Region One
Vegetation Classification, Mapping, Inventory and Analysis Report

$$\bar{x} = \frac{\sum x}{n}$$

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R1 COMMON STAND EXAM OLD GROWTH PROTOCOLS

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R1 Common Stand Exam Old Growth Protocols

These old growth stand exam protocols meet the basic requirements for a *CSE Quick Plot Exam* as defined in the *Region 1 Common Stand Exam and Inventory and Monitoring Field Guide.* See Section 1.1 for the minimum requirements of attributes that need to be collected on the Setting and Plot Form. See Section 2.13 for a list of the minimum requirements of attributes to collect for the Tree Form of the quick plot exam. If an item is not discussed in this document, record it exactly as specified for a quick plot exam in the R1 CSE/IM Field Guide, if it is required. Attribute tolerances are found in Appendix T in the R1 CSE/IM Field Guide under the quick plot exam level specifications. Contact the R1 Protocol Specialist for an R1 CSE Old Growth Template.

These protocols dictate the minimum attributes to collect in order to assess whether the stand meets old growth criteria as defined in Green et. al, and reported in the R1 Old Growth Report (see *R1 FSVeg Reports and Utilities User's Guide* for more information). Additional attributes can be collected in order to assess associated old growth characteristics. However, Forests should evaluate trade-offs between the amount of data collected per plot and the number of plots that can be examined at a given cost in time and money.

Number of Plots Needed

For calculating the number of plots that need to be installed in order to provide reliable estimates of large-, older-trees, see *R1 Supplement to National FSVeg/CSE User's Guide Chapter 2: Preparation and Design* and the R1 Sampling Spreadsheet (http://fsweb.r1.fs.fed.us/forest/inv/cse_exams/guides.htm). The more variable big, old trees are within the stand, the more plots you'll need to install in order to achieve reliable estimates. It is recommended that you estimate stand variability and calculate the preliminary number of plots needed before work is started. Plots need to be well distributed in an unbiased systematic manner across the entire stand, a grid design for plot locations is preferred to plots installed along a single transect bisecting the stand. See *Region 1 Plot Locator Tool Instructions,* for information about Region 1 software available for locating plots within a polygon.

For Old Growth Quick Plot Exams, generally a 20% Standard Error at the 68% Confidence Level for:

(1) large tree numbers (trees/acre ≥ minimum OG DBH); and/or

(2) old tree numbers (# of trees/acre ≥ minimum OG age) is desired.

Unless you are sampling an exceptionally uniform stand that's well over minimum old growth threshold age, you'll usually need **at least** 7-9 plots/stand. Most true Old Growth stands are NOT very homogenous, and fall in the Medium CV to High CV ranges in the spreadsheet examples. Needing 10-13 plots is not unusual, and some multi-aged, patchy stands may need even more. However, also be aware that some stands are so inherently variable and so close to old growth minimum thresholds that no reasonable number of plots will provide the answer as to whether or not they're old growth, and after collecting a reasonable amount of data, a well-documented judgment call may be required.

Section 2: Setting Form, Quick Plot Exam Level

Record all required attributes for a Quick Plot Exam as per R1 CSE Protocols.

Table 2.1: Setting Data Form required attributes

***** indicate defaults to be set in Exams Template file.

CSE Attribute #	Attribute Name	Value	Comments
2.1	Project Name	OG EXAM _____	Other project name may be used at Forest's discretion.
2.2	Proclaimed Region	01	Default in Exams software template file
2.3*	Proclaimed National Forest		Default in Exams software template file
2.4*	District		Default in Exams software template file
2.5*	Location		Default or create drop-down list in Exams software template file
2.6*	Stand Number		
2.7	Owner	USFS	Default in Exams software template file
2.8*	State		Default in Exams software template file
2.9*	County		Default in Exams software template file
2.10*	Administrative Forest		Default in Exams software template file.
2.11	Date	Exams software automatically fills in this field	
2.12	Photo ID	Not used	
2.13 *	Exam Level	1000 1020	Default in Exams template file. • Tree Form = 1, quick plot exam. • Veg Comp Form = 0, not collected • DWM Form = 0, not collected (setting to 2 indicates Brown's Protocols used to collect DWM so fuel loadings can be assessed. • Surface Cover Form = 0, not collected Exam Level 1020 indicates down-woody material is being collected using Brown's Protocols. Depending upon information needs, the exam level can be modified as additional attributes are collected on the various forms.

CSE Attribute #	Attribute Name	Value	Comments
2.14	Exam Purpose	SE	Note the requirements to meet the SE exam purpose, as explained in section 2.14 of the *R1 CSE/IM Field Guide*. Default in Exams software template file.
2.15	Stratum	Not used.	
2.16	Existing Veg Reference	Not used.	
2.17	Existing Veg Composition Type.	Not used.	
2.18*	Potential Vegetation Reference		Default in Exams software template file.
2.19	Potential Vegetation		Required. Record most prevalent habitat type for the stand to *phase.* Populate after exam has been completed.
2.20	Structure	Not used.	
2.21	Setting Capable Growing Area		Required. See CSE Field Guide.
2.22	Setting Fuel Model	Not used.	
2.23	Setting Elevation		Required. See CSE Field Guide.
2.24	Setting Aspect		Required. See CSE Field Guide. Record most prevalent habitat type for the stand to *phase.* Populate after exam has been completed.
2.25	Setting Slope		Required. See CSE Field Guide. Record most prevalent habitat type for the stand to *phase.* Populate after exam has been completed.
2.26	Setting Slope Position	Not used.	
2.27	Acres		Required. See CSE Field Guide.
2.28	Examiner		Required. See CSE Field Guide.
2.29	Precision Protocol	CSE_Q	Default in Exams software template file.
2.30	Radial Growth Interval	Not used.	

CSE Attribute #	Attribute Name	Value	Comments
2.31	Radial Growth Interval	Not used.	
2.32	Height Growth Interval	Not used.	
2.33	Fuel Photo Reference	Not used.	
2.34	Setting User Code	Not used.	
2.35*	Setting Lat Long Reference Datum	NAD 83	Required for old growth exams. Default in Exams software template file.
2.36	Declination	Not used.	Not needed for stand exams because azimuth of the trees is NOT being recorded. Only used for IM protocols.
2.37	Measurement Number	Not used.	
2.38	Setting Remarks		
2.39	Setting Damage Category	Not used.	
2.40	Setting Damage Agent	Not used.	
2.41	Setting Damage Severity	Not used.	
2.42	Species of Management Interest	Not used.	

Section 3: Sample Design Form

A default sample design for the Tree Form (and DWM Form, if collected) have been set up in the default template file. Figure 3.1 shows two options for sample designs for tree selection.

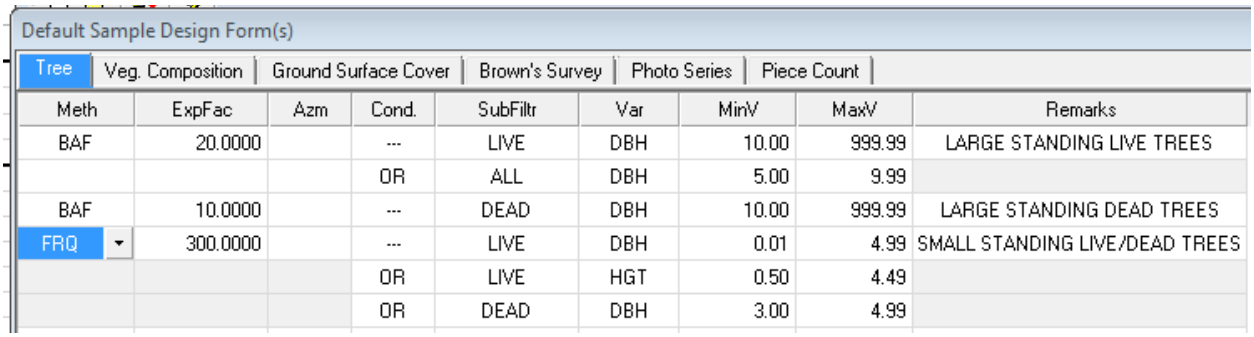
When collecting Old Growth Exams, in every stand, choose a basal area factor appropriate to get a good sample on each plot of the trees in potential old growth diameter classes. (20, 30, or 40 BAF are generally appropriate for these ecosystems. Keep in mind, there is a relationship between the BAF factor and the number of plots that need to be installed. Since smaller BAF factors sample more trees, less plots will generally be required as BAF factors decrease.

After selecting the appropriate BAF factor for the stand, go into the Setting Data/Sample Design Form and change the BAF factor if the default sample design for the Tree Form does not reflect the BAF that is used to sample the stand.

Figure 3.1 Tree Form Sample Design Format examples:

The following sample design for the Tree Form indicates:

- A 20 BAF variable-radius plot for all LIVE trees 5"+ DBH and DEAD trees 5.0-9.9" DBH, a 10 BAF for all DEAD trees 10.0" DBH and larger
    - Trees ≥ 5.0" DBH are tallied individually
- 1/300 acre fixed plot for trees less than 5" DBH
    - Live trees less than 0.5' height and dead trees less than 3.0" DBH are *not* tallied
    - All other trees (live and dead) are tallied
    - A height measurement is required only for trees less than 4.5' tall.
    - Once GST tree requirements are met, live and dead trees less than 5.0" DBH are grouped as described under section 10.7 of the Tree Data Form.



Default Sample Design Form(s)

Tree | Veg. Composition | Ground Surface Cover | Brown's Survey | Photo Series | Piece Count

Meth	ExpFac	Azm	Cond.	SubFiltr	Var	MinV	MaxV	Remarks
BAF	20.0000		---	LIVE	DBH	10.00	999.99	LARGE STANDING LIVE TREES
			OR	ALL	DBH	5.00	9.99	
BAF	10.0000		---	DEAD	DBH	10.00	999.99	LARGE STANDING DEAD TREES
FRQ	300.0000		---	LIVE	DBH	0.01	4.99	SMALL STANDING LIVE/DEAD TREES
			OR	LIVE	HGT	0.50	4.49	
			OR	DEAD	DBH	3.00	4.99	

The following sample design for the Tree Form indicates:

- A 20 BAF variable-radius plot for all trees 5"+ DBH
    - Trees ≥ 5.0" DBH are tallied individually
- 1/300 acre fixed plot for trees less than 5" DBH
    - Live trees less than 0.5' height and dead trees less than 3.0" DBH are *not* tallied
    - All other trees (live and dead) are tallied
    - A height measurement is required for trees with broken/missing tops and trees less than 4.5' tall.
    - Once GST tree requirements are met, live and dead trees less than 5.0" DBH are grouped as described under section 10.7 of the Tree Data Form.

*** Expansion Factor BAF could be 20, 30, or 40 for CSE Old Growth exams, depending on tree size and density. Regardless, of BAF used, it must stay the same for all plots in a stand (setting).

If additional forms are being used, which means the Exam Level of the Vegetation Composition and/or Ground Surface Cover and/or Down-woody material is greater than 0, then the associated sample designs need to be reviewed and updated.

Section 4: Plot Form

Table 4.1 lists the required attributes to collect in the Plot Form. Other attributes may be collected to meet information needs.

Table 4.1: Plot Data Form

CSE Attribute #	Attribute name	Comments
4.1	Plot Number	Use the pre-assigned plot number. If the plot number needs to be edited within Exams software, use the Option button on the Plot Data Form to edit the default plot number.
4.2.1	Plot Latitude	
4.2.2	Plot Longitude	
4.4	Plot Aspect	
4.5	Plot Slope	
4.11	Plot Potential Veg.	

Section 10: Tree Data Form – Quick Plot Exam Level

Record all required fields according to the R1 CSE Field Guide for the Tree Form, Quick Plot Exam Level (Section 10) and note additional specifics listed below. Additional attributes may be collected depending upon information needs.

Table 10.1 Tree form additional attributes/information

CSE Attribute #	Attribute Name	Comments
10.5	Growth Sample Tree	Recorded. Age is the only additional data item collected on GST trees. See additional information below.
10.7	Tree Count	Once GST trees have been collected, trees less than 5.0" DBH are grouped. See additional information below.
10.9	DBH	Required.
10.10	Tree Height	Required for all trees > 4.5 ft tall and for trees with broken or missing tops. Average height recorded for tree groups < 5.0" DBH. See additional information below.
10.15	Tree Age	Required for all GST trees. Age not required on trees < 3.0" DBH. If age is estimated follow protocols in R1 CSE/IM Field Guide under 5.15.3.
10.16	Crown Ratio	Required
10.20	Snag Decay Class	Required. See additional information below.
10.22 10.23 10.25	Damage Category Damage Agent Damage Severity	The following Category, Agent, Severity are reported within the R1 Old Growth Report. • Bark Beetles, Damage Category 11 • Stem Decay, Damage Category 22 • Broken and Missing Tops, Damage Category 99, Agent 1 and 2 This information is used to calculate the number of trees with rot and missing tops. Also, assessments about potential impact of beetle can be done. Record addition damages that may affect the stands old growth characteristics.

CSE Attribute #	Attribute Name	Comments
10.26	Tree Remarks	If age is estimated, then follow protocols in R1 CSE/IM Field Guide in item 5.26. In addition to recording AE1, • record the length, in inches, of the core for which rings were counted and the actual ring count in that core.

10.5 Growth Sample Trees (GST) (*Required)*

Age is the only additional data item collected on GST trees for old growth exams. Age must be recorded for all GST trees. Record code "G" for GST trees.

A **GST tree** is the **first live standing sample tree of each species** encountered on each plot in each of the following diameter classes, moving clockwise from 0 degrees azimuth. In addition, if not already tallied, the largest tree of each species on each plot is also a GST tree. The following Old Growth Exam GST diameter classes, which are different from standard stand exams, will be used for each species on each plot. Note that GST information for trees less than 3.0" in DBH is optional.

Old Growth Exam GST Class		
DBH range	Height Class Range	
<3.0 inches	1 – 4 feet	Optional
	5 – 12 feet	Optional
	≥ 13 feet	Optional
3.0 – 4.9 inches		Required
5.0 – 14.9 inches		Required
15.0 – 24.9 inches		Required
≥ 25.0 inches		Required
Largest tree		Required

If the side of the tree that would normally be selected for increment boring would involve drilling into extensive rot if bored, it is permissible to move around the bole of the tree to obtain a breast height core that avoids the worst of the rot, and thus provides a more accurate age.

If the first GST tree of a given species in a given diameter class obviously has very extensive rot, and there is another relatively sound tree of that species and diameter class, that is also within +/- 2" diameter of the rotten GST tree, and appears from its overall form to be of the same age class, it may be substituted as the GST tree to get a better age estimate. (However, field crews must be extremely cautious to avoid any bias in their GST sample. Be aware that sometimes the cause of the rot may be a

disturbance, and that the trees with rot may actually be an older age class. If you suspect this is the case, do not select an alternate GST Tree, but do the best you can with the first GST tree, and estimate total age if necessary – as outlined in Appendix O of the Handbook.)

10.7 Tree Count

All trees 5.0" DBH and larger (both live and dead) are recorded individually.
Do not tally any live trees less than 0.5' in height or any **dead** trees less than 3.0" DBH.

Grouping trees less than 5.0" DBH:

- For live trees 3.0 - 4.9 inch DBH:
  - Once GST information has been collected, group remaining trees by species. Record the average diameter, height, and crown ratio of the group.
  - Accuracy tolerance of tree count by diameter classes is +/- 2 trees or 20% (whichever is greater).

- For live trees < 3.0" diameter
  - Once GST trees have been identified, group by species and height classes defined below (these are simplified from the Field Guide).
    - If all of the trees of a species cluster closely around a particular height break and are within 1 or 2 feet of that height break it is permissible to consider these as one group and assign an average height for that group (e.g. most trees are between 12' and 14' tall; rather than split into 2 groups, this can be counted as one group, and assign the average diameter and height that fits best).

Height Classes for Grouping Trees less than 3" DBH:

Height Class Range (for sample tree groups)
0.5 – 4.0 feet
5.0 – 12.0 feet
≥ 13.0 feet

- For dead trees 3.0 – 4.9" DBH:
  - Group by species. Record the average diameter of the group.
  - Accuracy tolerance of tree count by diameter classes is +/- 2 trees or 20% (whichever is greater).

10.10 Height

Only required for trees < 4.5 ft tall and trees with broken or missing tops. Average height recorded for trees < 5.0" DBH.

For Old Growth exams, height is optional for trees ≥ 5.0" DBH. **It is not required to record tree height.** If recorded, collect heights on GST trees only (Section 10.5). There are Regional height/DBH tables that will automatically fill this field in if you do not record it, and these table values are reasonable. Precise heights are not a requirement for old growth determination, and gathering height data is time consuming. The same time could be used more productively to gather additional ages, or do additional plots.

10.15 Recording Age for GST trees (by Old Growth GST classes, see item 10.5)

Always include age for the largest tree of each species on each plot. Age is not required for trees less than 3.0" DBH. Recorded ages are actual ring count at breast height.

Estimate age for trees with heart-rot, or hollow centers. If estimating age due to rot or hollow center, record **"AE1"** in Field 10.26, Tree Remarks. Follow the **AE1** code with the length in inches of the core for which rings were counted and the actual ring count in that core. To estimate the breast height age, use the method for age estimates in Appendix O of the Region 1 CSE Field Guide.

Use Quick Plot accuracy standard tolerances for recording age:

- for trees <300 years old, use tolerance of +/- 10%;
- for trees ≥300 years old, the tolerance becomes +/- 15%.

Age is an **important criterion** for determining old growth status. *It is critical to keep increment borers properly sharpened and regularly cleaned.* A dull, chipped, or gummed-up increment borer will not take a useable core. Age estimates are only to be used for rotten or hollow trees, make sure that you have appropriate sized borers for the trees that need to be bored. Age estimates are not acceptable due to improper maintenance of increment borers.

10.20 Snag Decay Class *(Required for dead trees)*

Follow instructions in field Guide Section 5.20. The description table of snag decay classes is simply to create understanding of what characteristics are relevant. Classification is based on the *predominance of characteristics*, since few snags will perfectly match all characteristics in a single class. Do NOT spend a large amount of time on this call. Decay class is generally *determined from a quick visual inspection* and comparison with the pictures in Section 5.20.

Section 7: Down Woody Material

Collecting down-woody material (DWM) for old growth exams is optional. If DWM is collected then set the Exam Level, item 2.13 to 1020. If DWM is collected, all fields listed in chart at the beginning of Section 7, *R1 CSE/IM Field Guide*, required for Brown's Protocols, should be collected. Additionally, if *pieces per acre,* by diameter class, is needed in the R1 Old Growth Report, then Piece Length and Diameter Large End must be collected.

Down-woody Materials Form Additional Attributes / Additional Information		
Item	**Field**	**Remarks**
7.11	Piece Length	Required for all pieces 9.0 inch diameter and larger at point of intersection.
7.12	Diameter Large End	Required for all pieces 9.0 inch diameter and larger at point of intersection.

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