.308	.778	1.310
1462	1950	.786	1.269	.946	1.090	.552	1.027	1.066	1.031	.967	1.514
1462	1960	1.524	1.412	1.321	.848	.644	1.364	1.409	1.632	1.012	1.436
1482	1926	0.000	0.000	0.000	0.000	0.000	0.000	1.323	.714	.754	.769
1482	1930	.808	.914	1.109	.852	.710	.637	.326	.712	.363	.911
1482	1940	.314	.894	.742	1.737	1.418	1.586	.955	2.073	1.585	1.941
1482	1950	1.097	2.023	.776	1.652	.503	.646	.770	1.873	1.281	1.361
1482	1960	1.297	1.640	.700	.364	.482	.872	.441	.573	.971	.415
1496	1933	0.000	0.000	0.000	.284	.555	.493	.509	.938	.721	.547
1496	1940	.482	.884	1.216	1.374	1.457	1.235	1.517	1.641	1.277	1.477
1496	1950	.434	.336	.780	1.333	.383	.511	.974	1.674	1.865	1.980
1496	1960	2.043	2.112	.373	.286	.432	.929	.690	.890	.365	.998
1148	1931	0.000	1.302	.172	.335	.296	.511	1.680	1.273	.678	.978
1148	1940	1.370	1.675	1.215	1.185	.699	1.050	1.215	1.867	1.564	1.634
1148	1950	1.059	1.221	.879	1.671	.597	1.397	.491	.525	.749	.815
1148	1960	1.156	.984	.803	.452	.876	1.155	.580	.628	.896	1.021
1166	1931	0.000	.334	.183	.617	.995	.720	.757	1.081	.769	1.372
1166	1940	.764	1.230	1.471	1.550	.722	1.253	1.844	1.119	.468	1.435
1166	1950	1.447	1.940	2.280	1.485	.420	1.751	1.134	1.445	.227	1.414
1166	1960	.771	.408	.314	.932	1.021	.768	.490	.804	.604	.547

BITTERBRUSH

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
1642	1918	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	.557
1642	1920	.611	.431	.680	.664	.464	.908	1.482	.580	.454	.390
1642	1930	.464	.589	.630	.696	.962	.845	.684	1.177	1.015	.905
1642	1940	.913	1.640	1.813	2.155	1.929	2.364	1.455	2.315	1.575	1.930
1642	1950	1.079	1.238	.801	1.205	.167	.605	1.122	.661	1.287	1.062
1642	1960	1.187	1.138	1.040	.663	.721	.988	.256	.712	.250	.774
1655	1911	0.000	.407	.201	.598	1.119	.684	.645	.703	.886	.438
1655	1920	.993	1.137	.456	1.025	1.255	.799	2.582	1.395	1.037	.457
1655	1930	1.359	1.179	1.558	1.158	1.559	1.410	1.318	1.307	.952	1.259
1655	1940	1.093	1.317	.973	1.271	.781	1.051	.819	1.207	.831	1.019
1655	1950	1.012	1.291	.925	.683	.467	.813	.622	.984	1.023	.970
1655	1960	.964	1.425	1.459	.746	1.047	1.560	.452	.812	.382	.928
1663	1926	0.000	0.000	0.000	0.000	0.000	0.000	.497	.165	.234	.373
1663	1930	.674	.880	1.014	.665	1.324	1.477	1.765	2.929	1.435	.714
1663	1940	.867	1.770	1.189	1.162	.567	1.261	.801	1.121	.729	1.304
1663	1950	.425	1.017	1.160	1.408	.544	1.146	1.183	.806	1.317	1.127
1663	1960	.837	1.118	1.235	.685	.683	1.420	.577	.853	.375	1.122
1913	1910	.406	.224	.222	.354	.395	.698	.649	.903	1.409	.424
1913	1920	1.306	1.464	.457	1.982	1.230	.652	1.902	1.045	1.118	1.032
1913	1930	1.025	.901	.545	1.587	1.115	1.567	.949	1.586	1.126	.410
1913	1940	.445	1.364	1.978	1.821	1.774	1.368	.715	1.886	1.486	2.005
1913	1950	1.189	1.669	1.141	.860	.273	.476	.913	.774	.836	.466
1913	1960	.894	.527	.720	.423	.551	.838	.577	1.149	.571	1.453
1983	1910	1.068	.568	.816	.924	1.096	.874	1.215	.801	2.018	1.176
1983	1920	1.593	1.344	.895	.483	.398	.468	.741	.610	.615	.711
1983	1930	1.364	.698	.868	1.891	1.286	.960	1.693	1.438	1.375	.816
1983	1940	1.122	1.685	.836	.894	.644	.701	.576	.607	.559	.644
1983	1950	.677	1.120	.606	1.168	.701	1.217	1.686	1.672	1.659	1.145
1983	1960	1.482	1.646	1.329	.335	.708	.778	.660	.730	.673	.874
1989	1923	0.000	0.000	0.000	1.008	.605	.479	.972	.527	.859	.538
1989	1930	.526	.483	.693	.741	.333	1.217	.786	.885	.869	1.156
1989	1940	1.298	.691	1.227	2.490	1.994	1.713	1.735	1.539	1.018	1.958
1989	1950	1.285	1.289	1.025	1.142	.476	1.281	.694	.415	.553	.363
1989	1960	1.316	1.457	1.613	.691	.682	1.310	.425	1.114	.379	.642
221	1910	.639	.302	.300	.268	.445	.412	.234	.291	1.128	.057
221	1920	.400	.738	.564	1.094	1.674	.915	3.088	1.178	1.471	.704
221	1930	.754	.508	.559	1.933	1.448	1.990	1.718	.854	2.214	.947
221	1940	1.044	1.190	2.267	2.280	2.268	1.711	1.085	1.570	1.000	1.335
221	1950	1.377	1.490	.789	.380	.331	.612	.492	.932	1.160	.831
221	1960	.827	1.691	.910	.588	.360	.560	.379	.422	.552	.528
229	1925	0.000	0.000	0.000	0.000	0.000	.979	.476	.370	.767	.484
229	1930	.300	.461	.573	1.879	.703	.764	1.197	1.062	.789	.914
229	1940	.965	1.622	.729	1.008	.702	1.129	.893	2.271	2.619	2.312
229	1950	.748	.877	.668	.658	.783	.638	.235	1.729	2.339	1.654
229	1960	1.062	2.241	1.225	.758	.327	.438	.569	.696	.599	.219
264	1926	0.000	0.000	0.000	0.000	0.000	0.000	.946	.898	.459	.807
264	1930	.222	.721	.433	.396	.752	.623	1.932	1.040	.941	1.294
264	1940	.472	.548	1.138	2.168	1.798	1.541	.439	1.607	.983	2.469
264	1950	1.232	1.682	.819	.811	.424	.933	.692	1.691	1.651	.940
264	1960	.797	1.908	1.520	.473	.383	.885	.522	.372	.615	.792
271	1927	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.484	.299	1.333
271	1930	.293	.377	.574	.454	2.447	1.309	1.544	1.365	1.244	.133
271	1940	.557	1.340	1.796	1.599	1.252	.962	.702	.995	1.109	1.173
271	1950	.823	1.297	1.143	.448	.327	.766	1.151	1.347	1.359	1.146
271	1960	1.292	2.145	1.760	.805	.691	1.264	.340	.612	.628	.623

BITTERBRUSH

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
279	1913	0.000	0.000	0.000	.691	.479	.466	.681	.619	.431	.883
279	1920	.903	1.122	.548	1.837	1.946	.549	1.828	.737	1.204	.910
279	1930	.562	.551	.541	1.218	.368	1.657	.473	.261	1.030	.759
279	1940	.332	.381	1.340	1.821	1.455	1.920	1.009	2.784	.735	2.415
279	1950	1.143	2.160	.949	.685	.518	.734	.900	1.453	1.113	1.226
279	1960	1.316	1.816	.795	.402	.458	.964	.505	.769	.570	.357
286	1916	0.000	0.000	0.000	0.000	0.000	0.000	.349	.498	.573	.424
286	1920	1.148	1.797	.224	1.423	1.349	.324	1.249	.250	1.425	1.000
286	1930	1.751	1.251	.751	1.728	.526	1.353	.376	.501	1.279	.953
286	1940	1.490	1.405	1.406	1.080	.653	1.206	.854	2.213	.905	1.560
286	1950	.604	1.132	1.259	.856	1.058	1.789	1.134	1.260	1.160	.857
286	1960	1.236	1.565	.782	.303	1.010	.631	.606	.607	.430	.430
289	1923	0.000	0.000	0.000	.238	.296	.560	.969	.350	.843	.867
289	1930	1.007	.916	1.453	1.248	1.213	1.910	.838	1.112	1.024	.826
289	1940	.466	.819	1.494	1.081	1.965	2.009	.826	2.336	.872	1.526
289	1950	1.178	1.486	.700	.749	.360	.461	.510	.964	.783	.805
289	1960	1.629	2.345	1.267	.544	.689	.932	.513	.608	.629	.723
292	1934	0.000	0.000	0.000	0.000	.655	.652	.449	.679	1.237	.574
292	1940	.376	.732	1.069	.887	.979	1.967	1.258	2.219	1.168	1.839
292	1950	1.017	1.246	1.070	.772	.353	.704	1.083	1.306	1.694	1.416
292	1960	.825	1.643	1.235	.578	.738	1.058	.746	.554	.726	.463
294	1922	0.000	0.000	.266	.267	1.030	.743	.932	.955	.791	.041
294	1930	.859	.104	1.221	1.372	1.524	1.740	1.106	1.152	1.048	1.459
294	1940	1.355	1.942	1.558	1.519	.783	1.025	1.291	1.931	1.606	1.346
294	1950	.863	1.132	1.002	.915	.447	.583	1.238	.881	1.087	.772
294	1960	.638	1.394	1.238	.436	.507	.786	.696	1.023	.630	.725
623	1919	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.319
623	1920	1.368	.751	.215	2.961	1.865	.435	2.162	1.271	1.452	.662
623	1930	.842	.801	.245	.381	.472	.767	.395	.910	1.027	.298
623	1940	.345	.877	1.252	1.350	1.776	1.712	.329	1.820	.569	1.215
623	1950	1.028	1.441	1.157	.339	.194	.512	.784	1.624	1.532	1.042
623	1960	1.245	1.876	.829	.454	.658	1.755	.383	1.770	.360	1.164
936	1916	0.000	0.000	0.000	0.000	0.000	0.000	1.087	.616	1.198	.166
936	1920	.567	1.184	.230	.375	.513	.787	1.889	.684	1.405	.589
936	1930	.512	1.193	.861	.844	1.183	1.683	.797	1.846	2.252	1.673
936	1940	.530	.990	1.435	1.412	.992	1.171	.961	1.183	.512	1.514
936	1950	.723	1.782	.702	.476	.384	.379	.664	1.722	1.213	.678
936	1960	.985	1.829	1.652	.607	.599	1.407	.585	.578	.786	.918
960	1924	0.000	0.000	0.000	0.000	.797	.720	1.460	1.141	.807	.635
960	1930	.756	1.064	.860	.542	.342	.937	.854	.927	.603	.681
960	1940	.523	.818	1.576	1.345	1.299	.874	.899	2.332	1.044	1.955
960	1950	1.313	1.733	1.442	.367	.316	.226	.782	1.566	1.434	.673
960	1960	.841	1.592	1.173	.480	.907	1.482	.807	.364	.777	1.144
976	1936	0.000	0.000	0.000	0.000	0.000	0.000	2.261	1.555	.317	.736
976	1940	.405	.714	.729	1.402	.677	.865	.768	1.370	.919	1.308
976	1950	1.381	1.516	1.571	.715	.381	.210	.807	1.443	1.183	.845
976	1960	.814	1.497	1.723	.480	.697	1.418	.822	.412	1.334	1.038
993	1927	0.000	0.000	0.000	0.000	0.000	0.000	0.000	9.781	3.324	6.564
993	1930	1.004	1.281	1.135	.965	.839	.212	.285	.129	.314	.471
993	1940	.504	.908	1.231	1.102	.857	.369	1.260	.222	1.250	.607
993	1950	1.881	1.172	.733	.464	.265	1.057	1.810	2.095	.666	.997
993	1960	2.604	1.509	.579	.776	1.462	1.032	.324	1.411	.011	.903

BITTERBRUSH

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
141	1926	0.000	0.000	0.000	0.000	0.000	0.000	.879	.670	.751	.860
141	1930	.723	.799	1.105	.600	1.151	.386	.597	1.388	.788	.517
141	1940	.534	1.478	1.653	1.604	1.677	.731	2.141	1.009	1.538	.379
141	1950	1.210	1.651	.707	.232	.355	.268	.692	1.750	2.185	1.492
141	1960	1.319	2.089	1.856	.543	.407	1.208	.579	.429	.478	.350
1218	1884	0.000	0.000	0.000	0.000	.384	.314	.244	.244	1.504	.350
1218	1890	.735	.700	.700	.455	1.086	1.542	.876	1.473	.596	.596
1218	1900	1.123	.772	.316	.667	1.687	1.441	3.129	2.286	1.090	1.865
1218	1910	.985	.633	1.690	.845	.422	1.057	.669	1.728	.670	.988
1218	1920	2.470	1.871	.635	2.013	1.307	.706	.989	.353	.742	1.026
1218	1930	.212	.177	.956	2.231	1.063	2.197	.496	.886	1.525	.816
1218	1940	.425	.497	1.988	1.633	.923	.568	.639	1.066	.426	1.707
1218	1950	.533	1.032	.676	.569	.427	.712	.819	2.317	.677	.642
1218	1960	.678	1.606	.928	.750	.785	1.643	.607	.500	.429	1.216
1229	1910	.684	.301	.373	.406	.256	.363	.503	.785	1.237	.525
1229	1920	.660	1.206	.649	2.135	2.251	.399	1.950	.721	1.366	1.548
1229	1930	.448	.539	.945	1.907	1.179	2.463	1.589	1.395	2.137	.956
1229	1940	.326	.441	1.520	1.364	.518	.801	.824	1.495	.560	1.948
1229	1950	1.160	1.757	.654	.758	.484	.454	1.062	.844	.760	1.171
1229	1960	1.060	1.722	1.226	1.167	.403	.752	.647	.544	.689	.782
1264	1902	0.000	0.000	.633	.764	.810	.568	1.131	.585	.381	.974
1264	1910	1.078	.863	1.246	1.465	.562	1.244	.625	.468	1.276	.578
1264	1920	1.593	1.110	.917	1.620	.797	.227	.096	1.452	1.741	.453
1264	1930	1.700	1.388	.773	1.555	.959	1.206	1.303	1.453	1.488	1.888
1264	1940	1.218	2.321	1.738	1.442	1.169	1.028	1.226	1.357	1.670	1.098
1264	1950	.965	.634	.964	.957	.877	.637	.802	.528	.577	.312
1264	1960	.225	.680	.883	.644	.865	1.106	.926	.664	.525	.771
1287	1909	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.552
1287	1910	.444	.404	1.604	.754	.970	.984	.768	1.563	.822	.404
1287	1920	1.738	2.075	.390	2.278	1.792	.431	1.860	.444	.444	1.118
1287	1930	.458	.269	.566	1.253	.781	1.712	.620	.822	1.213	.660
1287	1940	.579	1.388	2.129	1.415	1.186	.930	.593	1.712	.566	1.712
1287	1950	.620	1.213	.606	.539	.471	.781	.903	1.685	.903	.916
1287	1960	1.091	1.253	1.132	1.051	.903	1.536	.498	.633	.768	1.064
1294	1890	1.648	.346	.642	.295	.458	.919	.515	.544	.574	.493
1294	1900	.798	1.298	.249	1.252	1.033	1.037	1.800	1.525	.850	1.991
1294	1910	.713	.773	1.582	1.097	1.130	1.716	1.284	1.729	.970	.738
1294	1920	1.867	2.172	.567	2.489	1.505	.513	1.699	.639	.856	1.136
1294	1930	.462	.464	.683	1.435	.532	1.447	.442	.888	1.401	.543
1294	1940	.192	.773	1.327	1.268	.685	.426	.428	1.322	.930	2.134
1294	1950	.904	1.345	.912	.509	.375	.445	.928	2.142	.971	.941
1294	1960	1.085	1.618	1.378	.532	.570	.465	.899	.867	1.053	.730
1206	1917	0.000	0.000	0.000	0.000	0.000	0.000	0.000	2.354	.610	.391
1206	1920	1.290	1.149	.714	1.088	.708	.631	.950	1.437	.604	.577
1206	1930	1.103	.862	.748	.821	.692	.572	.897	.889	.817	.750
1206	1940	.545	1.137	1.238	1.426	1.207	1.509	1.162	2.016	.764	1.444
1206	1950	.682	1.575	1.303	.753	.779	.763	.679	1.732	1.058	1.293
1206	1960	.955	1.455	.787	.868	.537	1.217	.609	.521	.873	1.170

BITTERBRUSH

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
878	1927	0.000	0.000	0.000	0.000	0.000	0.000	0.000	.757	.270	.432
878	1930	.850	1.061	.981	.498	1.226	1.025	.386	.643	.663	.483
878	1940	.532	.855	1.225	.778	1.244	1.593	1.057	1.882	1.004	2.082
878	1950	2.007	2.514	1.671	1.816	.256	.990	.819	1.102	1.490	.879
878	1960	.978	1.742	1.085	.378	.353	.927	.570	.625	.359	.592
2040	1935	0.000	0.000	0.000	0.000	0.000	.223	.388	1.150	1.198	.581
2040	1940	.856	.840	.612	.913	1.217	1.159	.583	1.585	1.376	1.098
2040	1950	1.304	1.245	1.543	1.597	.611	1.980	1.649	2.096	1.761	.979
2040	1960	.516	.873	.736	.550	.625	.992	.633	.735	.172	.571
2006	1901	0.000	.288	.144	.345	.374	.345	.748	.690	.805	1.323
2006	1910	.373	.230	.718	.488	1.264	.603	.459	.861	1.350	.430
2006	1920	1.378	1.636	1.148	2.009	2.381	.975	2.008	.803	.659	.573
2006	1930	.544	1.605	2.980	2.836	2.750	2.234	1.460	1.202	.887	1.345
2006	1940	.944	1.087	1.459	1.830	.686	.743	.771	1.257	.743	1.314
2006	1950	.942	1.685	.885	.885	.485	.999	.627	.856	.741	.570
2006	1960	.513	.969	.712	.541	.484	.769	.598	.655	.541	.427
2234	1920	1.972	.552	.316	.606	1.162	.697	.671	.732	.873	.522
2234	1930	.465	.563	.473	.741	.720	.666	.550	1.229	1.044	1.346
2234	1940	.962	1.594	1.584	2.091	1.645	1.791	.914	.671	1.095	1.001
2234	1950	1.332	1.627	1.213	1.014	.562	1.062	1.357	1.805	1.229	.812
2234	1960	.643	.709	1.056	.501	1.115	.918	.567	.890	.413	1.119
2247	1925	0.000	0.000	0.000	0.000	0.000	.786	.303	.325	.293	.340
2247	1930	.463	.506	.946	1.176	1.423	1.116	1.123	1.083	1.248	1.521
2247	1940	1.566	1.913	1.500	1.839	1.063	1.090	.487	.380	1.226	1.093
2247	1950	1.813	1.276	.903	1.728	.642	1.306	1.309	1.347	1.016	.242
2247	1960	.359	.864	.855	.646	1.279	.941	.706	.858	.818	.981
522	1904	0.000	0.000	0.000	0.000	1.583	.788	1.030	.732	.583	.823
522	1910	.820	1.297	.956	.667	.569	.945	.564	1.078	1.214	.279
522	1920	1.389	1.661	.505	2.151	.684	.454	.904	.631	1.391	1.028
522	1930	1.113	1.553	.619	1.321	1.184	1.574	.958	1.909	1.253	.559
522	1940	.472	1.240	1.107	1.485	1.522	1.137	.461	1.087	.583	1.246
522	1950	.538	.989	.657	.901	.571	.813	1.013	1.534	1.489	.842
522	1960	.719	1.633	.913	.910	.749	1.296	.940	.897	.778	.659
534	1905	0.000	0.000	0.000	0.000	0.000	.534	.527	1.042	1.372	1.058
534	1910	.962	.826	.816	.524	1.754	1.142	.779	1.347	.761	.414
534	1920	1.378	1.547	1.275	1.190	.927	.953	1.048	1.107	1.095	1.559
534	1930	1.208	1.429	1.283	1.467	.904	1.247	.633	.408	.497	.400
534	1940	.519	.635	.780	.595	.825	1.081	.695	1.293	1.140	.876
534	1950	1.121	.806	1.158	1.067	.379	1.211	1.282	1.934	1.867	.782
534	1960	.802	1.568	.994	1.114	.552	.998	.743	1.032	1.000	.678
2159	1916	0.000	0.000	0.000	0.000	0.000	0.000	1.061	.580	.799	.636
2159	1920	.921	.798	.607	.669	1.006	.752	.842	.897	.491	.387
2159	1930	.478	.283	.496	.674	.847	1.075	.649	1.107	1.381	.909
2159	1940	1.067	1.610	1.756	2.875	2.253	2.174	1.206	2.152	1.000	1.929
2159	1950	.954	1.938	1.008	1.143	.409	1.359	.566	1.028	.740	.618
2159	1960	.522	1.461	.890	.860	.655	1.212	.558	.255	.358	.647
2188	1915	0.000	0.000	0.000	0.000	0.000	.436	.559	.763	.779	.501
2188	1920	.768	.900	.644	.661	.392	.207	.505	.426	.606	.373
2188	1930	.424	.532	.462	.790	.882	.970	1.504	1.756	1.846	1.387
2188	1940	1.553	1.523	1.890	2.542	1.686	2.361	.845	1.959	1.360	1.646
2188	1950	1.072	1.592	1.135	.867	.265	.952	.938	1.069	.910	.827
2188	1960	.485	.923	.893	.964	.639	1.311	.431	.630	.389	.691

BITTERBRUSH

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
415	1914	0.000	0.000	0.000	0.000	3.548	.589	.623	.475	.910	.145
415	1920	.542	.540	.394	1.108	.926	.638	1.343	.810	1.334	1.294
415	1930	1.533	1.458	.830	1.069	1.134	1.096	.716	1.020	.949	.608
415	1940	.471	.738	.969	1.066	.963	1.853	.626	1.183	.655	.914
415	1950	.618	1.297	.970	1.289	.738	1.312	1.180	2.004	1.363	1.327
415	1960	1.134	1.695	1.001	.592	.684	.930	.865	.770	.706	.428
449	1903	0.000	0.000	0.000	.483	.241	.242	.346	.173	.347	.521
449	1910	.591	.453	.837	1.013	1.154	.700	1.157	1.404	1.230	.316
449	1920	1.198	1.905	.848	3.431	2.727	.780	2.343	1.635	1.210	.891
449	1930	1.320	.643	.894	.967	.753	1.688	.755	1.260	1.334	.974
449	1940	.506	1.266	1.739	1.269	1.380	1.491	1.165	2.261	.657	1.023
449	1950	.842	1.869	.513	.918	.331	.442	.590	1.182	.813	.703
449	1960	.630	1.114	.892	.521	.484	.933	.598	.823	.674	.562
409	1916	0.000	0.000	0.000	0.000	0.000	0.000	1.276	.294	.912	1.106
409	1920	.728	1.399	.355	1.171	.733	.686	1.131	.895	.921	1.021
409	1930	.901	.463	.459	.419	.726	.923	.575	.938	.829	.755
409	1940	.781	1.385	1.532	1.485	2.254	2.481	1.198	1.096	.814	1.136
409	1950	1.422	1.263	1.397	1.414	.858	1.532	1.434	1.227	1.466	1.234
409	1960	.979	1.295	.615	.796	.526	.653	.726	.566	.383	.202
2221	1910	.923	.463	.968	.926	1.148	1.339	1.854	1.232	1.462	.614
2221	1920	1.591	.851	.765	.709	.865	.760	1.018	.815	.844	.714
2221	1930	.688	.819	.946	1.093	.967	.872	.779	.784	.673	.692
2221	1940	.440	.884	.738	1.077	1.264	1.198	1.301	1.480	1.193	1.196
2221	1950	1.035	1.191	1.258	1.398	.518	.837	.865	1.471	1.424	1.554
2221	1960	1.343	1.433	1.033	.685	.631	1.092	.697	.846	.654	.813
2222	1910	.704	.375	.385	.567	.707	.627	.694	.633	1.080	.494
2222	1920	.988	1.108	.454	1.113	1.032	.666	1.415	1.215	1.017	.998
2222	1930	.789	.781	.761	1.012	.977	1.122	1.063	1.150	1.058	.863
2222	1940	.772	1.180	1.364	1.486	1.228	1.302	1.038	1.631	1.090	1.517
2222	1950	1.074	1.417	1.023	.804	.441	.807	.905	1.263	1.227	.989
2222	1960	1.132	1.558	1.159	.572	.704	1.071	.539	.758	.576	.771
2223	1884	0.000	0.000	0.000	0.000	.384	.314	.244	.244	1.504	.350
2223	1890	1.191	.523	.671	.375	.772	1.231	.696	1.009	.585	.545
2223	1900	.961	.786	.335	.702	.955	.708	1.245	1.005	.775	1.138
2223	1910	.739	.642	1.091	.807	1.163	.889	.795	1.102	.967	.532
2223	1920	1.326	1.368	.664	1.641	1.287	.615	1.165	.827	.876	.840
2223	1930	.805	.812	.888	1.245	1.044	1.302	.836	1.113	1.206	.916
2223	1940	.751	1.180	1.450	1.518	1.246	1.345	.827	1.432	.920	1.411
2223	1950	1.046	1.425	1.009	1.040	.529	.986	.998	1.468	1.102	.838
2223	1960	.743	1.288	.943	.744	.678	1.033	.673	.693	.607	.738
2250	1884	0.000	0.000	0.000	0.000	.384	.314	.244	.244	1.504	.350
2250	1890	1.191	.523	.671	.375	.772	1.231	.696	1.009	.585	.545
2250	1900	.961	.786	.335	.702	.955	.708	1.245	1.005	.775	1.138
2250	1910	.745	.553	.881	.735	1.019	.838	.859	.971	1.046	.525
2250	1920	1.243	1.224	.600	1.337	1.139	.650	1.264	1.006	.937	.898
2250	1930	.783	.797	.832	1.113	1.001	1.160	.940	1.083	1.057	.858
2250	1940	.716	1.137	1.305	1.438	1.240	1.303	.997	1.535	1.041	1.430
2250	1950	1.058	1.387	1.052	.979	.485	.878	.934	1.370	1.209	1.015
2250	1960	1.017	1.439	1.060	.653	.683	1.060	.612	.746	.599	.765
2250	1950	1.058	1.387	1.052	.979	.485	.878	.934	1.370	1.209	1.015
2250	1960	1.017	1.439	1.060	.653	.683	1.060	.612	.746	.599	.765

PONDEROSA PINE

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
112	1880	.525	.906	.741	.216	1.055	.855	.696	.742	.808	.959
112	1890	1.151	.951	.410	.116	1.093	1.458	.923	1.147	1.433	.994
112	1900	1.015	1.026	.776	1.156	1.498	.967	1.249	1.246	1.338	1.810
112	1910	1.044	.835	1.013	1.009	1.246	1.502	1.561	1.169	1.030	.311
112	1920	1.254	1.750	.895	1.750	1.188	.978	1.103	1.027	1.142	1.446
112	1930	1.036	.981	.673	1.020	.808	1.155	.661	1.107	1.019	.987
112	1940	.877	1.042	1.348	1.419	1.403	1.937	1.226	1.491	.953	1.339
112	1950	.685	1.126	.962	.956	.175	.530	.512	.644	.883	.548
112	1960	.706	.798	1.173	.449	.413	1.068	.381	.703	.792	1.042
113	1880	.290	.377	.496	.883	1.307	1.015	.703	.788	.883	.800
113	1890	1.110	1.442	.584	.244	.602	1.051	.809	.633	.962	.467
113	1900	.889	.475	.786	1.585	1.461	1.501	1.710	2.215	1.102	1.803
113	1910	1.461	1.181	1.260	1.401	1.424	1.943	1.716	1.082	1.092	.651
113	1920	1.135	1.670	1.298	1.540	1.456	1.326	1.362	.637	.988	1.161
113	1930	.727	.996	.683	.982	.931	.843	.576	.850	.885	.753
113	1940	.617	1.130	1.252	1.131	1.062	1.118	1.132	1.075	.857	.942
113	1950	.865	.892	.966	.684	.347	.752	.649	.857	.837	.543
113	1960	1.001	.947	.891	.670	.386	.880	.552	.969	.888	1.085
253	1880	.734	1.410	.868	.789	.529	.534	.290	.713	.664	.858
253	1890	.830	.978	.845	.361	.824	1.879	1.057	1.147	.966	.846
253	1900	1.284	1.117	.354	1.028	1.232	1.136	1.594	1.052	.955	1.769
253	1910	.716	.933	1.473	1.326	1.507	1.829	1.582	1.330	1.125	.553
253	1920	1.438	2.486	.938	2.006	1.573	.968	1.381	.694	1.156	1.311
253	1930	1.353	.993	.421	1.424	.777	.815	.540	.711	1.011	.489
253	1940	.319	.569	.828	.827	1.106	.978	.658	1.381	.877	.968
253	1950	.708	1.177	.964	.947	.100	.698	.903	.923	1.013	.914
253	1960	.769	1.021	.861	.491	.550	.894	.398	.794	.957	1.525
92	1880	.827	1.131	.396	1.149	1.599	2.069	1.585	1.360	.627	1.237
92	1890	.648	1.273	.694	.279	.841	1.269	.755	.657	.580	.832
92	1900	1.085	.905	.439	1.144	1.274	.892	.656	.969	.554	1.065
92	1910	.671	.812	1.212	1.089	1.000	1.330	1.241	1.664	1.362	.322
92	1920	1.298	1.741	.602	2.010	1.025	.762	1.028	.978	1.297	1.229
92	1930	.633	.569	1.224	1.163	.492	1.030	.329	1.004	1.051	.234
92	1940	.481	1.073	1.236	1.161	1.222	1.507	.449	1.432	.563	1.442
92	1950	.748	1.275	.770	1.102	.532	.708	.782	1.589	.596	.789
92	1960	.879	1.556	.929	.766	.638	2.400	.573	1.157	1.319	1.164
101	1880	.855	1.454	.635	1.757	1.600	2.110	1.034	1.172	.360	1.410
101	1890	.934	1.428	.581	.147	.388	.895	.326	.821	.614	1.216
101	1900	1.289	1.048	.177	.798	.880	.852	.833	.881	.323	1.008
101	1910	.750	.723	1.123	1.144	1.638	1.568	1.126	1.301	1.942	.369
101	1920	1.563	2.158	.845	1.423	1.165	.450	.812	.747	.863	1.181
101	1930	.702	.786	.853	1.006	.725	1.008	.729	1.103	1.230	.929
101	1940	.440	.712	.983	1.176	1.090	1.380	.711	1.403	.990	1.389
101	1950	.948	1.507	1.164	.985	.330	.504	.766	1.405	1.300	1.159
101	1960	1.062	1.074	1.387	.652	.694	1.349	.633	.824	1.084	1.074

PONDEROSA PINE

STANDARDIZED RING WIDTH DATA
(STANDARDIZED ON A LINEAR REGRESSION)

ID	YEAR	0	1	2	3	4	5	6	7	8	9
103	1880	.420	.913	.502	.625	1.440	1.665	.880	.937	.852	1.685
103	1890	.976	1.187	.578	.127	.610	1.217	.625	.526	.631	.857
103	1900	1.227	1.063	.595	1.158	1.144	1.543	1.704	1.635	.709	1.465
103	1910	.745	.729	.971	.627	1.250	.955	1.040	1.208	1.479	.625
103	1920	1.545	1.895	.551	1.988	1.798	.687	1.625	.608	1.202	1.133
103	1930	.976	.774	.844	1.014	.875	1.114	.862	1.036	1.110	.694
103	1940	.458	.622	1.065	1.398	1.242	1.331	.794	1.084	1.175	1.592
103	1950	.461	2.026	1.068	.988	.559	.700	.654	.949	1.120	.730
103	1960	.863	.908	1.057	.512	.674	.918	.643	.728	1.018	1.025
233	1880	.543	.816	.859	.723	.719	.819	.834	.907	1.108	1.800
233	1890	1.133	1.230	1.069	.674	1.074	1.082	1.203	1.305	1.419	1.177
233	1900	1.122	1.301	.462	1.440	1.451	.979	1.474	1.162	.979	.931
233	1910	.389	.599	.942	.961	1.064	1.240	1.010	.715	.783	.370
233	1920	.983	1.004	.557	1.201	.954	.273	1.222	1.114	1.312	1.054
233	1930	.559	1.033	1.252	1.081	.780	1.103	.666	1.302	1.167	.806
233	1940	.724	1.037	1.249	1.200	1.166	1.642	.999	1.549	.957	1.485
233	1950	.844	1.453	1.315	1.173	.567	.556	.818	1.013	.560	.756
233	1960	1.169	1.244	.808	.599	1.216	.431	1.419	.889	1.677	0.000
201	1880	.424	.459	.570	.875	.988	1.076	.748	.674	1.312	1.437
201	1890	1.097	1.066	1.036	.524	.649	.916	1.087	1.127	1.185	1.512
201	1900	1.347	1.217	.760	1.236	1.077	1.301	1.435	1.617	.881	1.211
201	1910	.888	.695	.764	.994	.856	1.433	1.602	1.194	1.064	.417
201	1920	.614	.862	.866	.929	.933	.748	.841	.775	.788	.436
201	1930	.244	.491	.730	.920	1.194	1.148	1.142	1.685	1.799	1.435
201	1940	1.474	1.653	1.315	1.864	1.666	1.433	1.220	1.502	.810	1.629
201	1950	1.312	1.341	1.121	1.127	.366	.770	.635	.882	.875	.692
201	1960	.637	.711	.918	.503	.445	.920	.572	.845	.455	.804
202	1880	.567	.613	.729	1.070	1.055	1.211	.858	.980	1.296	1.538
202	1890	1.343	1.595	1.060	.431	.776	1.098	.891	.808	1.365	.818
202	1900	1.178	1.319	.388	1.442	1.304	1.116	1.037	1.724	.873	.915
202	1910	.395	.492	.851	.892	1.116	1.288	1.035	.918	.756	.117
202	1920	.405	.482	.364	.857	1.051	.809	.945	.937	.734	.439
202	1930	.297	.716	.919	1.254	2.148	1.743	1.598	1.696	1.314	1.244
202	1940	1.323	.953	.936	1.255	1.217	1.396	1.461	1.590	1.264	.916
202	1950	1.101	1.011	1.417	1.336	.468	.825	.819	.831	.972	.837
202	1960	.755	1.104	1.432	.848	.843	.961	.824	.697	.410	.816
212	1880	.228	.226	1.057	.955	.882	.758	.943	.897	1.064	.919
212	1890	1.096	1.318	1.017	.384	.821	1.382	.925	1.162	1.533	1.098
212	1900	1.169	1.137	.234	1.064	1.265	.972	1.214	1.269	1.046	.201
212	1910	.936	.522	.477	.844	1.227	1.635	1.704	1.071	1.024	.810
212	1920	.421	.799	.493	1.259	.563	.578	.820	.674	.632	.490
212	1930	.413	.694	1.098	1.001	1.819	1.452	1.469	1.847	2.029	1.573
212	1940	1.633	1.477	1.212	2.131	2.355	2.123	1.101	1.684	1.031	1.632
212	1950	1.166	1.078	.967	1.130	.350	.705	.402	.792	.639	.589
212	1960	.772	.952	.557	.410	.362	.721	.628	1.042	.399	.972
1111	1880	.541	.831	.685	.904	1.117	1.211	.857	.917	.897	1.264
1111	1890	1.032	1.247	.787	.329	.768	1.225	.860	.933	1.069	.982
1111	1900	1.160	1.061	.497	1.205	1.259	1.126	1.291	1.377	.876	1.218
1111	1910	.800	.752	1.009	1.029	1.233	1.472	1.362	1.165	1.166	.454
1111	1920	1.066	1.485	.741	1.496	1.171	.758	1.114	.819	1.011	.988
1111	1930	.694	.803	.870	1.086	1.055	1.141	.857	1.234	1.261	.914
1111	1940	.835	1.027	1.142	1.356	1.353	1.485	.975	1.419	.948	1.333
1111	1950	.884	1.289	1.071	1.043	.379	.675	.694	.988	.879	.756
1111	1960	.861	1.031	1.001	.590	.622	1.054	.662	.865	.900	.951

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