

Protocol for estimating stem density (7/15/09)

Assessment of stem density should be conducted 2 times during the 3-year grant period. First assessment should be conducted pre-treatment count (year 1) and the second assessment should be conducted post-treatment (year 3), after 2 growing seasons. Basic methodology for assessing stem density was based on paper published by Litvaitis et al. (1985).

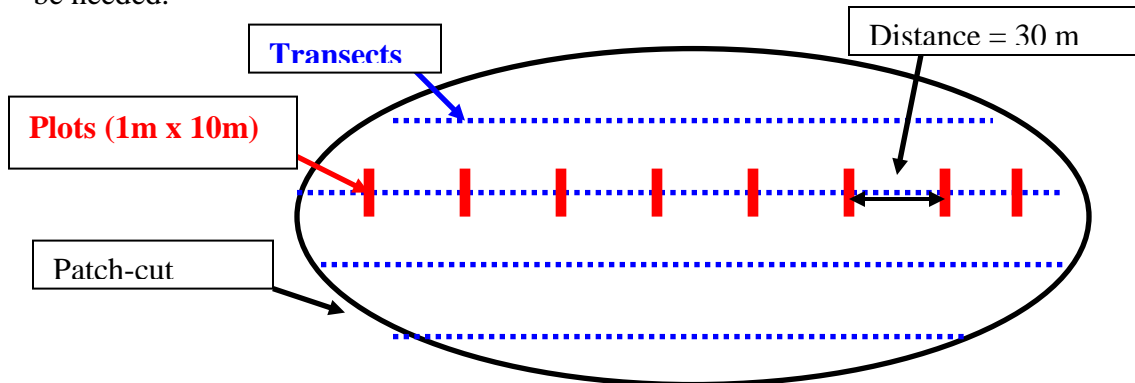
Number of transects and number of sample plots will vary from site to site depending on shape and size of habitat patch, and variation in stem density. Below are general guidelines that should be followed.

Transects:

- 1) Transects should be evenly stratified through the patch cut and should be oriented parallel with the longest edge of the patch cut (see diagram below). If patch has much variation in topography or hydrology, then transects should run parallel to these gradients.
- 2) Number of transects needed will depend on number of sample plots needed (see #4 under sample plots)
- 3) Length of transects will depend on shape and size of study area

Sample plots

- 1) Sample plots will be 1 m x 10 m in size (10m² sampling area). Long narrow plots tend to minimize variation in stem counts
- 2) Plots should be evenly spaced along transects at 30 m intervals. Plots should be centered on the transect and the long side of the plot (10m) should be perpendicular to the transect (see diagram below).
- 3) Total number of sample plots needed should be initially estimated using the ratio of 2 plots per 1 hectare (> 10 ha patch) or 5 plots per hectare (≤ 10 ha patch). Thus, if patch-cut to be sampled is 50 ha, then 100 plots need to be spaced at 30-m intervals along the stratified transects (Table 1).
- 4) Number of plots needed (at 30 m intervals) will dictate number of transects needed (see table below for example on how to calculate number of plots and number of transects).
- 5) If variation in stem density is high then additional transects and sample plots may be needed.



Appendix H.

Table 1. Example on how to calculate number of plots and number of transects for a 50 ha patch cut. Calculations based on sample plots spaced at 30-m intervals along transects.

Goshen Wildlife Management Area - NEC restoration project (50 ha)

Trans No.	Start Lat (UTM)	Start Long (UTM)	Compass Bearing	Transect Meters	No Plots (If every 30m)	No Plots	Total Sum of Plots	Ratio (Plots/ha)
1	647627	4638147	80	763.9	25.463333	25	25	0.5
2	647596	4638330	80	810.5	27.016667	27	52	1.04
3	647503	4638568	80	770.96	25.698667	25	77	1.54
4	647964	4638722	260	732.36	24.412	24	101	2.02
5	647959	4638838	260	623.25	20.775	20	121	2.42
6	648130	4639007	260	527.8	17.593333	17	138	2.76

Four transects are needed to establish 101 sample plots, to achieve a ratio of 2 plots per hectare

Vegetation sampling

- 1) Stem density assessment should be conducted during the leaf-off period.
- 2) For each plot, count and record separately, total number of hardwood stems, conifer stems, and laurel stems that are ≥ 0.5 m high and ≤ 7.5 cm dbh. **Stems must originate from inside the plot.**
- 3) If stems branch (i.e. Multiflora rose), then number of **vertical** stems should be counted at height of 0.5 m.
- 4) Optional – record number of stems native and invasive.

Materials

- a) Compass
- b) GPS Unit
- c) Metal spikes (4)
- d) 10-meter rope with loops on both ends (2)
- e) 1-meter stick (2)
- f) 0.5 meter stick (1)
- g) 7.5 cm gauge (1)
- h) Data Sheet