APPENDIX C
Old Growth

Appendix C – Old Growth **1**

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Appendix C – Old Growth

Process

Estimates of current old growth and snags on the Forests were completed using the Forest Inventory and Analysis (FIA) data. The following reports document the process used in estimating old growth and results, both forestwide and by Landscape Area on the IPNF or 5th code Hydrologic Unit (HUC) on the KNF. See the reports included in this appendix. Also included is a report explaining recent modifications to the modeling of old growth with FIA data. These modifications resulted in a change to the old growth percentage reported in the IPNF 2004 Forest Plan Monitoring and Evaluation Report.

In addition to (but separate from) the FIA data for old growth, both Forests have stand-level maps of old growth. These maps are for project-level delineation and management of old growth. They represent a spatial depiction of stands that are either old growth or being managed to eventually become old growth. They contain the attributes of being either old growth or future old growth. The collection and use of this data is documented in the Forest Plan Monitoring and Evaluation Reports. This data on existing old growth was used in conjunction with the VMap data in developing the existing vegetation layer for analyses for the forest plan revision.

See Appendix G for more information on FIA and the existing vegetation data used in the forest plan revision.

Estimates of Old Growth Percentages and Snag Density on the Idaho Panhandle National Forest

Renate Bush 1
Renee Lundberg2
April 11, 2006

This analysis was done using Forest Inventory and Analysis (FIA) data. See Application of Forest Inventory and Analysis (FIA) Data to Estimate Amount of Old Growth Forest and Snag Density in the Northern Region of the National Forest System for an overview of FIA inventory and why this data is appropriate to use for broad-level estimates of old growth and snags. The following are estimates of old-growth percentages and snag density for the Idaho Panhandle National Forest (IPNF) as a whole, as well as by landscape analysis areas delineated at three progressively finer-nested spatial scales defined by the IPNF National Forest. All plots that had forested 3 conditions located on the IPNF were used to derive these estimates. Those FIA plots in which wildfire or harvest have occurred since the date of inventory (June 2000 through October 2002) through the year 2003 were coded to not meet the old-growth definition or contribute to snag densities. This results in conservative estimates as not all wildfire and harvest activities remove all old growth and snags on the landscape. Because forest characteristics change over time, FIA is continuously updated on a 10-year refreshment cycle, with 10% of the plots re-measured each year.

Percent and Distribution of Old Growth on the Idaho Panhandle National Forest

Region One's old-growth definition[4] was used in the analysis, namely Table 1, Northern Idaho Zone Old Growth Type Characteristics, columns 1-5. "…Numerous definitions for old growth forests all tend to focus on age, size and successional stage of overstory trees" (Foster et al. 1996)[5]. The four attributes identified by Foster et al. are consistent with the four important attributes in Region One's old-growth definition, i.e., *minimum age, diameter, and trees per acre (TPA) over minimum age and diameter, and minimum basal area.* All four of these criteria are used as required attributes to define old growth. Moreover, Foster et al., in agreement Spies and

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[1] USDA Forest Service, Region 1, Forest and Range Management, 200 E Broadway, Missoula, MT, 59802.

[2] Forester, USDA Forest Service, Forest and Range Management, 200 E. Broadway, Missoula, MT, 59802.

[3] "..land at least 10 percent stocked, or currently nonstocked but formerly having such stocking, with timber and/or woodland trees, and where human activity on the site does not preclude natural succession of the forest (i.e., the site will be naturally or artificially regenerated)." *Interior West Forest Land Resource Inventory Field Procedures, 1995-1996.*

[4] Green, P.; J. Joy; D. Sirucek; W. Hann; A. Zack; and B. Naumann. 1992 errata corrected 2/05. Old Growth Forest Types of the Northern Region. Missoula, MT. United States Department of Agriculture, Forest Service, Northern Region. 60 p.

[5] Foster,D.R.,D.A. Orwig, and J.S. McLachlan. 1996.Ecological and conservation insights from reconstructive studies of temperate old-growth forests. Trends in Ecology and Evolution. 11:419-424, Harvard Forest, Harvard University, Petersham, Ma.

Franklin (1996)[6], suggest an old-growth ecosystem is distinguished by old trees but is not necessarily in the late successional condition nor free of evidence of human activities." A variety of additional "associated characteristics" have been identified in the 1992 Green et al. paper that can be very useful in determining the quality of old-growth communities for some specific purposes when developing a fine-scale management approach.

Estimated percentage of old growth on all forested lands on the IPNF is 11.8% with a 90% confidence interval of 9.5% to 14.0%. Note: all estimates of the proportion of old growth are rounded down to the nearest 0.1%.

Estimates of percentage of Old Growth by Zones and associated 90% confidence intervals are as follows:

Zone	Standard Error	90% Confidence Interval Lower Bound	Estimate of Percent Old Growth	90% Confidence Interval Upper Bound	Total Number PSUs	Number Forested PSUs
Central Zone	2.2	5.4%	9.2%	12.7%	116	115
North Zone	2.1	10.0%	13.4%	17.1%	181	167
South Zone	2.5	7.8%	12.0%	16.4%	116	115

Estimates of percentage Old Growth by IPNF Geographic Areas and associated 90% confidence intervals are as follows:

IPNF Geographic Areas	Standard Error	90% Confidence Interval Lower Bound	Estimate of Percent Old Growth	90% Confidence Interval Upper Bound	Total Number PSUs	Number Forested PSUs
Coeur d'Alene	2.2	5.4%	9.2%	12.7%	116	115
St. Joe	2.5	7.9%	12.0%	16.5%	116	115
Sandpoint / Pend Oreille	3.7	5.3%	11.1%	17.6%	54	47
Bonners Ferry / Kootenai	3.5	10.2%	15.9%	21.9%	68	66
Priest Lake	3.9	6.3%	12.5%	19.3%	59	54

[6] Spies,T.A. and Franklin, J.F. (1996) The diversity and management of old growth forests, in Biodiversity in Managed Landscapes (Szaro,R. and Johnston, D., eds) pp.235-248, Cambridge University Press

Estimates of percentage Old Growth by IPNF Landscape Areas and associated 90% confidence intervals are as follows:

IPNF Landscape Areas	Standard Error	90% Confidence Interval Lower Bound	Estimate of Percent Old Growth	90% Confidence Interval Upper Bound	Total Num PSUs	Number Forested PSUs
Priest Lake South	3.8	1.1%	6.8%	13.6%	32	29
Priest Lake North	7.1	7.8%	19.0%	31.4%	27	25
Selkirks	5.2	10.7%	18.9%	27.7%	35	33
Purcell / Boulder	4.8	5.4%	12.8%	21.2%	33	33
Cabinet / Scotchman	5.2	3.9%	11.9%	20.8%	21	21
Pend Oreille	5.3	2.5%	10.5%	20.0%	33	26
Lakeface / Lower CdA	4.4	1.5%	8.0%	15.9%	28	28
Little North Fork CdA	4.8	1.5%	8.7%	17.5%	20	20
Upper Coeur d' Alene	1.8	0.0%	2.0%	5.5%	25	25
Central North Fork CdA	4.8	6.6%	14.4%	22.0%	43	42
Little N. Fk. Clearwater	7.5	10.0%	21.8%	35.0%	24	24
St. Maries/Lower St. Joe	3.6	0.0%	4.3%	11.3%	19	19
West Central St. Joe	2.7	0.0%	2.6%	8.0%	29	28
East Central St. Joe	7.5	8.7%	20.4%	33.6%	22	22
Upper St. Joe	5.2	3.5%	11.3%	20.6%	22	22

Density and Distribution of Snags on the Idaho Panhandle National Forest

The estimated average number of snags per acre on all forested lands on the IPNF with diameter at breast height (dbh) between 10.0" and 19.9" is 10.4 snags with a 90% confidence interval of 9.2 to 11.8 snags per acre. The average number of snags per acre with dbh 20" and larger is 1.4 snag per acre with a 90% confidence interval of 1.2 to 1.8 snags per acre. Note: all estimates of snags per acre are rounded down to the nearest 0.1%.

Estimates of the number of snags per acre by IPNF Zone and diameter class and associated 90% confidence interval:

IPNF Zone	**10.0" – 19.9" DBH**				**20.0" plus DBH**				Total # PSUs	# Forested PSUs
	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound		
Central	1.399	8.3	10.7	13	0.297	1	1.4	2	116	115
North	1.355	10.7	12.9	15.1	0.288	1.3	1.9	2.2	181	167
South	1.061	5.3	7	8.9	0.244	0.8	1	1.6	116	115

Estimates of the number of snags per acre by IPNF Geographic Area and diameter class and associated 90% confidence interval:

IPNF Geographic Areas	**10.0" – 19.9" DBH**				**20.0" plus DBH**				Total # PSUs	# Forested PSUs
	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound		
Coeur d'Alene	1.396	8.3	10.7	13	0.298	1	1.4	2	116	115
St. Joe	1.056	5.4	7	8.9	0.244	0.8	1	1.6	116	115
Sandpoint / Pend Oreille	3.214	10.8	15.7	21.2	0.522	1.1	2	2.9	54	47
Bonners Ferry / Kootenai	1.548	7.4	9.9	12.6	0.492	0.8	1.6	2.3	68	66
Priest Lake	2.388	10	13.9	17.9	0.468	1.2	2	2.9	59	54

Estimates of the number of snags per acre by IPNF Landscape Area and diameter class and associated 90% confidence interval:

IPNF Landscape Areas	10.0" – 19.9" DBH				20.0" plus DBH				Total # PSUs	# Forested PSUs
	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound		
Priest Lake South	3.841	8	13.9	20.4	0.403	0.8	1.3	2	32	29
Priest Lake North	2.755	9.4	13.8	18.6	0.874	1.4	2.8	4.2	27	25
Selkirks	2.033	6.8	9.9	13.3	0.554	0.1	1	2	35	33
Purcell / Boulder	2.359	6.2	9.9	14	0.819	0.9	2	3.4	33	33
Cabinet / Scotchman	4.393	6.8	13.1	21	0.704	0.4	1.3	2.7	21	21
Pend Oreille	4.691	10.7	17.9	26	0.758	1.3	2.4	3.8	33	26
Lakeface / Lower CdA	3.503	5.8	11	17.1	0.426	0.8	1.3	2.1	28	28
Little North Fork CdA	2.72	7.8	12	16.8	0.746	0.7	1.7	3	20	20
Upper Coeur d' Alene	2.878	4.6	9	14	0.242	0.2	0.6	1	25	25
Central North Fork CdA	2.288	7.1	10.8	14.7	0.665	1	2	3	43	42
Little N. Fk. Clearwater	1.809	2.8	5.6	8.7	0.535	0.7	1.5	2.4	24	24
St. Maries/ Lwr. St. Joe	1.969	3.2	6.3	9.7	1.046	0.6	2	4	19	19

IPNF Landscape Areas	10.0” – 19.9” DBH				20.0” plus DBH				Total # PSUs	# Forested PSUs
	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound		
West Central St. Joe	1.84	2	4.6	7.9	0.351	0.2	0.8	1.3	29	28
East Central St. Joe	2.738	6	10.3	15	0.484	0.2	1	1.9	22	22
Upper St. Joe	3.311	4.3	9.2	15.2	0.203	0.1	0.4	0.8	22	22

Estimates of Percentage of Old Growth and Snag Density on the Kootenai National Forest

Renate Bush [7]
Renee Lundberg[8]
March 15, 2006

This analysis was done using Forest Inventory and Analysis (FIA) data, see *Application of Forest Inventory and Analysis (FIA) Data to Estimate Amount of Old Growth Forest and Snag Density in the Northern Region of the National Forest System* for an overview of FIA inventory and why this data is appropriate to use for broad-level estimates of old growth and snags. The following are estimates of old growth percentages and snag density for the Kootenai National Forest by as well as by 5th Hydrologic Unit Code (HUC). All forested[9] plots that were located on the Kootenai National Forest were used to derive these estimates. Those FIA plots in which wildfire or harvest have occurred since the date of inventory (June1993 though July1995) through the year 2003 were coded to not meet the old growth definition or contribute to snag densities. This results in conservative estimates as not all wildfire and harvest activities remove all old growth and snags on the landscape. Because forest characteristics change over time, FIA is continuously updated on a 10-year refreshment cycle, with 10% of the plots remeasured each year.

Percentage of Old Growth on the Kootenai National Forest

Region One's old growth definition[10] was used in the analysis namely Table 2, Western Montana Zone Old Growth Type Characteristics, columns 1-5. "…Numerous definitions for old growth forests all tend to focus on age, size and successional stage of overstory trees" (Foster et al. 1996)[11]. The four attributes identified by Foster et al. are consistent with the four important attributes in Region One's old growth definition, i.e., *minimum age, diameter, and trees per acre (TPA) over minimum age and diameter, and minimum basal area.* All four of these criteria are used as required attributes to define old growth. Moreover, Foster et al., in agreement Spies and Franklin (1996)[12], suggest an old growth ecosystem is distinguished by old trees but is not

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[7] USDA Forest Service, Region 1, Forest and Range Management, 200 E Broadway, Missoula, MT, 59802.

[8] Forester, USDA Forest Service, Forest and Range Management, 200 E. Broadway, Missoula, MT, 59802.

[9] "..land at least 10 percent stocked, or currently nonstocked but formerly having such stocking, with timber and/or woodland trees, and where human activity on the site does not preclude natural succession of the forest (i.e., the site will be naturally or artificially regenerated)." *Interior West Forest Land Resource Inventory Field Procedures, 1995-1996.*

[10] Green, P.; J. Joy; D. Sirucek; W. Hann; A. Zack; and B. Naumann. 1992 errata corrected 2/05. Old Growth Forest Types of the Northern Region. Missoula, MT. United States Department of Agriculture, Forest Service, Northern Region. 60 p.

[11] Foster,D.R.,D.A. Orwig, and J.S. McLachlan. 1996.Ecological and conservation

insights from reconstructive studies of temperate old-growth forests. Trends in Ecology and Evolution. 11:419-424, Harvard Forest, Harvard University, Petersham, Ma.

[12] Spies,T.A. and Franklin, J.F. (1996) The diversity and management of old growth forests, in Biodiversity in Managed Landscapes (Szaro,R. and Johnston, D., eds) pp.235-248, Cambridge University Press

necessarily in the late successional condition nor free of evidence of human activities." A variety of additional "associated characteristics" have been identified in the 1992 Green et al. paper that can be very useful in determining the quality of Old Growth communities for some specific purposes when developing a fine scale management approach.

Estimated percentage of Old Growth on all forested lands on the Kootenai National Forest is 8.8% with a 90% confidence interval of 6.9% to 10.6%.

Estimates of percentage of Old Growth by 5th Code HUC:

5th Code HUC	Standard Error	90% Confidence Interval Lower Bound	Percent Old Growth	90% Confidence Interval Upper Bound	Total Num PSUs	Num Forested PSUs
1701010101	10.5	0.0%	19.0%	38.0%	3	3
1701010102	4.3	2.8%	9.5%	17.1%	21	21
1701010103	5.6	0.0%	6.3%	16.8%	10	9
1701010104	8.5	0.0%	12.5%	27.7%	19	16
1701010105	1.5	0.0%	1.0%	4.2%	13	13
1701010106	4.8	3.2%	10.5%	19.0%	19	19
1701010107	3.9	3.0%	8.9%	15.9%	27	24
1701010108	.6	3.5%	12.7%	23.6%	20	17
1701010109	2.5	0.0%	1.7%	7.1%	8	8
1701010110	5.7	0.0%	8.3%	18.5%	13	12
1701010111	3.3	0.0%	4.9%	11.1%	15	15
1701010112	5.5	4.9%	13.4%	23.2%	19	17
1701010201	11.9	0.0%	16.6%	38.0%	6	6
1701010202	14.8	0.0%	17.6%	44.0%	6	6
1701010203	7.8	0.0%	11.9%	26.1%	12	12
1701010204	8.1	0.0%	14.2%	28.5%	12	12
1701010301	4.8	1.1%	8.1%	16.9%	23	21
1701010302	2.3	0.0%	3.5%	7.8%	22	22
1701010303	5.1	0.0%	7.1%	16.4%	18	18
1701010401	1.2	0.0%	19.9%	40.4%	6	5
1701021001	1.6	0.0%	26.1%	53.6%	6	6
1701021301	.0	0.0%	0.0%	0.0%	2	2
1701021307	7.2	0.0%	7.1%	20.6%	12	12
1701021308	.5	0.0%	5.6%	15.0%	10	10
1701021309	15.6	0.0%	20.0%	40.0%	1	1
1701021310	4.1	0.0%	5.2%	12.9%	20	19
1701021311	4.6	0.0%	6.8%	15.2%	14	13
1701021313	1.7	0.0%	1.2%	4.8%	13	13

Density and Distribution of Snags on the Kootenai National Forest

The estimated average number of snags per acre with diameter at breast height (dbh) between 10.0” and 19.9” is 10.0 snags with a 90% confidence interval of 8.3 to 11.7 snags per acre. The average number of snags per acre with dbh 20” and larger is 1.0 snag per acre with a 90% confidence interval of .8 to 1.2 snags per acre.

Estimates of the number of snags per acre by 5th Code HUC and diameter class and associated confidence intervals follow.

5th code HUC	10.0” – 19.9” DBH				20.0” plus DBH				Total # PSUs	# Forested PSUs
	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound	Standard Error	90% CI Lower Bound	Estimate of Snags / Acre	90% CI Upper Bound		
1701010101	11.187	2.8	21.7	40.6	5.228	0	5.1	15.1	3	3
1701010102	3.098	2.8	7.2	12.8	0.191	0	0.2	0.7	21	21
1701010103	3.865	4.1	10	16.8	0.648	0	0.9	2	10	9
1701010104	4.721	0.9	7.7	16.1	0.387	0	0.4	1.2	19	16
1701010105	6.059	0	9.1	19.9	0	0	0.0	0	13	13
1701010106	4.576	2.6	9.4	17.6	0.324	0	0.4	1	19	19
1701010107	4.707	6	12.9	21.2	0.275	0	0.4	1	27	24
1701010108	1.777	1	3.7	6.8	1.887	0.1	2.6	6	20	17
1701010109	3.786	0	5.9	12.4	0.656	0	0.7	1.9	8	8
1701010110	7.425	5.8	16.8	29.9	1.107	0	1.1	3.2	13	12
1701010111	7.176	5.8	16	28.9	1.129	0.3	2.1	4	15	15
1701010112	5.525	8.6	17	26.6	0.652	0.2	1.1	2.3	19	17
1701010201	7.164	0	8.3	21.6	0.917	0	1.0	2.8	6	6
1701010202	7.148	0	9.4	22.3	1.73	0	2.4	5.6	6	6
1701010203	2.893	2	6.3	11.3	0.775	0	1.1	2.6	12	12
1701010204	4.324	2.2	8.1	16	0.482	0	0.8	1.7	12	12
1701010301	3.885	4.2	10.1	17	0.637	0	0.8	2	23	21
1701010302	2.153	2.4	5.8	9.6	0.284	0.1	0.6	1	22	22
1701010303	6.776	4.6	14	26.1	0.979	0.8	2.1	4	18	18
1701010401	24.945	0	29.7	74.4	0	0	0.0	0	6	5
1701021001	4.404	0	5.1	13.1	0.894	0	1.3	3	6	6
1701021301	11.032	4.7	18.4	39.8	1.447	0	1.1	4.7	2	2
1701021307	3.708	1	6	12.9	1.232	0.4	2.2	4.4	12	12
1701021308	4.002	3.4	9.6	16.6	0	0	0.0	0	10	10
1701021309	0	0	0	0	0	0	0.0	0	1	1
1701021310	2.34	2.6	6	10.2	0.385	0	0.6	1.2	20	19
1701021311	6.99	5.1	15.2	27.7	0.379	0	0.6	1.2	14	13
1701021313	3.194	1.8	6.4	12.1	0.357	0	0.3	1	13	13

Calculating Years to Grow to Breast Height For Estimating Old Growth Percentages From FIA Data

Art Zack
Doug Berglund
Renate Bush

May 9, 2006

The Northern Region of the Forest Service and the Idaho Panhandle National Forest use the old growth definitions in Old Growth Forest Types of the Northern Region (Green and others. 1992, errata corrected 2/05).[13] These definitions of old growth are based, in part, on the number of trees per acre that meet or exceed a total age threshold.

When using Forest Inventory and Analysis (FIA) data to estimate old growth amounts, we need to be aware that FIA protocols for large trees record "breast height age", which is actually the annual growth ring count at breast height (4.5 feet above ground level). This is not the same as total age for the tree. Conifer trees in these ecosystems always take a number of years to grow up to breast height (4.5' tall). Therefore, to obtain the total age of a tree (which is the criteria in the old growth definition) the annual ring count at breast height must have a factor added to account for the number of years it takes a tree to grow to breast height.

Initial Estimates of Years For a Tree to Grow to 4.5' Tall

In 2005, a Northern Region analysis team gathered approximately 122,000 records of trees from the FSVeg database that were inventoried over the last 30 years which were between 4 and 5 feet tall and had an age recorded. The goal was to produce unbiased and statistically appropriate regression equations for the number of years it takes a tree to grow to 4.5' tall. The analysis team dropped from the analysis the records of those trees least likely to survive to old growth minimum ages (because the trees were already overtopped, or suppressed, or seriously damaged). This left approximately 52,000 tree records (approximately 57% of the initial tree records were dropped). These 52,000 tree data records were used to build models by tree species and National Forest of the number of years it takes a tree to grow to breast height. These regression equations provided an unbiased, statistically appropriate estimate of the number of years a tree takes to reach 4.5 feet tall. This value was added to the FIA ring count at breast height to estimate total tree age. [It should be recognized that overtopped or damaged trees generally tend to grow more slowly. Eliminating slower growing trees from the analysis provides a conservative estimate of years to breast height. [14] The more conservative the estimate, the fewer years will be added to the breast height ring count to calculate total tree age.]

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[13] Green, P.; J. Joy; D. Sirucek; W. Hann; A. Zack; and B. Naumann. 1992 (errata corrected 2/05).Old Growth Forest Types of the Northern Region. Missoula, MT. United States Department of Agriculture, Forest Service, Northern Region. 60 p

[14] For detailed information on the above methodologies *see Estimates of Years to Breast Height for Mature Conifer Tree Species in the Northern Region* available from http://fsweb.r1.fs.fed.us/forest/inv/classify/index.htm.

In July of 2005, the approach described above for total age calculation was incorporated in the Region 1 FIA Summary Database. Later in 2005 the Idaho Panhandle National Forest (IPNF) released its 2004 Forest Plan Monitoring Report. In that report the IPNF used the FIA Summary Database old growth estimates (incorporating the regression-based age calculations described above) to report 12.85% old growth.

More Conservative Estimates of Years For a Tree to Grow to 4.5' Tall

In early 2006 the Northern Region analysis team reconsidered the regression estimates of years to grow to 4.5' tall. Since those estimates were based on averages, it was decided to take an even more conservative approach. First, all shade-intolerant tree species which occurred in intermediate crown classes were dropped from the analysis. These eliminated records were generally slower growing trees, which were dropped because partial shading and slower growth made them somewhat less likely to survive to old growth minimum ages. This second screening left approximately 39,000 tree records out of the 122,000 originally extracted.

The years to breast height for these remaining tree records were then displayed by species, geographic zone, and habitat type group by percentile classes of 5%. (So, for example the 20th percentile trees represent those trees that are growing faster (fewer years to breast height) than the remaining 80% of that population.)

In general, faster growing trees are more vigorous, and have a higher probability of out-competing their neighbors and surviving to an old age. After further data exploration, and consideration of cumulative distribution curves and scientific literature, for purposes of estimating years to grow to breast height for old trees, it was decided to use the 20th percentile. In general, this represents the 20% of the screened population that has grown the fastest (taken the least amount of years) to reach 4.5' tall, and is therefore in the best competitive position to survive to an old age.

This is a very conservative approach because the analysis is based on using the fastest growing trees out of a twice-screened population. The original 122,000 tree records were reduced to 52,000 records by dropping overtopped, suppressed, or damaged trees with reduced probabilities of surviving to old age. The population for analysis was further reduced from 52,000 records to 39,000 records by dropping the shade-intolerant species in intermediate crown classes (which are generally slower growing). The remaining population represents the 32% of the original small trees that are generally growing the fastest and are thus in the best competitive position to survive to old age. The estimated age to breast height is based on the 20% out of this remaining twice-screened population that's growing the fastest (taken the fewest years to reach breast height).

We wanted a conservative estimate to minimize the risk of over-estimating the total age of the tree, and thus overestimating the percent of the FIA plots that met old growth criteria. The more conservative the estimate, the fewer the years added to FIA breast height age. While the estimate of years to breast height based on the 20th percentile value of a twice-screened population is conservative, it's also very robust. Basing our estimates on a sample of over 39,000 trees -- after the data has been thoroughly screened – is using an unusually powerful sample. Furthermore, using the 20th percentile value for this screened population of trees makes the estimate even more conservative, and greatly reduces the risk of overestimating the number of years it takes a tree to grow to 4.5' tall.

In February of 2006, the 20th percentile value approach replaced the regression approach in the R1 FIA Summary Database. Because this additional analysis used an even more conservative

approach to estimate number of years to grow to breast height, fewer years were added to FIA ring counts at breast height, and fewer measured trees met old growth minimum age criteria. As a result of this more conservative approach, the FIA Summary Database estimated old growth percentage for the IPNF has dropped by about 1%. It now stands at approximately 11.8% old growth for the IPNF. This is clearly both a very conservative and statistically robust estimate.