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OLD-GROWTH FOREST TYPES OF THE NORTHERN REGION

by

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INTRODUCTION

In 1989, The Chief of the Forest Service established a National Old Growth Task Force and an action plan to deal with management of old growth forests. The action plan called for each Region to develop local definitions based upon a national generic definition of old growth. Regional definitions were not to be tied to resource values derived from old forests, but would be based on ecological attributes. In 1989, Region 1 named an old growth committee and set forth an action plan for meeting national requirements.

Many people do not see the National Forests as "working" forests, but rather believe old growth is the ultimate and desirable forest condition. Others believe old growth has value only as habitat for dependent or associated wildlife species. Old growth has an important role to play in forests managed for multiple resources. Region 1 views old growth as one element of the total diversity that should be found in a healthy forest landscape.

Region 1 old growth types were developed by three committees representing the major geographic areas of northern Idaho, western and eastern Montana. Each National Forest involved concerned publics as these definitions evolved. The Intermountain Research Station participated in this effort as well as interest groups from outside of the agency. The definitions have been coordinated with similar efforts in adjoining Forest Service Regions 4 and 6.

These definitions will be used in the implementation of Forest Plans. Where there are conflicts with existing plan requirements, differences will be worked out on a case-by-case basis. These definitions will be used as Forest Plans are revised. They will constitute an important criteria for the current Regional effort of Sustaining Ecological Systems.

Both NFMA and WO direction prescribe an ecological approach to old growth that considers old growth as a key element in providing for biological diversity. Old growth dependent and associated species are provided for by supplying the full range of the diversity of late seral and climax forest community types that make up habitat for these species.

Past efforts at developing old growth definitions were generally applicable only to the area where they were developed, because they were not stratified based on site potential. Because of differing capabilities of the land, adequate and defensible old growth definitions should be based on a site potential stratification, such as habitat type, series, or habitat type groups. Otherwise, type descriptions will fail to adequately describe old growth across a variety of site conditions. As examples, stands with lots of 21" diameter trees could easily be produced on sites with hemlock and cedar potential in 90 years. On the other hand, many higher elevation subalpine fir sites could never grow a 21" tree. Multi-storied stands may be elements of old growth on many hemlock and cedar habitat types, but they probably are not natural on drier Douglas-fir or ponderosa pine habitat types.

Habitat types are based on the biological capability of the land to produce a given type of plant community at the endpoint of secondary succession (climax). Normal timber management rotations do not extend long enough to produce climax plant communities, or subclimax late seral community types that would be part of a natural landscape. A biodiversity-based approach to old growth management seeks to maintain a relatively natural range of both climax plant communities and late seral subclimax communities. Both climax and late seral subclimax community types will be composed of stands with mixes and structural characteristics that are not commonly seen in current timber management regimes.

Ecological definitions of all successional stages, stratification by habitat types, and other site conditions will help us do a better job of managing for a landscape with a full range of natural biological diversity.

As we inventory the landscape, we must gather enough hard data to provide for management needs and to improve our understanding of communities and their dynamics. The old growth types of this report are a first step in describing the successional stages for forest types of the Northern Region.

ECOLOGICAL CONCEPTS RELATED TO OLD GROWTH FORESTS

The term old growth has not been a well defined or common term in much of the forest ecology literature. The older stages of forest succession have typically been referred to as late seral, climax, mature, or overmature (Dansereau 1957; Daubenmire 1968; Kimmons 1987; Spurr 1964; Weaver and Clements 1938). The old growth stage is thoroughly discussed by Oliver and Larson (1990), with references to old growth dating back to the 1940s. Environmentalists have typically used ancient, primeval, and virgin forest as terms for the older stages of forest succession (Hunter 1990).

With the emergence of old growth as a management issue in the 1980s, that developed first in western Washington and Oregon, the literature has become prolific with discussions of old growth definitions and characteristics. Various definitions have been developed and used for the forests of Washington and Oregon (Franklin and others 1986; Franklin and Spies 1991; Marcot and others 1991).

Unfortunately the definitions and ecological relationships for forests of Washington and Oregon have often been extrapolated to the northern Rocky Mountains of Idaho and Montana. The ecological systems of the northern Rocky Mountains are significantly different than the Cascades, due to a variety of factors. Primary factors that differ include: a climate that is transitioning from marine to continental influences; an older land surface with complex geologic history and soil development; generally drier conditions with relatively frequent droughts and extensive fire; stand and fuel conditions that often result in running or creeping ground fire that does not kill the overstory trees; stressed sites that have significant insect and pathogen influences; and a different complex of biogeographic fauna and flora that have evolved in a very different system.

Based on Oliver and Larson (1990) true old growth would only include trees that have grown up without outside stand initiating disturbances. Transition old growth can contain large, old trees that are relics from stand initiating disturbances. This definition is promoted by Hayward (1991) in emphasizing that old growth should be restricted to stands that are influenced by within-stand processes. This narrow definition generally does not fit with stand development processes common to the northern Rocky Mountains. This is well documented by Achuff (1989) and Habeck (1988; 1990) in reviews of old growth forests. Old growth stands in the northern Rockies that proceed from a stand-consuming fire, through dominance by seral tree species, and then to climax are typically short lived, due to the high probably of crown fire. Many of the oldest stands of old growth are dominated by seral tree species that are maintained as dominants and protected from crown fire, by repeated underburns that reduce ladder fuels and competition from more tolerant tree species. These relationships are well documented by Arno and others (1985), Arno (1980), Fisher and Clayton (1983), and Fisher and Bradley (1987). In reviewing historic data it has recently been determined that the bulk of the presettlement upland old growth in the northern Rockies was in the lower elevation, ground-fire maintained ponderosa pine/western larch/Douglas-fir types (Losensky 1992). This does not mean that other types of old growth were not common or not important, but it emphasizes that the older stages of succession in the northern Rockies do not follow traditional old growth climax succession theory. In essence it provides solid support for more region-specific old growth definitions and understanding of ecological relationships.

As the old growth issue began to receive national attention, it became apparent that the definitions that had been developed for Washington and Oregon would not work for other geographic areas. This is reflected by Hunter (1987) who emphasized that there was no generally accepted definition, that the climax forest idea was too restrictive, and that old growth forests should be relatively old and relatively undisturbed by humans. Thomas and others (1988) emphasize that there is no single all-inclusive definition and that old growth characteristics vary by region, forest type, and local conditions. Hunter (1990) promotes that a universal old

growth definition is not desirable and that forest ecologists should develop unique definitions for each forest type, taking into account forest structure, development, function, and patterns of human disturbance.

This general emphasis in the scientific literature for region and type specific definitions evolved into national Forest Service direction in 1989. This included a generic definition of old growth forests as "ecosystems distinguished by old trees and related structural attributes." Within the description old growth could encompass both seral fire-dependent species and tolerant, climax species. The national direction provided a list of general characteristics that "typically" distinguished old growth from younger growth.

Within the Northern Rockies various attempts at old growth definition were made during the Forest planning process. Unfortunately, these efforts continued to follow the definitions being developed in Oregon and Washington or emphasized structural characteristics related to old growth-associated wildlife species. Pfister (1987) conducted the first quantitative analysis based on ecological data for the Northern Rockies. This effort concentrated on the Kootenai and Nez Perce National Forests and provided a structure for the analysis presented in this paper. The analysis provided a basic review of concepts and provided an ecologically based classification of old growth based on numbers of large trees, snags, and down logs and described associated attributes of layers, canopy cover, age, and basal area. Pfister (1987) provided eight recommendations for further analysis, some of which have been crucial in conducting the regional level analysis.

ECOLOGICAL STRATIFICATION FOR THE NORTHERN REGION

In order to classify old growth forests it was decided that the most applicable system for stratification of site potential would be groups of habitat types. The habitat type classification systems used for this grouping are the "Forest Habitat Types of Northern Idaho: A Second Approximation" (Cooper and others 1991) and "Forest Habitat Types of Montana" (Pfister and others 1977).

Habitat types were grouped using the interdisciplinary process. For each zone a group of ecologists, soil scientists, and silviculturists met and selected criteria for grouping similar habitat types. Criteria used for grouping included: similarity of disturbance response, potential productivity, potential stocking density, potential down wood accumulation, fire frequency, and tree species. These groups relate closely in the environment with temperature and moisture regimes.

Appendix A, table 1 provides a listing of habitat type alpha and numeric codes for groups in Idaho, north of the Salmon River. Appendix A, table 2 provides a listing of habitat type alpha and numeric does for groups in Montana, west of the continental divide. Appendix A, table 3 provides a listing of habitat type alpha and numeric codes for groups in Montana, east of the continental divide. Due to differences in precipitation distribution, length of growing season, and floristic composition, the habitat types that occur in a given group will differ between geographic areas.

The old growth types for the Northern Region have been developed for three different geographic areas within the Region. The Region was geographically stratified into northern Idaho, western Montana, and eastern Montana. The Northern Idaho Zone is the western side of the northern Rocky Mountains in Idaho that is heavily influenced by pacific storms and weather patterns and generally received higher precipitation, especially in the winter, than areas to the east. The area generally north of Lake Coeur d'Alene has landforms designed by past continental glaciation, while the areas to the south have been primarily influenced by steep river downcutting and mountain glaciation. Northern Idaho is also heavily influenced by past volcanic events that deposited ash, which gives the soils relatively higher moisture holding capabilities.

The Western Montana Zone generally extends from the Bitterroot Mountain Divide to the Continental Divide of the Rocky Mountains in Montana. This area is influenced by pacific storms, with relatively high precipitation in the winter, but is also in the rain shadow of the Bitterroot Mountains. Some continental climatic influence also occurs and this area typically receives a higher percentage of precipitation in the

summer than northern Idaho. Some areas in western Montana have soils developed on volcanic ash, but much less than in northern Idaho. The area north of Missoula has landforms designed by past continental glaciation while the areas to the south have been primarily influenced by glacial lake deposition, moderate river downcutting, and mountain glaciation.

The Eastern Montana Zone generally extends from the Continental Divide east to the eastern portions of the Rocky Mountains that occur near Billings and north to Lewistown and Great Falls. This area is strongly influenced by both a continental climatic influence and storms from the west. It lies in the rain shadow of the Rocky Mountains and receives much less precipitation than northern Idaho or western Montana. A relatively high percentage of the precipitation occurs in the summer. A minor percentage of the soils are influenced by volcanic ash deposition. A large percentage of the soils are developed on limestone parent material. Landforms north of Great Falls were generally developed through continental glaciation, while landforms to the south were generally developed as a result of mountain glaciation and gradual to moderate river downcutting.

ANALYSIS PROCESS FOR CLASSIFYING OLD GROWTH TYPES

For each geographic zone of the Region a committee was selected that included members from National Forest Systems, Forest Service Research, Universities, and the public. Each committee was chaired by a Forest Supervisor and had members from each National Forest that represented various disciplines. The committees also coordinated with adjacent Forests in other Regions. The R1-RO Ecology group provided coordination and leadership throughout the process and developed the computer analysis tools with the assistance of the Regional Timber inventory group. The committees conducted a preliminary analysis to develop the draft definitions presented in this report. Further refinement and development of descriptions will be conducted as more data is collected.

The concept of old growth was based on the National definition. In this definition old growth forests are considered ecosystems that are distinguished by old trees and related structural attributes. They encompass the later stages of stand development that typically differ from earlier stages in characteristics such as tree age, tree size, number of large trees per acre and basal area. In addition, attributes such as decadence, dead trees, the number of canopy layers and canopy gaps are important but more difficult to describe because of high variability.

The October 1989 Forest Service position statement on old growth recognized that "old growth forests encompass the late stages of stand development and are distinguished by old trees and related structural attributes . . ." and that " . . . specific attributes vary by forest type." Forest Service Regions were charged with developing forest type old growth definitions, and conducting old growth inventories.

Both biological processes and human values were considered to determine criteria for old growth. As stands develop and age, there are changes in ecological composition, structure, and function as well as changes in aesthetic and economic values. The point in that process of forest aging where a stand is classified as old growth is largely a function of human values and concerns. It's similar to the process of human aging. People change in real physical ways as they age. But, how old is considered old, depends upon whether you ask a 15 year old, a 40 year old, or a 70 year old person.

Forest Plans generally set timber rotations at approximately 100 years, plus or minus 2 decades. Old growth has become an issue because some people think that it might be in short supply. Therefore, our concern with old growth focuses on forests with tree ages and sizes, or stand structures significantly different than what could be obtained in 100 years.

Plot data from the Northern Region stand exam inventory (USDA Forest Service R-1; 1989) were used as the basis for the old growth definition analysis. All plots that met a given set of criteria were used in the analysis.

The criteria for inclusion of a plot in the analysis were:

1. Plots were survey type 45 and 46, which meet full standard exam procedures.
2. Plots were selected from stands with no evidence of logging.
3. Plots had an identified habitat type.
4. The largest tree on the plot was equal to or greater than 100 years old and $\geq$ 9 inches dbh.
5. The plot basal area for trees equal to or greater than 5" dbh was $\geq$ 40 sf/acre.

A total of 680,000 plots were screened for the Idaho Panhandle, Clearwater, and Nez Perce National Forests in northern Idaho. A total of 1,068,000 plots were screened for the Kootenai, Flathead, Lolo, and Bitterroot National Forests in western Montana. A total of 388,000 plots were screened for the Lewis & Clark, Helena, Deerlodge, Beaverhead, Gallatin, and west side of the Custer National Forests in eastern Montana.

Habitat types are a land classification system based on the potential plant associations that will dominate a site at the end point of plant succession (climax). Habitat types are ideal for stratifying site conditions in order to predict the type of old growth forest they will produce. The plot data was sorted into groups of similar habitat types. Before a site reaches climax condition, it may be dominated by several different conifer tree species (with some associated structural differences), so plots in each habitat type group were subdivided by forest cover type (based on plurality of tree species basal area).

Within each habitat type group and forest cover type group, plots containing large trees over 100 years of age were selected for further analysis. The guiding principle was to select plots containing large, old trees that would represent the latter stages of stand development. These plots with large old trees were then further analyzed to determine the characteristics typical of old growth. These plots with old trees were analyzed for significant differences in tree ages, sizes, and forest stand structures and composition. Based on groupings of the data, and on professional judgment of the foresters, ecologists, and wildlife biologists, the following ages were selected as minimums:

North Idaho		
	All types except lodgepole pine	150
	Lodgepole pine	120
Western Montana		
	Ponderosa pine, Douglas-fir, western larch	170
	Lodgepole pine	140
	Other types	180
Eastern Montana		
	Douglas-fir types 1 and 2	200
	Limber pine	120
	Lodgepole pine	150
	Subalpine fir type 10	135
	Subalpine fir other types	160
	Whitebark pine type 11	150
	Whitebark pine type 12	135
	Pondersoa pine	180
	Douglas-fir type 3	180

The other minimum criteria -- tree size, and number of large trees per acre -- were selected to distinguish those stands where the old trees were dominating the stand structure. The number of trees equal to or greater than a given age and size (diameter at breast height) were used as minimum screening criteria for old growth. Associated characteristics (such as number of snags, down woody material, dead tops and decay, and diameter variation) represent the means, values, and ranges for structural characteristics found in the data for plots that met the old growth minimum criteria.

Three broad old growth stand structures were recognized in the analysis:

1. *Late Seral, Single-Story* -- these stands are still dominated by the tree species and tree canopy later that first captured the site after a stand replacing disturbance. The upper canopy is relatively closed. If understory trees were present, they are generally small, exhibit little growth, and do not form an apparent canopy layer. Other understory vegetation may be sparse. Ages and sizes of dominant trees are significantly beyond what may be found at culmination of mean annual increment of tree stand volume growth, growth rates are slowing, and tree crowns are showing signs of maturity or old age (flat, wide tops with slow main leader growth). This stage may have moderate amounts of tree decay, but little mortality, and few snags or pieces of down woody material.

2. *Late Seral, Multi-Story* -- the initial seral trees and canopy layer have lost control of the site. Disturbance or the natural mortality of age has produced holes in the upper canopy; shade tolerant understory vegetation and trees are increasing in crown volume; and shade tolerant understory tree species are growing towards the main canopy, and may have occupied part of it. Two or more canopy layers are obvious, the canopy may be irregular, and broken tops, bole rot, snags, and large down woody debris may be common. The stand may have small openings dominated by shrubs or understory forbs. Although there may be some very large or old individual trees, stand average diameter and age may be either greater or less than in the previous Late Seral, Single-Story stage. There is often great variation in average tree diameter.

3. *Near Climax* -- this stage is dominated by shade tolerant (possibly climax) tree species that captured the site after the initial seral stand has been largely replaced. A few remnant shade intolerant, early seral trees may persist, but they represent a small part of total live canopy. Depending upon overstory structure, there may be great variation in understory characteristics and tree diameter distributions. If the shade tolerant tree species are relatively short lived (such as subalpine fire), or only moderately long lived (such as grand fir), the canopy will be multi-storied, and contain significant numbers of snags and down woody debris. If the shade tolerant tree species is very long lived (such as cedar), there may be 1 dominant canopy layer, with relatively few snags or pieces of down woody debris.

The above 3 stages are generalities useful for explaining why an individual old growth stand may be expected to have, or not have, various structural characteristics sometimes identified with old growth in forest ecology literature. Individual old growth stands may combine various elements of the above 3 stages, or may have some other unique characteristics as the result of particular site and stand history.

The plot data base was stratified by habitat type groups and forest cover types. The forest cover type was assigned to the tree species with plurality of basal area for trees equal to or greater than 9" dbh. Data from these plots on numbers of trees by 4" diameter size class, basal area, layers, snags, decay, broken tops, age, and crown ratio were graphed in various combinations, analyzed in frequency diagrams, and displayed in tables. Interdisciplinary team members from the zone committees and Forests then reviewed the output and identified minimum screening criteria for old growth for each habitat type group and forest cover type by Forest. Zone committees then met and grouped this data into minimum criteria for screening stands for old growth.

The minimum screening criteria can be used to identify stands that may meet the old growth type descriptions. Type descriptions are presented in a later section of this report. The screening criteria are presented in tables 1, 2, and 3 for the north Idaho, western Montana, and Eastern Montana zones respectively. In the tables the column headings are defined as follows:

Old Growth Type - the type is a group of forest cover types that have similar characteristics relative to size, number and age of dominant overstory trees. The forest cover types are identified with the following codes: PP - ponderosa pine; DF - Douglas-fir; L - western larch; LP - lodgepole pine; Y - western yew; GF - grand fir; SAF - Engelmann spruce and subalpine fir; WH - western hemlock; WP - western white pine; MAF - mountain hemlock, alpine larch, and subalpine fir; WBP - whitebark pine; C - western redcedar; PF - limber pine,WSL-combinations of alpine larch, whitebark pine, and limber pine

Habitat Type Group - Habitat types are grouped differently according to geographic zone. The letters identify the zone habitat type groups displayed in Appendix A. Habitat type groups are grouped into larger groups based on similarity of temperature and moisture regimes within each zone.

Minimum Criteria:

Minimum Age of Large Trees - This is the minimum average age for the largest size class for the old growth type.

Number TPA/DBH - Number of live trees per acre equal to or greater than a given dbh level and age. This would be the minimum number of live trees per acre equal to or greater than a set dbh level and age.

Minimum Basal Area - the minimum basal area in square feet for trees equal to or greater than 5" dbh.

Associated Characteristics:

DBH Variation - variation in diameter of trees equal to or greater than 9" dbh. The variation is classed in L = low (+ 0-20%), M = moderate (+ 21-40%), and H = high (+ 41-100%).

Percent Dead/Broken Top - the percent of trees equal to or greater than 9" dbh. with dead or broken tops.

Probability of Down Wood - the probability that abundant down wood $\geq$ 9" diameter will be present. Probabilities are classed into L = low (+ 0-20%), M = moderate (+ 21-40%), and H = high (+ 41-100%).

Percent Decay - the percent of trees equal to or greater than 9" dbh with significant decay.

Tree Canopy Layers - an indication of the number or variation in numbers of tree layers that can be expected. SNGL = single layer; MLT = multiple layers.

Snags $\geq$ 9" - range in number of snags (dead standing trees) $\geq$ 9" diameter.

No. of Samples - this is the number of plots from the plot data base that met the screening criteria and are used in the old growth type descriptions.

TABLE 1 NORTHERN IDAHO ZONE OLD GROWTH TYPE CHARACTERISTICS *(2/05 errata edit)*

DESCRIPTION		MINIMUM CRITERIA			ASSOCIATED CHARACTERISTICS						
OLD GROWTH TYPE	**HABITAT TYPE GROUP**	**MINIMUM AGE OF LARGE TREES**	**MINIMUM NUMBER TPA/DBH**	**MINIMUM BASAL AREA (FT^2/AC)**	**DBH VARIA-TION** 2/	**PERCENT DEAD/ BROKEN TOP** 1/	**PROB-ABILITY OF DOWN WOODY** 2/	**PER-CENT DECAY** 1/	**NUMBER CANOPY LAYERS** 3/	**SNAGS ≥9" DBH** 1/	**NUMBER OF SAMPLES**
1 - PP, DF, L	A,B	150	8 ≥ 21"	40	M	0 - 30	L - M	0-8	SNGL/MLT	0 - 13	815
2 – LP	B,C,D,E,G,H,I,J,K	120	10 ≥ 13"	60	M	0-19	M	2-13	SNGL/MLT	1 - 37	875
3 - Y	C,C1, G1	150	3 ≥ 21"	80	M	7 - 10	H	9-34	SNGL/MLT	5	26
4A - DF, GF, L, SAF, WP, PP	C, C1,D,E	150	10 ≥ 21"	80	M	3 - 28	M	2 –33	SNGL/MLT	7 - 35	2,938
4B - DF,GF, L, WH, WP, PP	F,G,G1,H,I	150	10 ≥ 21"	120 / 80 (4)	M - H	0 - 22	M - H	1- 41	SNGL/MLT	0 - 33	8,069
5 – SAF,MAF	F,G, G1,H,I	150	10 ≥ 17"	80	H	5 - 36	H	5-28	MULTIPLE	6 - 36	4,275
6 – WBP	I, J, K	150	5 ≥ 13"	60 / 40 (5)	M	0 - 17	M	6-17	SNGL/MLT	11 - 42	43
7 – C	F,G,G1	150	10 ≥ 25" (6)	120	M	5 - 36	L - H	6-55	SNGL/MLT	6 - 47	5,865
8 – DF,L, SAF,MAF,WP	J	150	10 ≥ 17"	60	M	1 - 14	M - H	1-15	SNGL/MLT	3 - 40	890
9 – SAF,MAF	K	150	5 ≥ 13"	40	H	21 - 23	M	13-35	MULTI	11 - 13	26

1/ These values are not minimum criteria. They are the range of means for trees ≥9" DBH across plots within forests, forest types, or habitat type groups.

2/ These are not minimum criteria. They are Low, Moderate, and High probabilities of abundant large down woody material or variation in diameters based on stand condition expected to occur most frequently.

3/ Not a minimum criteria. Number of canopy layers can vary within an old growth type with age, relative abundance of different species and successional stage.

4/ In Old Growth Type 4B, 120 ft^2 applies to habitat type groups F, G, and G1, and 80 ft^2 of basal area applies to habitat type groups H & I.

5/ In whitebark pine forest type, 60 ft^2 of basal area applies to habitat type groups I and J, and 40 ft^2 applies to habitat type group K.

6/ In Old Growth Type 7, the 25" minimum DBH only applies to cedar trees; old trees of other species are evaluated with a minimum DBH appropriate for that species on these habitat types (21" for DF, GF, L, WH, WP, PP; and 17" for SAF, MAF)

CORRELATION WITH ADJACENT REGIONS

Old growth types were correlated across regional boundaries with Region 6 (Washington and Oregon) and Region 4 (southern Idaho and Wyoming). Meetings were held with regional representatives on June 11, 1991 in Spokane, Washington and on October 4, 1991 in Missoula, Montana. Most definitions correlated fairly well. Region 6 will use R-1's definitions for seral cover types in eastern Washington and Oregon. A summary of the notes is given in Appendix B.

USE OF OLD GROWTH TYPE DESCRIPTIONS

Forest stand composition and structure is a function of site physical characteristics (soil, climate, topography), the particular history of that site, the characteristics of the species that occupy the site and their interactions, and the physical and biological forces that affect the site during successional development. The rugged, mountainous topography of the Northern Region is overlain with a complex climate produced by the west to east intersection of the pacific Marine climate with the Great Plains Continental climate. There is great annual variation in both temperature and moisture, and there is a large amount of variation from year to year around the long term averages for any given date or month. There is also great variation in type and severity of disturbance mechanisms, both natural and man caused. The result of this variety of forces that shapes individual stands, is a wide variation in the resulting stand structures. No set of generated numbers can capture all the variation that may occur at any given age or stage in forest development.

Because of the great variation in old growth stand structures, no set of numbers can be relied upon to correctly classify every stand. In addition, the uncertainties of sampling and statistics introduce another need for caution in using stand data. The minimum criteria in the "tables of old growth type characteristics" are meant to be used as a screening device to select stands that may be suitable for management as old growth, and the associated characteristics are meant to be used as a guideline to evaluate initially selected stands. They are also meant to serve as a common set of terms for old growth inventories. Most stands that meet minimum criteria will be suitable old growth, but there will also be some stands that meet minimum criteria that will not be suitable old growth, and some old growth may be overlooked**. Do not accept or reject a stand as old growth based on the numbers alone; use the numbers as a guide.**

A stand dominated by trees of the age and size listed under minimum criteria is generally good potential old growth. The number of trees is meant as a guideline for how many trees it takes to produce older stand characteristics, and should not be used as an absolute. The large tree age listed under minimum criteria is meant to define the minimum age which we will consider old growth, but that age is difficult to measure because some of the oldest trees may be too rotten or too large to accurately age. For this and other reasons, although age is the single most valuable guide for determining when a stand is old growth, age is often the least reliable data in an inventory. Tree size generally increases as a tree ages, but stand density and mortality affect tree size. The associated characteristics listed in Table 1 through 3 are meant to be guidelines in evaluating stands. A stand should not be accepted or rejected as old growth simply on the basis of associated characteristics. The predominance of minimum criteria and associated characteristics, rather than a single number, generally will be an excellent guide. Be aware that the associated characteristics of "DBH variation" and "tree canopy layers" were only provided as a descriptor of what was most common in existing inventory data, and should not be used to decide whether a stand is really old growth. Use these numbers and descriptions as guides in applying the basic principle that old growth is a "late stage of stand development" . . . " dominated by old trees and related structural attributes."

Where stand examination data is available, this data may be compared to the old growth minimum criteria in Tables 1 through 3, by habitat type group and forest cover type. Run Code 22 on the Forest Service Region 1 "R1EDIT Menu" (available in all Forest Service Region 1 Data General computers in the R1EDIT Program Package) is designed to extract potential old growth stands from the R1EDIT stand exam data base. Run Code 22 is an interactive program that allows a user to specify a group of habitat types and forest cover types,

and specify the minimum criteria of number of trees, minimum age, and minimum diameter. The program will then return a list of stands from the R1EDIT data base that meets the specified characteristics, and will give some summary data for each stand. A separate Run Code 22 extract will be needed for every combination of habitat types and forest cover types that has unique characteristics.

The minimum criteria are used to determine if a stand is potentially old growth. Where these values are clearly exceeded, a stand will usually be old growth. The associated structural characteristics may be useful in decision making in marginal cases, or in comparing relative resource values when making old growth evaluations.

In a few cases of multi-species stands, the forest cover type automatically assigned by the stand exam system (and stored in the TSMRS database), and the forest type calculated by Run Code 22 may both be misleading when trying to make an old growth determination. Sometimes, a dense understory of smaller and/or younger trees of one species may make up the plurality of basal area, while the big old trees may be composed of different species / species combination. For example, in a multi-species stand, cedar could be 25% of the stand basal area, and still be assigned the forest type, because it has more basal area than any other single species, but another species (or species combination) may make up most of the big old trees. In Northern Idaho, old cedar trees usually have a larger diameter than other species of the same age. For this reason, the minimum diameter for cedar old growth was set larger than for other species on the same habitat type. But, if a minimum DBH for cedar was applied to old trees of a different species, it might lead to inappropriate conclusions about whether or not the stand was old growth.
For this reason, when screening potential old growth stands, forest type needs to be calculated in a way that's relevant to old growth determination. Use the following methodology:

- For all forest types, assign old growth forest type based on the plurality of basal area in trees ≥ 9" only (this was plot data analyzed by the Northern Region Old Growth committees).
- In northern Idaho, if the Forest Type is cedar, use the 25" minimum DBH for the old cedar; but (consistent with rest of Table 1) use a 21" minimum DBH for DF, GF, L, WH, WP, PP; and a 17" minimum DBH for SAF & MAF old trees.

Other forest types may also very occasionally have situations like cedar, with the big old trees being a different species than the forest type. Because this is relatively uncommon with other forest types, it's best dealt with through individual stand assessment when doing project level analysis. When doing fine-scale project level assessments, detailed analysis of stand characteristics, and consideration of the site and landscape considerations discussed below all contribute to the best selection of potential old growth.

In addition to using old growth minimum criteria with the stand exam data base R1EDIT Menu, Run Code 22 for extracting potential old growth stands, additional Run Code 22 extracts with stepped down standards are recommended. These step down runs are useful to extract stands that are either close to being old growth, or are actually old growth, with an inclusion of younger or smaller trees that skews the data. This step down procedure may also identify old growth blocks within larger stands. Step down runs can be done with the minimum criteria backed off slightly (use 1" smaller minimum diameter, or 10 year lower age, or 1-2 fewer trees per acre; possibly do several iterations, each backing down 1 more step).

Because old trees are often rotten and difficult to age, it is recommended that 1 step down version of Run Code 11 be done with a zero age criteria to extract stands where this may be a factor. Careful further evaluation will be needed for any stands extracted with a zero age criteria, since many of these stands will not be old growth.

Where no in-place stand exam data exists, but a site was visited by a professional interdisciplinary team in previous environmental analysis, the notes and determinations of that interdisciplinary team may be used in deciding whether to consider the stand old growth. Be aware that some interdisciplinary teams may have allocated young stands of old growth to meet predetermined acreage targets, and some of their stands may not meet the type descriptions.

These old growth minimum criteria, associated characteristics, and descriptions were developed to apply to individual stands. When applying these standards, 3 things need to be remembered. First, these numbers represent averages and ranges that either existed in the inventories, or were assigned by professional judgment. While they are good guides, they are not absolute. Because of the innumerable combinations of site characteristics and historical factors that can occur, no set of numbers will correctly define every possible situation. The basic concept is that old growth should represent "the late stages of stand development . . . distinguished by old trees and related structural attributes."

The second point is that old growth is valuable for a whole host of resource reasons such as habitat for certain animal and plants, for aesthetics, for spiritual reasons, for environmental protection, for research purposes, for production of unique resources such as very large trees. Unusual natural communities, etc., the resource values associated with potential old growth stands need to be considered in making allocations.

The third point to bear in mind when evaluating old growth is that a stand's landscape position may be as important, or more important than any stand old growth attribute. The landscape is dynamic. We need to do more than draw lines to manage this dynamic system. Consider the size of old growth blocks (large blocks have special importance), their juxtaposition and connectivity with other old growth stands, their topographic position, their shapes, their edge, and their stand structure compared to neighboring stands. Stands are elements in dynamic landscape. We need to have representatives of the full range of natural variation, and manage the landscape mosaic as a whole in order to maintain a healthy and diverse systems.

At the same time, there may be some stands with trees so large or so old that they are unique. We should always maintain a good representation of these very old unique and outstanding stands, because they are irreplaceable within human life spans. Remember to value the truly unique and outstanding, wherever it may be.

OLD GROWTH FOREST TYPE DESCRIPTIONS

NORTH IDAHO ZONE:
Old Growth Type 1
Ponderosa pine, Douglas-fir, Western Larch Forest Types on warm, dry environments

Habitat Type Groups
Ponderosa pine and Douglas-fir habitat types
North Idaho Zone Groups A and B
This type is moderately well represented across all of the 3 National Forests, but is most abundant in the southern part of the North Idaho Zone. This zone includes the Clearwater, Idaho Panhandle and the Nez Perce National Forests.

Forest Types
Douglas-fir and ponderosa pine are major forest types. Western larch is a minor forest type.

Minimum Characteristics
8 trees per acre 21 inches DBH or more
Large trees 150 years old or more
Basal area 40 ft^2 per acre or more
Sample size: 815 Plots

Site Description
This old growth type occupies warm, dry environments on predominantly steep southerly aspects at elevations from 1000 to 6000 feet. It is on north aspects at lowest elevations. Ponderosa pine is the climax dominant on the driest sites and Douglas-fir on moister sites in these groups. Bunchgrass dominated understories are the least productive, typically with relatively low stocking. Habitat types where shrubs dominate the understory can support greater tree stocking. Prior to 1900, cool underburns at intervals of 5 to 25 years promoted open stands, while hotter stand replacing fires occurred at intervals of 150 to more than 300 years.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common during seral stages, or in climax ponderosa pine. Large ponderosa pine dominate ponderosa pine habitat types under seral and climax conditions, and pine is a seral dominant on Douglas-fir habitat types. Douglas-fir may be a seral or climax dominant on Douglas-fir habitat types. Larch is a seral dominant on the more moist Douglas-fir habitat types. This old growth type can maintain old growth characteristics for moderate periods in seral stands and for long periods where ponderosa pine or Douglas-fir are climax on the site.

The average age of the largest trees in this type is 225 years, with a range from 208 to 256. Individual trees may reach an estimated age of 475 years. There are an average of 24 trees per acre 21 inches DBH or more. The range of means across forests and forest types is from 18 to 20 on habitat types with dry bunchgrass understories and 19 to 27 on habitat types with shrub understories. The average basal area is 122 ft^2 per acre on sites with bunchgrass understories. The range is 89 to 124 ft^2. On moister sites with shrub understories, the average basal area is 164 ft^2 per acre and ranges from 147 to 193 ft^2.

The average number of dead standing trees 9 inches or more DBH is 5 with a range of 0 to 13. The average percent of trees 9 inches or more DBH with dead or broken tops is 9 with a range of 0 to 30 in means across forests and forest types. The average percent of trees showing decay is 6, with a range of 0 to 8. The probability of rotten, down log pieces 9 inches or more in diameter is low to moderate. Average litter and duff depth is 1 inch or less.

NORTH IDAHO ZONE:
Old Growth Type Code 2
Lodgepole pine forest type, on cool and cold environments

Habitat Types, Groups, and Geographic Distribution
Douglas-fir, grand fir, western red cedar, mountain hemlock, and subalpine fir habitat types. Subalpine fir and mountain hemlock habitat types with clintonia or menziensia in the understory are best represented.
North Idaho Zone Groups B, C, D, E, G, H, I, J, K
This type is well represented across all of the 3 National Forests in this zone. These Forests include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Lodgepole pine

Minimum Characteristics
10 trees per acre 13 inches DBH or more
Large trees 120 years old or more
Basal area 60 ft^2 per acre or more
Sample size: 875 plots

Site Description
This old growth type occupies cool and cold environments on all aspects at elevations from 2000 to 7000 feet or more. It is in areas of cold air impoundment at lowest elevations. Douglas-fir is the climax dominant on the driest sites, grand fir on cool, moist sites, and subalpine fir on cold moist sites in these groups. Western hemlock and western red cedar are climax on cool sites that are more moist than those that support grand fir. Bluejoint, grouse whortleberry and pinegrass dominated understories are the least productive, typically with relatively low stocking. Habitat types where clintonia, wild ginger, or menziesia dominate the understory are more productive and can support greater tree stocking. Prior to 1900, repeated fires at less than 100 to 150 years favored the occurrence of large stands of nearly pure lodgepole pine. These pure stands are frequently overstocked and potential centers for disease and insect epidemics.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure lodgepole pine. Multiple canopy layers are more common in stands of lodgepole pine and large trees of other seral species, such as Douglas-fir. Large lodgepole pine dominate these several habitat types where cold and frequent fire favor its occurrence as a seral species. This old growth type can maintain old growth characteristics for short periods until it is replaced by late seral or climax species.

The average age of the largest trees in this type is 173 years, with a range from 151 to 194. Individual trees of more long lived species may reach an estimated age of 347 years. There are an average of 81 trees per acre 13 inches DBH or more. The range of means across forests and forest types is from 15 to 64 on Douglas-fir, grand fir, and subalpine fir habitat types with beargrass or grouse whortleberry understories to 192 on moist subalpine fir habitat types with clintonia or menziesia understories. The average basal area is 171 ft^2 per acre. The range is 148 to 215 ft^2. Low basal areas are associated with the drier and colder environments in this old growth type.

The average number of dead standing trees 9 inches or more DBH is 24 with a range of 1 to 37. The average percent of trees 9 inches or more DBH with dead or broken tops is 9 with a range of 0 to 19 in means across forests and forest types. The average percent of trees showing decay is 7, with a range of 2 to 13. The probability of rotten down log pieces 9 inches or more in diameter is moderate. Average litter and duff depth is 1 to 2 inches.

Undescribed Types

Lodgepole pine forest type on very cold or droughty environments have been described in a few plots. Habitat Type Group K is the most harsh of the subalpine fir series. The minimum basal area requirement should be strongly considered here in determining whether there is really a lodgepole old growth stand.

NORTH IDAHO ZONE:
Old Growth Type Code 3
Pacific yew forest type on cool, moderately moist environments

Habitat Types, Groups, and Geographic Distribution
Grand fir habitat type phases with Pacific yew in the understory and grand fir/arrowleaf groundsel North Idaho Zone Groups C, C1, and G1.
This type is generally limited in occurrence to the Nez Perce National Forest in the North Idaho Zone. These Forests also include the Clearwater and Idaho Panhandle, and infrequently it may appear here, usually on a G1 habitat type.

Forest Types
Pacific yew

Minimum Characteristics
3 trees per acre greater than 21 inches DBH
Large trees 150 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 26 plots

Site Description
This old growth type occupies cool, moderately moist bottomlands and toe slopes as low as 2000 feet elevation, and is on moderate to steep uplands in warm protected exposures and ridge-top benches from 4000 to 5800 feet elevation. It seldom occurs in extensive stands. Grand fir is considered to be the climax tree species, but in this old growth type, Pacific yew is dominant. It is more shade tolerant and, in the absence of fire for many years, could dominate larger areas. Protection from frequent fire by topographic or climatic factors is required for the occurrence of this type.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer occurs in climax stands, when Pacific yew forms the only tree layer. Multistoried canopies occur when Pacific yew occurs with taller grand fir, or, less frequently, late seral Engelmann spruce. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees of species other than yew in this type is 205 years, with a range from 195 to 209. Individual trees may reach an estimated age of 326 years. There are an average of 13 trees per acre 21 inches DBH or more. These are usually grand fir. The range of means across forests and forest types is 12 to 14. The average basal area is 205 ft^2 per acre.

The average number of dead standing trees 9 inches or more DBH is 5 per acre. The average percent of trees 9 inches or more DBH with dead or broken tops is 8 with a range of 7 to 10. The average percent of trees showing decay is 26, with a range of 9 to 34. The probability of rotten, down log pieces 9 inches or more in diameter is high. Average litter and duff depth is 2 to 4 inches.

Undescribed Types
Pacific yew forest type on western red cedar habitat types with Pacific yew understories (Habitat Type group G1), may occur, but very infrequently. No data are available for these sites. They are currently expected to meet the minimum characteristics described above.

NORTH IDAHO ZONE:
Old Growth Type Codes 4A and 4B
Douglas-fir, grand fir, western larch, Engelmann spruce/subalpine fir, western hemlock, western white pine, and ponderosa pine forest types on cool, moist environments.

Habitat Types, Groups, and Geographic Distribution
All grand fir, western hemlock habitat types, western red cedar habitat types and the warmer and moister subalpine fir and mountain hemlock habitat types. Western red cedar and western hemlock habitat types with oak fern understories and grand fir with beargrass or twinflower understories are best represented.

Old Growth Type 4A is composed of ponderosa pine, Douglas-fir, grand fir, western larch, subalpine fir/ Engelmann spruce, and western white pine forest types on North Idaho Zone Habitat Type Groups C, C1, D, E (grand fir series).

Old Growth Type 4B is composed of ponderosa pine, Douglas-fir, grand fir, western white pine, and western hemlock forest types on North Idaho Habitat Type Groups F, G, G1, H, I (cedar, hemlock, and moist subalpine fir and mountain hemlock habitat type series).

These types are well represented across all of the 3 National Forests in this zone, but grand fir habitat types are more abundant on the Nez Perce, and cedar and hemlock habitat types are more abundant on the Clearwater and Idaho Panhandle National Forest.

Forest Types
Douglas-fir and grand fir are major forest types. Western larch, ponderosa pine, Engelmann spruce/subalpine fir, western hemlock and western white pine are less well represented.

Minimum Characteristics
10 trees per acre 21 inches DBH or more
Large trees 150 years old or more
Basal area: 80 ft^2 per acre or more for all OG Type 4A, and for Habitat Type Groups H and I on OG Type 4B;
120 ft^2 per acre or more for Habitat Types F, G, and G1 on OG Type 4B
Sample size: OG Type 4A: 2,938 plots;
OG Type 4B: 8,069 plots

Site Description
This old growth type occupies moist and cool environments on all aspects and elevations from 1400 feet along stream bottoms to 7300 feet on sheltered aspects. Grand fir is the climax dominant on the driest sites, and subalpine fir and mountain hemlock on the coldest. Western hemlock and western red cedar are climax on cool sites that are more moist than grand fir climaxes, and warmer than subalpine fir climaxes. Cedar and western hemlock habitat types are the most productive and can support greater tree stocking. Prior to 1900, infrequent stand replacing wildfires favored development of long lived seral and climax stands on cedar and western hemlock sites. Moist mountain hemlock and subalpine fir habitat types also have fire intervals of 200 years or more, and a harsher environment favorable to fewer seral species. More frequent fires in grand fir habitat types favor a greater number of seral species.

Vegetation Characteristics
The following descriptions are for all of Old Growth Types 4A and 4B combined. The range of data values of various associated characteristics for Type 4A or 4B separately are shown in Table 1. Even in their associated characteristics these two subtypes are extremely similar, and they are have identical minimum characteristics (except for basal area). They are separated primarily because the forest types and minimum basal areas differ slightly by habitat type group.

These types may be single or multistoried. A single canopy layer is most common in stands of pure Douglas-fir, larch or ponderosa pine. Multiple canopy layers are more common in late seral stands as

climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant species in both overstory and understory. On cedar and western hemlock habitat types, Douglas-fir, grand fir, and white pine are common seral forest types. Old growth white pine has become increasingly rare due to timber harvest and mortality from blister rust. On grand fir habitat types, Douglas-fir is the most common seral forest type, but grand fir may become established immediately after disturbance on all but the driest sites. Ponderosa pine is a seral species on cedar and grand fir habitat types. Douglas-fir and western larch can occur as seral species on almost all of the habitat type groups in this old growth type. This old growth type can maintain old growth characteristics for moderate periods in forest types of seral species, and for long periods of forest types of climax species in the absence of fire.

The average age of the largest trees in this type is 210 years, with a range from 160 to 264. Individual trees of long lived species like ponderosa pine, western larch, or western red cedar may reach an age of 400 to 700 years. Larch, ponderosa pine or western hemlock forest types have an average age of more than 200 years. There are an average of 27 trees per acre 21 inches DBH or more. The range of means across forests and forest types is from 12 to 53. Ponderosa pine and larch forest types usually support the fewest large trees per acre, averaging 12 to 33. The average basal area is 210 ft^2 per acre. The range is 160 to 270 ft^2. Basal areas in the low part of the range are most often associated with larch and ponderosa pine forest types, and subalpine fir and mountain hemlock habitat type groups (Habitat Type Groups H and I).

The average number of dead standing trees 9 inches or more DBH is 14 with a range of 0 to 35. Variability is highest in the grand fir forest type. White pine forest type average 24 snags per acre because of blister rust mortality. Ponderosa pine forest types average only 7. The average percent of trees 9 inches or more DBH with dead or broken tops is 7 with a range of 0 to 28 in means across forests and forest types. Ponderosa pine and larch forest types are the most variable. The white pine forest type averages only 4 percent dead and broken tops. The average percent of trees showing decay is 12, with a range of 1 to 41. Grand fir, subalpine fir and western hemlock forest types show the greatest decay, and white pine the least. Cedar and western hemlock habitat type groups (F, G, and G1) show the most decay across all forest types. The probability of rotten down log pieces 9 inches or more in diameter is moderate in early seral stands and high in late seral or climax stands. Average litter and duff depth is 1 to 2 inches.

NORTH IDAHO ZONE:
Old Growth Type Code 5
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir forest types on cold, moist environments

Habitat Types, Groups, and Geographic Distribution
Moist subalpine fir and mountain hemlock habitat types, and the colder western hemlock and western red cedar habitat types. Subalpine fir or mountain hemlock habitat types with clintonia or menziesia in the understory are best represented.
North Idaho Zone Groups F, G, H, I
This type is well represented across all of the 3 National Forests in this zone, but is most extensive on cold subalpine fir habitat types (Group I) on the Idaho Panhandle and Clearwater National Forests. This zone includes the Clearwater, Idaho Panhandle and Nez Perce National Forests.

Forest Types
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir

Minimum Characteristics
10 trees per acre 17 inches DBH or more
Large trees 150 years old or more
Basal area 80 ft^2 per acre or more
Sample size: 4275 plots

Site Description
This old growth type occupies moist and cold environments from 4000 feet in frost pocket situations to 7300 feet on sheltered northerly aspects. Subalpine fir and mountain hemlock are the climax dominants on the coldest sites. Mountain hemlock is limited to moist cold sites from the Middle Fork of the Clearwater River and northward. Western hemlock and western red cedar are climax dominants on warmer, lower elevation sites in the northern part of the zone. Cedar and western hemlock habitat types are the most productive and can support greater tree stocking. Prior to 1900, infrequent stand replacing wildfires in moist subalpine fir habitat types at intervals of 100 years or more favored growth of the shade tolerant climax species. Frost tolerant subalpine fir, western hemlock and Engelmann spruce are also important seral species when disturbance creates openings in low lying areas that impound cold air.

Vegetation Characteristics
This type is most often multistoried. A single canopy layer can occur in stands of pure Engelmann spruce in early seral stages. Multiple canopy layers are common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant subalpine fir or mountain hemlock in both overstory and understory. Engelmann spruce is less shade tolerant, but is a common seral associate. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 202 years, with a range from 188 to 220. Subalpine fir and spruce on wet cedar habitat types (Group F) develop rot early and seldom reach ages of more than 190 years. Individual trees of other more long lived species may reach an age of 400 to 500 years. There are an average of 39 trees per acre 17 inches DBH or more. The range of means across forests and forest types is from 34 to 51. The wettest subalpine fir habitat types (Group H) support the most large trees per acre, averaging 42 to 51. The average basal area is 184 ft^2 per acre. The range is 165 to 229 ft^2.

The average number of dead standing trees 9 inches or more DBH is 18 with a range of 6 to 36. Wet subalpine fir habitat types (Group H) average 22 snags per acre. The average percent of trees 9 inches or more DBH with dead or broken tops is 8 with a range of 5 to 36 in means across forests and forest types. Wet subalpine fir habitat types average 22 percent. The average percent of trees showing decay is 12, with a range of 5 to 28. Wet subalpine fir or western red cedar habitat types (Groups H, F) show

the greatest decay, averaging 24 and 27 percent. The probability of rotten down log pieces 9 inches or more in diameter is high. Average litter and duff depth is about 2 inches.

NORTH IDAHO ZONE:
Old Growth Type Code 6
Whitebark pine forest type
on cold environments

Habitat Types, Groups, and Geographic Distribution
Subalpine fir and mountain hemlock habitat types
North Idaho Zone Groups I, J, K
This type is of limited extent on all of the 3 National Forests in this zone, but has been sampled only on the Idaho Panhandle and Nez Perce. These Forests include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Whitebark pine

Minimum Characteristics
5 trees per acre 13 inches DBH or more
Large trees 150 years old or more
Basal area: 60 ft^2 per acre or more for Habitat Type Groups I and J;
40 ft^2 per acre or more for Habitat Type Group K
Sample size: 43 plots

Site Description
This old growth type occupies moist and dry cold upper elevation environments on all aspects at elevations from 5500 to 7600 feet or more. Subalpine fir is the climax dominant on sites too dry to support mountain hemlock. Mountain hemlock is the climax dominant on cold moist sites from the Middle Fork Clearwater River drainage and northward. Habitat types with menziesia and clintonia dominated understories (Habitat Type group I) are the most productive and can support greater tree stocking. Prior to 1900, repeated fires at intervals of less than 100 to 150 years favored the occurrence of whitebark pine stands. Fire suppression has resulted in conversion of many stands to subalpine fir and mountain pine beetle epidemics have increased fuel loadings to whitebark pine stands with increased potential for higher intensity fires.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure whitebark pine. Multiple canopy layers are more common in stands of whitebark pine and understory trees of more shade tolerant species, like Engelmann spruce or subalpine fir. Large whitebark pine dominate these habitat types where cold and frequent fire favor its occurrence as a seral species. This old growth type can maintain old growth characteristics for short periods until it is replaced by late seral Engelmann spruce or climax subalpine fir or mountain hemlock.

The average age of the largest trees in this type is 276 years, with a range from 183 to 295. Individual trees may reach an estimated age of 500 years. There are an average of 54 trees per acre 13 inches DBH or more. The range of means across forests and forest types is from 32 to 66. Lower values in the range are associated with drier environments (Habitat Type group J). The average basal area is 138 ft^2 per acre. The range is 103 to 170 ft^2. Lower basal areas are associated with drier environments in this old growth type.

The average number of dead standing trees 9 inches or more DBH is 35 with a range of 11 to 42. The average percent of trees 9 inches or more DBH with dead or broken tops is 7 with a range of 0 to 17 in means across forests and forest types. The average percent of trees showing decay is 9, with a range of 6 to 17. The probability of rotten down log pieces 9 inches or more in diameter is moderate. Average litter and duff depth is 1 to 2 inches.

Types Currently Lacking Data

The whitebark pine forest type on harsh, high elevation habitat types (Habitat Type group K) is known to occur, but has not been sampled. This old growth type is expected to be similar to the type described above, but the minimum basal area has been described as 40 ft^2 per acre instead of 60.

NORTH IDAHO ZONE:
Old Growth Type Code 7
Western red cedar forest type on moist environments

Habitat Types, Groups and Geographic Distribution
Western red cedar and western hemlock habitat types. Western red cedar and western hemlock habitat types with oak fern in the understory are best represented, but a variety of cedar and hemlock habitat types are present.
North Idaho Zone Groups F, G, G1
This type is well represented on the Idaho Panhandle and Clearwater National Forests and occurs on the Nez Perce National Forest primarily in the Selway River drainage. Forests in the North Idaho zone include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Western red cedar

Minimum Characteristics
10 trees per acre: 25 inches DBH or more for cedar;
21 inches DBH or more for old DF, GF, L, WH, WP, or PP;
17" inches DBH or more for old SAF or MAF.
Large trees 150 years old or more
Basal area 120 ft^2 per acre or more
Sample size: 5865 plots

Site Description
This old growth type occupies moist environments from 1500 to 5500 feet elevation on all aspects and slope positions that are protected from summer drought. Western hemlock is the climax dominant on sites above about 2500 feet, in areas of adequate summer moisture from the North Fork of the Clearwater River northward. Western red cedar is the climax dominant on sites slightly more prone to summer drought or winter cold. These sites are highly productive and can grow larger trees and support higher basal areas than other habitat types in the North Idaho Zone. Infrequent stand replacing wildfires at more than 200 year intervals favor development of long lived seral and climax stands on these sites.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in stands of pure western hemlock or cedar that can develop rapidly after disturbance on favorable sites. Multiple canopy layers are more common in climax conditions where tree mortality has created openings that have filled with young trees. Large western red cedar may be a seral dominant on western hemlock sites. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The minimum diameter for this type is meant to apply when both the forest type and the actual large old trees are cedar. Because of the way forest type is computed (usually plurality of basal area), the forest type may show as cedar, but in some cases the large old trees may be a different species. In that case, use the minimum criteria appropriate on these habitat types for the species of the large old trees being considered.

The average age of the largest trees in this type is 222 years, with a range from 184 to 261. Individual trees may reach an estimated age of 800 years. There are an average of 24 trees per acre 25 inches DBH or more. The range of means across forests and forest types is from 23 to 37. The average basal area is 285 ft^2 per acre. The range is 268 to 330 ft^2.

The average number of dead standing trees 9 inches or more DBH is 12 with a range of 6 to 47. The greatest variability is in cedar habitat types with Pacific yew in the understory (Habitat Type group G1). The average percent of trees 9 inches or more DBH with dead or broken tops is 6 with a range of 5 to 36 in means across forests and forest types. Percent dead and broken tops is also most variable in cedar habitat types with Pacific yew in the understory, ranging from 10 to 36 percent. The average percent of

trees showing decay is 13, with a range of 6 to 55. Highest incidence of decay is in the cedar habitat types with fern understories or with Pacific yew understories, ranging from 27 to 55 percent. The probability of rotten down log pieces 9 inches or more in diameter ranges from low to high depending upon successional pathways, watershed-scale disturbance history, and topographic position. Average litter and duff depth is about 2 to 3 inches.

NORTH IDAHO ZONE:
Old Growth Type Code 8
Douglas-fir, western larch, Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir, and white pine forest types on cold, moderately dry environments.

Habitat Types, Groups, and Geographic Distribution
Subalpine fir and mountain hemlock habitat types with beargrass, dwarf huckleberry, blue huckleberry, beargrass, grouse whortleberry, or pinegrass understories.
North Idaho Zone Groups J
This type is moderately well represented across all of the 3 National Forests in the North Idaho Zone. These Forests include the Clearwater, Idaho Panhandle and the Nez Perce.

Forest Types
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir, and Douglas-fir are major cover types. Western larch and western white pine are minor cover types.

Minimum Characteristics
10 trees per acre 17 inches DBH or more
Large trees 150 years old or more
Basal Area 60 ft^2 per acre or more
Sample size: 890 plots

Site Description
This old growth type occupies cold and moderately dry environments from 5100 feet in depressions where cold air is impounded to 7300 feet on warm exposures with well drained, coarse textured soils. Mountain hemlock is the climax dominant on cold, slightly moister sites from the Middle Fork Clearwater River drainage and northward. Mountain hemlock sites are slightly more productive. Subalpine fir is the climax dominant sites too dry to support mountain hemlock. Prior to 1900, repeated fires at intervals of 100 to 200 years favored the occurrence of stands of nearly pure Douglas-fir, western larch, or white pine. Subalpine fir or mountain hemlock may rapidly reestablish on mountain hemlock sites if seed is available.

Vegetation Characteristics
This type may be single or multistoried. A single canopy layer is most common in seral stands of Douglas-fir, larch or white pine. Multiple canopy layers are more common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant species in both overstory and understory. Douglas-fir, larch, and Engelmann spruce are seral on subalpine fir habitat types. Subalpine fir is the most common seral species on mountain hemlock sites, but Engelmann spruce, Douglas-fir, larch, and white pine may also occur. Douglas-fir, larch, and white pine forest types can maintain old growth characteristics for moderate periods until they are replaced by late seral Engelmann spruce or climax subalpine fir or mountain hemlock. Subalpine fir and Engelmann spruce forest types can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 201 years, with a range from 164 to 275. Individual trees of more long lived species may reach an age of 400 to 500 years. Larch forest type has an average age of 226 to 237 years. There are an average of 34 trees per acre 17 inches DBH or more. The range of means across forests and forest types is from 13 to 54. The white pine forest type is most variable because of stand openings created by blister rust mortality. The average basal area is 186 ft^2 per acre. The range is 128 to 216 ft^2. The white pine forest type is highly variable.

The average number of dead standing trees 9 inches or more DBH is 23 with a range of 3 to 40. The larch forest type usually has the fewest snags (3 to 10 per acre) and the white pine forest type the most (34 to 40). The average percent of trees 9 inches or more DBH with dead or broken tops is 8 with a range of 1 to 14 in means across forests and forest types. The average percent of trees showing decay is 12, with a range of 1 to 15. The Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir forest types have the highest incidence of decay, but all are highly variable. The probability of rotten,

down log pieces 9 inches or more in diameter is moderate in Douglas-fir, larch and white pine forest types and high in Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir forest types.

NORTH IDAHO ZONE:
Old Growth Type Code 9
Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir forest types on very cold, harsh environments.

Habitat Types, Groups, and Geographic Distribution
Subalpine fir and mountain hemlock habitat types with woodrush understories, alpine larch/subalpine fir and whitebark pine/subalpine fir habitat types
North Idaho Zone Group K
This type is limited to the highest elevation areas of the 3 National Forests in the North Idaho Zone, but has been sampled only on the Clearwater and Idaho Panhandle National Forests. This zone includes the Clearwater, Idaho Panhandle, and Nez Perce National Forests.

Forest Types
Engelmann spruce/subalpine fir, mountain hemlock/subalpine fir

Minimum Characteristics
5 trees per acre 13 inches DBH or more
Large trees 150 years old or more
Basal Area 40 ft^2 per acre or more
Sample size: 26 plots

Site Description
This old growth type occupies very cold and severe climates at elevations of 6000 feet in the north part of the zone to 8000 feet in the south. Snowpacks remain long into summer and trees grow deformed by snow and wind. Subalpine fir is the climax dominant on sites too dry to support mountain hemlock and at lower elevations than alpine larch and whitebark pine. Mountain hemlock is limited to moist cold sites from the Middle Fork of the Clearwater River and northward. Alpine larch/subalpine fir are incidental habitat types on the highest peaks of the Bitterroot Mountains. Whitebark pine/subalpine fir habitat types are a mosaic of timberline sites with more wind and higher snowpacks than subalpine fir habitat types. Fire suppression since 1900 has resulted in the conversion of many stands once dominated by seral whitebark pine to Engelmann spruce/subalpine fir and mountain hemlock/subalpine fir.

Vegetation Characteristics
This type is most often multistoried and trees tend to grow in clusters. A single canopy layer can occur in stands of pure Engelmann spruce, mountain hemlock or subalpine fir in early seral stages. Multiple canopy layers are common in late seral stands as climax tree species grow up beneath a seral overstory, or in climax stands with shade tolerant subalpine fir or mountain hemlock in both overstory and understory. Subalpine fir is a climax dominant on subalpine fir habitat types and seral on mountain hemlock. It usually grows in close association with whitebark pine and alpine larch on those habitat types. Mountain hemlock is climax on mountain hemlock habitat types and may rapidly reestablish on these sites after disturbance. Engelmann spruce is less shade tolerant, but is a common seral associate. This old growth type can maintain old growth characteristics for long periods in the absence of fire.

The average age of the largest trees in this type is 193 years, with a range from 190 to 195. In the limited sample, individual trees seldom reached an age of 300 years. There are an average of 79 trees per acre 13 inches DBH or more. The range of means across forests and forest types is from 77 to 81. The average basal area is 209 ft^2 per acre. The range is 176 to 223 ft^2. The number of large trees per acre and the basal area from the limited sample are higher than expected, and may not reflect the many openings in stands of this old growth type.

The average number of dead standing trees 9 inches or more DBH is 11 with a range of 11 to 13. The average percent of trees 9 inches or more DBH with dead or broken tops is 22 with a range of 21 to 23 in means across forests. This high amount of dead and broken tops is associated with snow and wind damage. The average percent of trees showing decay is 28, with a range of 13 to 35. The probability of

rotten, down log pieces 9 inches or more in diameter is moderate. Average litter and duff depth is 1 to 2 inches.

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APPENDIX: Habitat Type Groups for Northern Idaho

Habitat Type Group	Group Code	Alpha Code	Numeric Code
	A	PIPO/AGSP	130
		PIPO/FEID	140
		PIPO/SYAL	170
		PSME/AGSP	210
		PSME/FEID	220
	B	PIPO/PHMA	190
		PSME/PHMA	260
		PSME/PHMA-SMST	263
		PSME/PHMA-PHMA	261
		PSME/SYAL	310
		PSME/VAGL	280
		PSME/VACA	250
		PSME/CARU	320
		PSME/CARU-ARUV	322
		PSME/CARU-CARU	323
		PSME/CAGE	330
		PSME/SPBE	340
	C	ABGR/SETR	529
		ABGR/ASCA	516
		ABGR/ASCA-MEFE	518
		ABGR/ASCA-ASCA	517
		ABGR/CLUN	520
		ABGR/CLUN-MEFE	525
		ABGR/CLUN-PHMA	524
		ABGR/CLUN-CLUN	521
	C1	ABGR/ASCA-TABR	519
		ABGR/CLUN-TABR	526
	D	ABGR/LIBO	590
		ABGR/LIBO-XETE	592
		ABGR/LIBO-LIBO	591
		ABGR/VAGL	515
		ABGR/XETE	510
		ABGR/XETE-COOC	511
		ABGR/XETE-VAGL	512
		ABGR/CLUN-XETE	523
	E	ABGR/PHMA	506
		ABGR/PHMA-COOC	507

Habitat Type Group	Group Code	Alpha Code	Numeric Code
		ABGR/PHMA-PHMA	508
		ABGR/SPBE	505
	F	THPL/OPHO	550
		THPL/ATFI	540
		THPL/ATFI-ADPE	541
		THPL/ATFI-ATFI	542
		THPL/ADPE	560
	G	THPL/GYDR	555
		THPL/ASCA	545
		THPL/ASCA-MEFE	547
		THPL/ASCA-ASCA	546
		THPL/CLUN	530
		THPL/CLUN-MEFE	533
		THPL/CLUN-CLUN	531
		THPL/CLUN-XETE	534
		TSHE/GYDR	565
		TSHE/ASCA	575
		TSHE/ASCA-ARNU	576
		TSHE/ASCA-MEFE	577
		TSHE/ASCA-ASCA	578
		TSHE/CLUN	570
		TSHE/CLUN-ARNU	572
		TSHE/CLUN-MEFE	574
		TSHE/CLUN-CLUN	571
		TSHE/CLUN-XETE	573
	G1	THPL/CLUN-TABR	535
		THPL/ASCA-TABR	548
	H	ABLA/STAM	635
		ABLA/STAM-MEFE	636
		ABLA/STAM-LICA	637
		ABLA/CACA	650
		ABLA/CACA-LEGL	655
		ABLA/CACA-VACA	654
		ABLA/CACA-LICA	652
		ABLA/CACA-CACA	651
		TSME/STAM	675
		TSME/STAM-LUHI	676
		TSME/STAM-MEFE	677
	I	ABLA/CLUN	620

Habitat Type Group	Group Code	Alpha Code	Numeric Code
		ABLA/CLUN-CLUN	621
		ABLA/CLUN-XETE	624
		ABLA/CLUN-MEFE	625
		ABLA/MEFE	670
		ABLA/MEFE-LUHI	672
		ABLA/MEFE-VASC	674
		ABLA/MEFE-COOC	671
		ABLA/MEFE-XETE	673
		TSME/CLUN	685
		TSME/CLUN-MEFE	686
		TSME/CLUN-XETE	687
		TSME/MEFE	680
		TSME/MEFE-LUHI	681
		TSME/MEFE-XETE	682
		TSHE/MEFE	579
	J	ABLA/XETE	690
		ABLA/XETE-LUHI	694
		ABLA/XETE-VASC	692
		ABLA/XETE-COOC	693
		ABLA/XETE-VAGL	691
		ABLA/VAGL	720
		ABLA/CARU	750
		ABLA/VASC	730
		ABLA/VACA	640
		TSME/XETE	710
		TSME/XETE-LUHI	711
		TSME/XETE-VASC	713
		TSME/XETE-XETE	712
	K	ABLA-LUHI	830
		TSME/LUHI	840
		PICO/VACA	920
		PICO/XETE	925
		PICO/VASC	940
		LALY-ABLA	860
		PIAL-ABLA	850