

## Procedures for Determining Foraging Habitat Availability:

1. Delineate stands
  - a. Delineate each stand from an aerial photograph. A stand is a contiguous group of trees sufficiently uniform in species composition, age, or arrangement of age classes and condition to be considered a homogenous and distinguishable unit.
  - b. Each stand should be identified by a unique number.
  - c. To use the RCW Foraging Analysis computer program, these stands must be georeferenced in a geodatabase or shapefile.
  
2. Identify Longitudinal Axis of Each Stand and Run a Compass Line
  - a. Identify a route of travel that runs through the longitudinal axis of the stand and run a compass line on this route.
  - b. Establish sample points at 2- to 5-chain intervals along this route.
  - c. At these sample points, variable radius 10-factor basal area prism plots will be used to collect overstory data as outlined below. Midstory will be collected using .1-acre circular plots (~37 ft radius, but see step 5.b below), and groundcover will be collected at .01-acre circular plots (~11 ft radius).
  
3. Determine Placement and Number of Sample Points
  - a. The first points in each stand should be placed at one-half the distance between points (i.e., at 5 chains between points, the first point would be 2.5 chains from the stand boundary).
  - b. Use a minimum of 10 points in homogeneous and 20 points in heterogeneous stands.
  - c. If stand configuration is such that one line transect through the longitudinal axis does not result in enough points, then modify the sampling scheme to result in an adequate number of points distributed throughout the stand in such a way as to sample the diversity in the stand. For example, 1) parallel transects that are 2 chains apart with points that are 2 to 5 chains apart along each transect, 2) in a circular-shaped stand, transects may be established in a triangular pattern, or 3) in a square-shaped stand, 2 perpendicular transects crossing through the center of the stand may be used.
  
4. Characterize Pine and Canopy Hardwood Characteristics of the Stand
  - a. To use the **Standard for Managed Stability**:
    - i. Recording x,y coordinates for each sample point is optional but recommended for reference purposes.
    - ii. At every other plot, determine the age of a typical dominant tree by using an increment borer. If the stand is a pine plantation, it is only necessary to core one tree. If the stand is even-aged, it is only necessary to core three dominant trees per stand.

- iii. Record the following characteristics for each basal area prism plot:
    1. Pine basal area by diameter class (see example tally sheet)
    2. Total pine basal area for pines <10"
    3. Total pine basal area for pines  $\geq 10$ "
    4. Total overstory hardwood basal area
    5. Total basal area, including both pines and hardwoods  $\geq 10$ "
    6. To use the RCW Foraging Matrix application, one must also record the basal area and trees per acre for 10-14" hardwoods and  $\geq 14$ " hardwoods (see 7.b.ii.5 below).
  - b. To use the **Recovery Standard**:
    - i. Recording x,y coordinates for each sample point is optional but recommended for reference purposes.
    - ii. At every other plot, determine age of a typical dominant tree by using an increment borer. If the stand is a pine plantation, it is only necessary to core one tree. If the stand is even-aged, it is only necessary to core three dominant trees per stand.
    - iii. Record the following characteristics for each basal area prism plot:
      1. Pine basal area by diameter class (see example tally sheet)
      2. Total pine basal area for pines <10"
      3. Total pine basal area for pines  $\geq 10$ "
      4. Total overstory hardwood basal area (see 7.b.ii.5 below)
      5. Total basal area, including both pines and hardwoods  $\geq 10$ "
      6. To use the RCW Foraging Matrix application, one must also record the basal area and trees per acre for 10-14" hardwoods and  $\geq 14$ " hardwoods (see 7.b.ii.5 below).
5. Characterize Hardwood Midstory
- a. Collect midstory data at all sample points from step 4 and as many other points as deemed necessary based on homogeneity of stand.
  - b. Use .1-acre (~37 ft radius) plots when categorizing midstory. At points with a dense midstory, smaller sample plots (e.g., .01-acre plots) may alleviate the difficulties this density poses for data collection. Plot sizes must be consistent within the stand.
  - c. Categorize height as low (<7 ft tall), medium (7 – 15 ft tall), or tall (>15 ft tall).
  - d. Categorize density as sparse, moderate, or dense. No ranges of stem counts have been established to differentiate these categories of density, but the definitions of these categories should be somewhat intuitive.
  - e. In assessing midstory in the field, height of the majority of the midstory stems is determined first (step 5.c). For example, if on average 20% of the stems exceed 15 ft but 80% are 7-15 ft, the height category is moderate, not tall. Once this height is determined, total midstory density of all stems is estimated (step 5.d).
  - f. Pictures of different stands are included on this cd to illustrate each of the categories.
  - g. When aggregating plot data to the stand level, assign each stand the midstory category for the mode or most frequently occurring category in the stand. If the stand is essentially evenly split between two categories, the stand should be

assigned the category with the higher density and height combination. That is, if a stand is 50% medium height, sparse density and 50% medium height, moderate density, then the stand should be assigned to the latter category.

- h. For use in the RCW Foraging Analysis computer program, the following codes should be used to describe midstory height and density:

- 1 = Low, Sparse
- 2 = Low, Moderate
- 3 = Low, Dense
- 4 = Medium, Sparse
- 5 = Tall, Sparse
- 6 = Medium, Moderate
- 7 = Tall, Moderate
- 8 = Medium, Dense
- 9 = Tall, Dense

6. Characterize Groundcover

- a. Collect groundcover data at all sample points from step 4 and as many other points as deemed necessary based on homogeneity of stand.
- b. Use .01 acre (~11 ft radius) plots when categorizing groundcover.
- c. Record % herbaceous groundcover in 10% increments. Though it is not necessary to report % bare ground, % pine straw, and % woody vegetation, it may be helpful to visually assess these characteristics as well. When these four percentages are added together, their sum should equal 100%.

7. Determine acreages and stand totals

- a. Acreages of stands can be determined by planimetry of delineated stands, the use of a dot grid overlay on aerial photos, or through the use of computer software such as geographic information systems (GIS) or computer assisted design (CAD).
- b. Average basal area and stem counts for all plots in a stand to determine the stand value (per acre) for each of the following summary characteristics:
  - i. For evaluations using the **Standard for Managed Stability**
    - 1. basal area of all pine stems <10" dbh
    - 2. basal area of all pine stems between 10" and 14" dbh
    - 3. basal area of all pine stems that are  $\geq 10$ " dbh\*
    - 4. basal area of all pine stems that are  $\geq 14$ " dbh
    - 5. total basal area (including both pines and hardwoods  $\geq 10$ "\*)
  - ii. For evaluations using the **Recovery Standard**
    - 1. basal area and number of pines <10" dbh
    - 2. basal area and number of pines  $\geq 14$ " dbh
    - 3. basal area of all pines between 10" and 14" dbh
    - 4. basal area of all pines  $\geq 10$ " dbh\*
    - 5. percentage of the canopy (based on stem count) that is comprised of hardwoods (*Note: The first iteration of the foraging matrix application calculates the percent canopy hardwood for each stand using the number of hardwood stems  $\geq 10$ " and the number of pine stems  $\geq 10$ ".*)

\* Note that these characteristics are automatically calculated by the RCW Foraging Matrix application from the data collected for other characteristics.

8. Determine Fire History

- a. For each stand, record the number of years since the last burn. If left blank, the matrix application assigns a default value of 50.
- b. For each stand, record the season of last burn (growing season or non-growing season). For use in the RCW Foraging Analysis computer program, the following codes should be used to describe season of last burn:

1 = Non-growing Season

2 = Growing Season

9. Partition Level Characteristics

- a. Additional characteristics are determined at the partition level.
  - i. **Standard for Managed Stability** (Appendix 5 of the Recovery Plan)
    1. total acres of foraging habitat in the partition
    2. total acres of foraging habitat within ¼ mile of the cluster center
    3. total basal area of pine  $\geq 10''$  dbh in the partition
    4. number of contiguous foraging acres in the partition
  - ii. **Recovery Standard** (section 8I of the Recovery Plan)
    1. total acres of good quality foraging habitat (GQFH) in the partition
    2. total acres of pine at least 30 years old in the partition
    3. total acres of GQFH within ¼ mile of the cluster center
    4. number of contiguous foraging acres in the partition
- b. The RCW Foraging Analysis Program will calculate these additional characteristics at the partition level for both standards after evaluating the stands for the stand level characteristics.