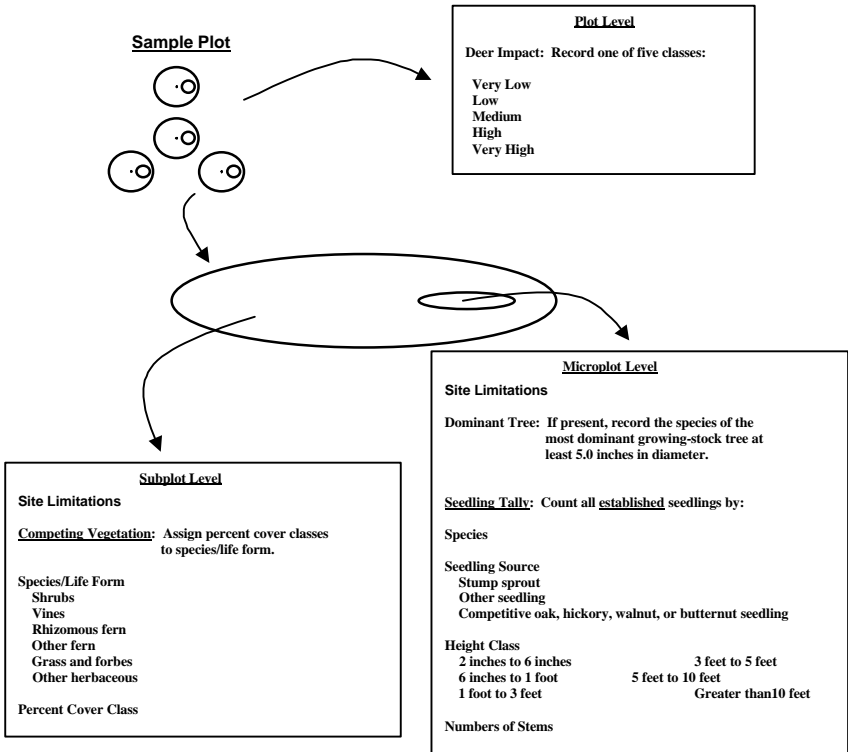


APPENDIX 12 – SPECIAL STUDIES

Field Instructions for Pennsylvania's Regeneration Assessment

Overview -- The regeneration assessment is being conducted in Pennsylvania at the request of the State's forestry community. There is concern that regeneration is lacking in many stands and with over half of the State's forests in a financially mature condition, this is a critically important issue. The regeneration data will provide answers to questions about advance regeneration, post-disturbance regeneration, and future forest composition. The data will be used to quantify regeneration adequacy statewide, provide estimates of numbers of seedlings per acre, and for research into regeneration dynamics. Regeneration plots are selected prior to the field season and are visited during the leaf-on season from June through September.

The figure below summarizes measurements needed for the regeneration assessment. Data are collected at three levels: the entire sample plot, the subplot, and the microplot. **The competing vegetation and regeneration tallies should be completed for all accessible forest land conditions that are encountered.**



PLOT DATA

State, Unit, County, and Plot Number -- Refer to Chapter 3 of this field guide.

Month/Day/Year -- Refer to Chapter 3 of this field guide.

Deer Impact -- Estimate the amount of browsing pressure that deer are exerting on regeneration. Deer impact is a function of deer population and the amount of available food sources within one-square mile surrounding the plot.

Code	Definition
1	Very Low - Plot is inside a well-maintained deer exclosure.
2	Low - No browsing observed, vigorous seedlings present (no deer exclosure present).
3	Medium - Browsing evidence observed but not common, seedlings present.
4	High - Browsing evidence common <u>OR</u> seedlings are rare.
5	Very High - Browsing evidence omnipresent <u>OR</u> forest floor bare, severe browse line.

Degree of deer browsing can be a difficult variable to quantify due to preferences that deer have for various food sources and the elusive nature of deer populations. Although not a complete list of species in Pennsylvania, the following deer preference list may be useful for assigning deer impact:

Species	Browse Preference	Tolerance of Browsing
Black Cherry	L	L
Fern	L	H
Grass & Sedge	L-M	H
Striped Maple	L-M	H
American Beech	M	H
Birches	H	M
Oak	H	M-H
Hickory	H	M-H
Ash	H	M
Rubus spp.	H	M-H
Pin Cherry	H	L
Red Maple	H	L
Sugar Maple	H	L
Yellow-poplar	H	L
Cucumbertree	H	L
Eastern Hemlock	H	L

In addition, a handout showing the Pennsylvania Game Commission's estimates of deer density by county will be provided. Deer densities in excess of 20 deer per square mile of forest are generally considered to inhibit the development of tree seedlings.

SUBPLOT DATA -- Complete the subplot data for all forested conditions.

Subplot Number -- Record the code corresponding to the subplot number.

Condition Class Number -- Record the corresponding condition class number.

Site Limitations -- Record site limitation codes 2 and 3 if they occur on at least 30 percent of the subplot or condition area, else record as code 1.

1	No site limitations
2	Rocky surface with little or no soil
3	Water-saturated soil (during the growing season)

Competing Vegetation -- Assign percent cover classes to species/life forms within the subplot. The sum of the percent cover classes may exceed 100 percent. For subplots with more than one condition, only record percent cover for the portion of the subplot in the condition. For example, if 50 percent of the subplot is in a condition and is entirely covered with *Rubus* spp., record 99 for percent cover class (100 percent cover).

Species/Life Form

	Deciduous Shrubs, all valid NEFIA species codes (see Appendix 4)
	Evergreen Shrubs, all valid NEFIA species codes (see Appendix 4)
	Vines, all valid NEFIA species codes (see Appendix 4)
001	Rhizomous Fern, including Bracken, Hay-scented, and New York
002	Other Fern
003	Grass
004	Other Herbaceous

Percent Cover Class – Assign a cover class to each species or life form.

Code	Definition	Code	Definition
01	1 to 9 percent	50	50 to 59 percent
10	10 to 19 percent	60	60 to 69 percent
20	20 to 29 percent	70	70 to 79 percent
30	30 to 39 percent	80	80 to 89 percent
40	40 to 49 percent	90	90 to 100 percent

As an aid in determining percent cover, consider that one-percent cover of the 24-foot radius subplot is equivalent to a square 4.2 feet on each side or a circle with a radius of 2.4 feet. Ten percent cover is equivalent to a square 13.4 feet on each side or a circle with a radius of 7.6 feet.

MICROPLOT DATA -- Complete the microplot data for microplots within accessible forest land.

Microplot Number -- Record the code corresponding to the microplot number (same as subplot number).

Microplot Center Condition Class -- Record the corresponding condition class number.

Site Limitations -- Record the following site limitation if it dominates the area of the microplot or condition:

1	No site limitation
2	Rocky surface with little or no soil
3	Water-saturated soil (during the growing season)
4	Thick duff layer (in excess of two-inches thick)

Dominant Tree -- Record the presence/absence of at least one growing-stock tree 5.0-inches or larger in diameter at breast height on the microplot or condition by recording species code. If there are no such trees, record as "000." If more than one such tree is present, record the species code of the tree with the largest diameter.

Tree and Seedling Data -- Tally all established seedlings (<1.0-inch DBH) for stems rooted within the microplot by species, seedling source, and height class.

Count all seedlings at least 2-inches tall with at least two normal-sized leaves that do not still bear cotyledons.

For most species encountered, the tug test should be used to determine if seedlings are established. Seedlings that slip out of the ground with a slight

tug do generally not have sufficient root systems to survive through the growing season and are not established.

- Small oak, hickory, walnut, and butternut seedlings (less than 1-foot tall) should be at least 6-inches tall or have a root-collar diameter (RCD) of at least 0.20 inches.
- Pine seedlings should have at least two whorls or be at least 6-inches tall.

Species -- Record valid NE-FIA tree species code (see Appendix 4).

Seedling Source -- Discriminate between stump sprouts and other seedlings. Tally clumps of stump sprouts as one seedling and tally only the tallest, most dominant sprout for each stump. Tally sprouts on stumps that originate from cutting or mortality only. Stumps must be at least 2 inches in diameter to qualify as having sprouts.

A special code (3) is used for oak, hickory, walnut, and butternut that are classified as “competitive.” Research indicates that competitive seedlings are highly likely to become dominant or codominant stems in the next stand. To be classified as competitive, stems must have an RCD > 0.75 inches. In situations with relatively high tally, it should only be necessary to check a few RCD's.

Code	Definition
1	Stump sprout
2	Other seedling
3	Competitive oak, hickory, walnut, or butternut seedling

Height Class – Each seedling is assigned a height class.

Code	Definition	Code	Definition
1	2 inches to 6 inches	4	3 feet to 5 feet
2	6 inches to 1 foot	5	5 feet to 10 feet
3	1 foot to 3 feet	6	Greater than 10 feet

Numbers of Stems -- Record the number of tree seedlings in each category described by species, seedling source, and height class. The first five seedlings of each species must be counted precisely. Counts above five may be estimated. In the case of beech root suckers, count all individuals unless they arise from a single root node, in which case they should be counted as a single stem.

Soil Sampling Protocols for the Delaware River Basin Study

Site selection – A single soil pit will be dug at each mid-point of each of the three “spokes” defined by the line connecting the center points of each FIA sub-plot. If all four subplots are not in forest, dig the three soil pits in the vicinity of the subplot or subplots that are forested. If none of the subplots are in forest, do not collect any soil at the plot. The forest and forest floor conditions at the pit should be roughly (visually) representative of the forest conditions measured in the plots.

Sampling protocol for each pit –

- Dig a small pit to a depth that is about 6 inches below the bottom of the organic-rich surface horizon that is identified by its black or blackish-gray color, high root density and high organic-matter content. The underlying mineral soil will have a color that will range from dark brown to redish-orange or a pinkish hue. Put all the excavated soil and rocks in a neat pile that will not contaminate a large area around the pit, and will make refilling the pit convenient.
- Clean off the pit face with a trowel. On that pit face measure and record the depth of the black surface horizon. Make sure that footprints haven't compressed the face that you are measuring.
- Using a trowel, clean all the loose soil out of the bottom of the pit, being particularly careful to remove all the black soil that fell in from the surface horizon. Then collect 2-3 cups of sample from the bottom of the pit that approximately represents the layer that is 4-8 inches below the bottom of the organic surface horizon. Put the soil into a plastic bag and label the bag with site ID, date, plot ID, collection date, and “10-20 cm” (i.e., the depth of the sample).
- Then use the trowel excavate 2-3 cups of soil from the cleaned off face from the layer that is 0-4 inches below the organic surface horizon. Be careful not to mix any of the surface horizon into this sample. If you are not completely certain where the surface horizon stops and the mineral horizon begins, move down into the mineral soil before sampling until you are certain that you are not in the organic surface horizon. Label this bag with the site ID, plot ID, collection date, and “0-10 cm” representing the upper B-horizon. Fill in the sample form and place in a separate plastic bag, then put the bagged form into one of the sample bags for that plot.
- *If time and digging allow*, USGS would like a deeper sample at each pit. You would get that sample by digging the pit 8-10” deep, and collecting a sample from the bottom of the pit that would be labeled with the depth at which you take the sample (i.e., “20-25cm”, or “30-35cm”, etc). Then collect the 0-10 cm and 10-20cm samples from the pit face. Note the depth of the deeper soil sample on the field form.

- To sample the surface organic horizon, pick an area that appears representative and use the FHM protocols for collecting the forest floor and organic horizon sample (i.e., collect a litter sample and an OA sample separately—we haven't been using the calibrated squares for this but I'm hoping to start). Inspect each sample to ensure that no mineral soil is included. Collect 3-5 cups, and place in the plastic bag with the filled-out sample form (again the form should be in a separate bag to avoid getting it wet from the sample).
- Fill in the required information on the subplot form.
- Backfill the pit, and repeat at the midpoint of the other 2 spokes.
- ***IMPORTANT*** Unseal the bags when you return from the field to allow the soil to dry.

Storage/transfer protocol – The USGS will arrange to periodically retrieve the samples from the FIA field crew. Logistics for this step will depend on the location of the field crew's home base and the storage space available at that base. The samples have to be stored open to the air in a dry place until complete drying can be accomplished. We could build a drying rack for a barn or garage if one is available, where the samples could stay till they are picked up by the USGS.

Tools/materials – Tools required are a shovel, a trowel, a marking pen and a ruler. If these are not standard equipment for the FIA field crew we will make arrangements to provide those tools. A soil auger for each crew will be provided if needed. Sample bags are standard gallon-size freezer bags-- we will provide those. We will also provide a drying rack if needed.

Training – The USGS will meet with the field team if desired and demonstrate the procedures recommended above. The USGS will have all responsibility for the samples and field data after they are retrieved.

DRB SOIL SAMPLE COLLECTION FORM

PAGE 1

Plot ID _____

FIA Station ID _____ Date: _____

Weather: raining recently rained dry Bedrock Depth (if reached): _____

Samples collected: Sample 1 (spoke 1-2): O-Hor 0-10cm 10-20cm 20-30cm 30-40cm
_____cm

Sample 2 (spoke 1-3): O-Hor 0-10cm 10-20cm 20-30cm 30-40cm
_____cm

Sample 3 (spoke 1-4): O-Hor 0-10cm 10-20cm 20-30cm 20-30cm
40-C Deep _____cm

Thickness of Organic Horizon:

Sample 1 (spoke 1-2): 0.1' 0.2' 0.3' Other _____

Sample 2 (spoke 1-3): 0.1' 0.2' 0.3' Other _____

Sample 3 (spoke 1-4): 0.1' 0.2' 0.3' Other _____

Soil Moisture, Organic sample: wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

0-10 cm sample: wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

10-20 cm sample: wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

20-30 cm sample: wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

30-40 cm sample: wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

40-C cm sample: wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

Deep (_____cm): wet (1) (2) (3) moist (1) (2) (3) dry (1) (2) (3)

Soil description: (lots of rocks? Fragipan present?, etc)

Deep Sample O _____

0-10 cm _____

10-20cm _____

20-30cm _____

30-40cm _____

40-Ccm _____

DRB SOIL SAMPLE COLLECTION FORM

Sample 2: O-Horizon _____
 0-10 cm _____
 10-20cm _____
 20-30cm _____
 30-40cm _____
 40-Ccm _____
 Deep _____

Sample 3: O-Horizon _____
 0-10 cm _____
 10-20cm _____
 20-30cm _____
 30-40cm _____
 40-Ccm _____
 Deep _____

Dominant tree species:

Dominant understory species:

Position of samples:

Sample 1 (spoke 1-2): Mid-point of spoke **Other:** _____
Sample 2 (spoke 1-3): Mid-point of spoke **Other:** _____
Sample 3 (spoke 1-4): Mid-point of spoke **Other:** _____

Comments: _____

Soil Column drawing:

