**Appendix C4 - LEMP Vegetation Diversity and Structure Protocols**

**August 2011**

**Introduction**

This protocol set is based on the Forest Inventory and Analysis (FIA) Phase 3 Vegetation Diversity and Structure sampling protocol (Version 4, October 2007), with modifications for the LEMP. The Vegetation Diversity and Structure protocol measures the type, relative abundance, and vertical position of all trees, shrubs, herbs, graminoids, ferns, and fern allies within each LEMP plot. We will use this information to assess forest ecosystem health in terms of diversity and rates of change of community structure for both native and non-native vascular plant species. Changes in the composition and spatial arrangement of vascular plants in a forest may indicate the presence of chronic stresses such as discrete site degradation, climate change, and pollution, as well as forest succession in response to land use history and other disturbances such as ice storms and wind throw.

Sampling is based on a nested plot design known as multi-scale sampling. This method is necessary because different communities have different spatial patterns of species richness, so that a single plot size is an arbitrary sample of species diversity. Sampling at two or more scales provides a better comparison among communities and over space and time.

Data will be collected by crew members that have had previous botanical training and/or experience in Vermont or northern New England, and experience with establishing and measuring cover within vegetation plots at multiple scales

**Sample Design and Layout**

LEMP Vegetation data are collected on all four subplots of each LEMP plot (Figure 1). Subplot 1 is the Center subplot; Subplot 2 is the North subplot; Subplot 3 is the Southeast Subplot; and Subplot 4 is the Southwest Subplot. The boundaries of the subplot are 24 feet, horizontal distance, from the subplot center. Data are collected on two plot sizes on each subplot: three 1m2 quadrats, and the 24-foot radius subplot (Figure 2). From the subplot center, the quadrats are located on the right sides of transects at azimuths 30o, 150o, and 270o (from true north).

When arriving at a subplot, use survey pins or stakes to layout the transects and mark the corners of each quadrat. Use a stake to hold a tape at the subplot center, and measure out each transect along the required azimuth. Mark the 24 foot radius with flagging and a stake, then mark the two corners of the quadrat along the transect at 15 feet and 18.3 feet. Once all three transects are laid out and their 24 foot endpoints flagged, use flagging to mark a minimum of three additional points along the 24 foot radius so that the perimeter is visible from the subplot center.

Once the subplot is laid out, fill out information on the VEG Plot and Subplot Information form. Natural community is determined based on Thompson and Sorenson’s 2000 Guide to the Natural Communities of Vermont (as updated on the Vermont Nongame and Natural Heritage Program’s website). Estimate total cover of all vascular vegetation foliage in four height layers (0-2, >2-6, >6-16, and >16 feet) on the entire 24 foot radius subplot, and then estimate ground variable cover on the subplot (this can be done in either order and may be easier to reverse, doing the ground variable cover first before it is too trampled). Once this is complete, assess each quadrat for status and trampling using the VEG Quadrat and Subplot Species form.

A species matrix is compiled for each subplot as the vegetation specialist visits each sample unit –quadrats and subplot. A species code is recorded when a species is first encountered. When discovered on subsequent quadrats or in the entire subplot, information is added to the original species record.

Assess quadrats first by identifying all vascular plant species rooted in the quadrat or with overhanging foliage or live material within 6 feet above the ground above the quadrat. After the quadrats are assessed, a time-constrained search of all vascular plant species on the subplot is conducted. Once all species are recorded, the vegetation specialist will estimate total canopy cover of each individual species, and then the canopy cover within each of three height layers (0-6, >6-16, and >16 feet), over the entire subplot. Most species will have canopy cover in one layer only, in which case the total canopy cover and layer canopy cover will be the same.

Specimens of all measured plants that cannot be confidently identified to species, but include identifiable material, are collected off-plot and preserved for future identification by the specialist or another more knowledgeable botanist.

**Suggested Field Gear**

* GPS unit with plot centers entered to navigate to plots
* 2-way radio for communication and safety (and cell phone if available)
* Hardhat
* Compass with declination and azimuths for laying out transects
* Measuring tape at least 24 feet long for laying out transects (loggers tape, roller tape)
* 10 Chaining pins and/or temporary pin flags to mark transects and quadrat corners (3 for each transect plus the center); leather chaining pin “quiver”
* Flagging to mark the subplot perimeter (to be removed when subplot completed)
* 2, 2-meter folding rulers for making the quadrat frame (or use 4, ½-inch, 1-m PVC pipes with elbows); folding rulers can also be used for height measurements
* LEMP VEG Plot and Subplot Information forms (1 per plot)
* LEMP VEG Quadrat and Subplot Species forms (at least 4, often 8, per plot)
* Pencils and knife or sandpaper for sharpening
* LEMP VEG Plot Cheat Sheet for converting m2 to cover class and listing other codes
* PLANTS Plant code cheat sheet for plants previously found in the LEMP plots
* Local flora keys and species lists (e.g. Newcomb’s, Peterson’s ferns, fern allies, trees and shrubs)
* Hand lens
* 1-gallon plastic bags for unknown plant specimens
* Sharpee for marking plant bags with plot and specimen information
* Cooler with cold packs for storing plant specimens until return to office
* Access to a plant press or cardboard and newspaper to press specimens until they can be ID’d
* Access to dissecting scope (or to a person with one who is willing to ID specimens)
* Access to a PLANTS code dictionary to look up species not seen before on plots and add to cheat sheet.



Figure 1 – FIA Plot Diagram

24’ radius

subplot boundary

**Q3**

**Q1**

**Q2**

1 m2 quadrat

15 ft

270o

150o

30o

Figure 2 – Layout of LEMP subplot showing location of quadrats and subplot boundary

**LEMP VEG PLOT AND SUBPLOT INFORMATION FORM INSTRUCTIONS**

**Plot and Visit Reference Information**

STATE

Record the unique FIPS code identifying the State where the plot center is located.

When collected: All plots

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: See LEMP VEG Plot Cheat Sheet or Appendix 1 of FIA P2 field guide; VT = 50.

COUNTY

Record the unique FIPS code identifying the County where the plot center is located.

When collected: All plots

Field width: 3 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: See LEMP VEG Plot Cheat Sheet or Appendix 1 of FIA P2 field guide.

PLOT NUMBER

Record the unique plot identification number assigned by LEMP team.

When collected: All plots

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: 01-20

VEG SAMPLE KIND

Record sample kind.

When collected: All plots

Field width: 1 digit

Tolerance: no errors

MQO: At least 99% of the time

Values:

1. Initial LEMP VEG plot establishment
2. Remeasure of previously established LEMP VEG plot
3. Replacement LEMP VEG plot

VEG CREW

Record the initials of the crew members measuring vegetation diversity and structure.

When collected: All plots

Field width: 40 alphanumeric characters

Tolerance: No errors

MQO: At least 99% of the time

Values: XXX, XXX…

YEAR

Record the year that the plot was completed.

When collected: All plots

Field width: 4 digits

Tolerance: no errors

MQO: At least 99% of the time

Values: ≥ 2008

MONTH

Record the month that the plot was completed.

When collected: All plots

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values:

01 January 05 May 09 September

02 February 06 June 10 October

03 March 07 July 11 November

04 April 08 August 12 December

DAY

Record the day of the month that the plot was completed.

When collected: All plots

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: 01 to 31

VEG PLOT NOTES

Use this field to record notes pertaining to the entire plot. If the notes apply only to a specific subplot or other specific aspect of the plot, then make that clear in the notes.

When collected: All plots

Field width: 160 alphanumeric characters

Tolerance: N/A

MQO: N/A

Values: English language words, phrases and numbers

**Subplot Information**

VEG SUBPLOT STATUS

Record the code corresponding to how the subplot was sampled.

When collected: Each subplot

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

1. Sampled
2. Nonsampled (provide reason in the VEG Plot Notes)

NATURAL COMMUNITY

Record the natural community code for the subplot based on the Guide to the Natural Communities of Vermont (Thompson and Sorenson 2000; as updated at <http://www.vtfishandwildlife.com/wildlife_nongame.cfm>)

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 7 alphanumeric characters

Tolerance: No errors

MQO: At least 99% of the time

Values: See LEMP VEG Plot Cheat Sheet

**Subplot Total Canopy Cover By Layer**

Estimate the total canopy cover of the foliage of all vascular plants by layer above the ground surface within the subplot. A rapid canopy cover estimate is made, ignoring overlap among species. It may help to visualize canopy cover by collapsing each layer into a 2-dimension space and using the polygon method (canopy cover is based on a vertically-projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between leaves of plants). It is also useful to use the square meter quadrat as the polygon, and estimate how many square meters of foliage exist in a given layer. This area estimate can then be converted to percent cover using the LEMP VEG Plot Cheat Sheet. For tree canopies, it is also useful to imagine the polygons as circles of a particular radius, again using meters because that is the scale of the quadrats. The LEMP VEG Plot Cheat Sheet also provides conversions of various size circles to square meters and then to percent cover.

SUBPLOT CANOPY COVER CLASS LAYER 1 (0-2 feet above ground)

Estimate the total canopy cover class of the foliage of all vascular plants in Layer 1, 0 to 2 feet above the ground. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

SUBPLOT CANOPY COVER CLASS LAYER 2 (>2 - 6 feet above ground)

Estimate the total canopy cover class of the foliage of all vascular plants in Layer 2, >2 to 6 feet above the ground. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

SUBPLOT CANOPY COVER CLASS LAYER 3 (>6 - 16 feet above ground)

Estimate the total canopy cover class of the foliage of all vascular plants in Layer 3, >6 to 16 feet above the ground. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

SUBPLOT CANOPY COVER CLASS LAYER 4 (>16 feet above ground)

Estimate the total canopy cover class of the foliage of all vascular plants in Layer 4, >16 feet above the ground. A rapid canopy cover estimate is made, ignoring overlap among species.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

**Subplot Ground Variable Records**

Assess the cover of ground variables found within the subplot. In areas of thick vegetation, you may opt to complete this section after you have collected the species data and have a better perspective on the ground cover. These describe things in contact with the ground surface and not occupied by vegetation cover. Multiple ground variables often occur on a subplot. It is useful to imagine the ground cover from above, with all of the vascular plant vegetation stripped off and live trees cut. Items must be visible from above. For example, a large rock completely covered with moss would not be coded, but the moss would be. Estimate the percent cover of each ground variable and place within the appropriate cover class. The sum of all ground variable covers must equal 100%.

CRYPTOBIOTIC CRUST COVER CLASS

Record the % cover class for cryptobiotic crust cover in the subplot. Cryptobiotic crust is a layer of symbiotic lichens and algae on the soil surface (common in arid regions).

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

LICHEN COVER CLASS

Record the % cover class for lichen cover in the subplot.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

LITTER/DUFF COVER CLASS

Record the % cover class for litter and/or duff cover in the subplot. This is a continuous layer of accumulated organic matter over forest mineral soil (e.g. scattered leaves over mineral soil is coded mineral soil). This is usually more than 80% of the ground cover in the GMNF, and so it may be useful to estimate cover on all the other variables first and leave this one for last to determine if it is less than 80% cover.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

MINERAL SOIL COVER CLASS

Record the % cover class for mineral soil cover in the subplot. This is physically weathered soil parent material that may or may not also be chemically and biologically altered. In our area (GMNF) this is usually the A and/or B horizons, usually when there is windthrow in the subplot.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

MOSS COVER CLASS

Record the % cover class for moss cover in the subplot. This includes all bryophytes (mosses, liverworts, hornworts).

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

ROAD/TRAIL COVER CLASS

Record the % cover class for road and/or trail cover in the subplot. Include any areas compacted and unvegetated from regular use by foot travel or small motorized vehicles.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

ROCK COVER CLASS

Record the % cover class for rock cover in the subplot. Include any rocks, boulders, or accumulations of gravel (> ¼ inch diameter) or pebbles).

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

STANDING WATER/FLOODED COVER CLASS

Record the % cover class for standing water and/or flooded cover in the subplot. Include any ponding or flowing water that is not contained within banks.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

STREAM/LAKE COVER CLASS

Record the % cover class for stream and/or lake cover in the subplot. Include any body of water contained within banks that is within a forested condition.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

TRASH/JUNK/OTHER COVER CLASS

Record the % cover class for trash, junk, or other cover in the subplot. .

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

WOOD COVER CLASS

Record the % cover class for wood cover in the subplot. Wood pieces included should average greater than 3 inches in diameter and be in contact with the ground; smaller pieces should be included in Litter/Duff cover. Stumps and roots are included. Live trunks are included by imagining them as stumps cut flush to the ground surface.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

**LEMP VEG QUADRAT AND SUBPLOT SPECIES FORM INSTRUCTIONS**

This form is used only for subplots where SUBPLOT STATUS = 1

**Quadrat Data**

Place the quadrat frame to the right side of the transect line and make sure the corners are lined up at 15 and 18.3 feet from the subplot center along the azimuth line. Level the quadrat, if necessary, by propping up the quadrat corners. When a quadrat is located on a steep slope, the vegetation specialist should be positioned next to or downhill from the quadrat to prevent sliding or falling into the quadrat. In areas of thick vegetation, slide the quadrat sides through the vegetation. Using 2-meter folding rulers allows flexibility in maneuvering through the vegetation.

VEG CREW NAME, YEAR, MONTH, DAY and PLOT are the same as for the LEMP VEG Plot and Subplot Information form.

SUBPLOT NUMBER

Record the code corresponding to the number of the subplot.

When collected: All subplots where SUBPLOT STATUS = 1

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

1. Center subplot
2. North subplot
3. Southeast subplot
4. Southwest subplot

QUADRAT NUMBER

Ensure that data entered for each quadrat corresponds with the correct quadrat number on the data sheet

When collected: Each quadrat

Field width: 1 digit (on data sheet)

Tolerance: No errors

MQO: At least 99% of the time

Values:

1. Quadrat on 30o
2. Quadrat on 150o
3. Quadrat on 270o

QUADRAT STATUS

Record the code corresponding to how the quadrat was sampled. If QUADRAT STATUS is 1 or 3, continue to enter data for the quadrat. If the value entered is 2, 4, or 5, leave the remaining quadrat items blank.

When collected: Each quadrat

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

1. Quadrat sampled
2. Quadrat not sampled because most or all of it is no longer accessible forested condition
3. Quadrat sampled, no vascular plants rooted in or overhanging within 6 feet of the ground surface
4. Quadrat not sampled, hazard present on quadrat
5. Quadrat not sampled, other reason – enter in plot notes

TRAMPLING

A trampling code is assigned to each quadrat at the start of vegetation diversity measurements. Trampling is defined as damage to plants or disturbance of the ground layer by humans, livestock, or wildlife.

When collected: QUADRAT STATUS = 1 or 3

Field width: 1 digit

Tolerance: +/- one code

MQO: At least 90% of the time

Values:

1. Low: 0-10% of quadrat trampled; pristine to relatively undisturbed
2. Moderate: 10-50% of quadrat trampled: trampling by animals or field crew
3. High: >50% of quadrat trampled: hiking trail or heavily grazed

VEG SUBPLOT NOTES

Use these fields to record notes pertaining to the quadrats and subplot

When collected: As needed

Field width: 160 alphanumeric characters

Tolerance: N/A

MQO: N/A

Values: English words, phrases, and numbers

**Species Records**

Species data are collected at both the subplot level and the quadrat level for each subplot. A single species list is maintained for the entire subplot. Species codes are recorded as each species is discovered for the first time on a given quadrat or subplot. Data are added to the original species’ record when the species is encountered on subsequent quadrats. This section describes the data required to uniquely identify each recorded species. *Note: it is typically easier to collect quadrat species and data first, and then the remaining subplot species data.*

SPECIES CODE

Record a code for each vascular plant species found rooted in or overhanging the subplot at any height or rooted in or overhanging within 6 feet above the quadrat. Species codes must be the standardized codes in the Natural Resource Conservation Service (NRCS) PLANTS database (most recent version).

If a plant cannot be identified quickly and confidently, assign a NRCS PLANTS genus or unknown code appropriate to the species. Collect a specimen away from the quadrat unless the species is locally sparse (if 5 or fewer individuals are present in the entire plot (4 subplots) and immediate surrounding area).

When collected: First time each unique species is discovered in the subplot

Field width: 10 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: Accepted NRCS species when the species is known, or an accepted NRCS genus or unknown code when the species is not known

UNKNOWN NUMBER (UNK #)

When a NRCS genus or unknown code is entered for the first time on a PLOT, the UNK # is “1”. If more than one unidentified species is discovered on the PLOT that is described by the same genus or unknown code, the next sequential number is assigned.

When collected: For any species coded using an NRCS genus or unknown code

Field width: 2 digits

Tolerance: No errors

MQO: At least 99% of the time

Values: 1-99, assigned in sequential numbers

SPECIMEN COLLECTED (COLLECT?)

Record if a specimen was collected or not for each species, genus, or unknown code. If an unknown or genus-level species was not collected, not the reason in the PLOT SPECIES NOTES.

When collected: All species records

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

1. No, a specimen was not collected
2. Yes, a specimen was collected

SPECIMEN LABEL NUMBER

Record the label number for the collected specimen. The label number consists of the concatenation of the genus or unknown code, the unknown #, the plot #, and the subplot #. Write this number in sharpie on a 1-gallon plastic bag and place the specimen in the bag. Include on the bag the date, the natural community, soil drainage conditions, and the most common plants associated.

When collected: When COLLECT? = 1

Field width: 18 alphanumeric characters

Tolerance: No errors

MQO: At least 99% of the time

Values: *genus/unk-unk#-plot#-subplot#*

PLOT SPECIES NOTES

Notes may be entered for any species encountered, but are required for each new species that is not identified. Enter text that describes the species or explains why it was not collected. This text may be used on the specimen label as well.

When collected: Required for any new unidentified species encountered on a plot and when COLLECT? = 0.

Field width: Unlimited alphanumeric characters

Tolerance: N/A

MQO: N/A

Values: English or Latin words, phrases, and numbers

**Quadrat Species Data Collection**

SPECIES PRESENCE/ABSENCE ON QUADRAT

At each new sampled quadrat, record species presence or absence. When a new species is encountered, enter it using the fields described for **Species Records**.

When collected: For each unique species present on a quadrat with a QUADRAT STATUS = 1

Field width: 1 digit

Tolerance: No errors

MQO: At least 99% of the time

Values:

Blank or 0 not present

1 present

**Subplot Species Data Collection**

After completing the three quadrats on a sampled subplot, the vegetation specialist does a search of the entire subplot. Only species rooted in or overhanging the subplot are included. All species recorded on the current subplot’s quadrats must be included in canopy cover assessments. The vegetation specialist records abundance for all species, searching for no more than an average of 45 minutes per subplot. Some vegetation specialists find they spend more time on the first subplot, but less time on other subplots because most plants have been identified and coded. Only emergent plants are recorded in wetland forest situations. Epiphytes (Spanish moss, ferns, orchids, mistletoes) are recorded as well as possible as seen from ground level.

Two types of canopy cover class estimates are made for each species: total canopy cover class and canopy cover class within each of three layers. The majority of plants will have canopy cover in only one layer, in which case the total and layer canopy cover classes will be identical. It is often easiest to estimate the species’ total cover after each layer’s cover has been estimated. Canopy cover is based on a vertically projected polygon described by the outline of the foliage, ignoring any normal spaces occurring between the leaves of plants. It may be useful to use a square meter quadrat as the polygon, and estimate how many square meters of a species’ foliage exist in a given layer. This area estimate can then be converted to percent cover and then cover class using the LEMP VEG Plot Cheat Sheet. For tree species’ canopies, it is also useful to imagine the polygons as circles of a particular radius, again using meters because that is the scale of the quadrats. The LEMP VEG Plot Cheat Sheet also provides conversions of various size circles to square meters and then to percent cover and cover class. For each species, when applying cover class, ensure that the total cover class represents no more than the sum of cover assigned for all layers, but is also at least as large as the greatest cover class assigned to any one layer. For species occurring in more than one layer, it may be useful to keep track of actual % cover estimates in crib notes to ensure the total cover class is estimated correctly.

SUBPLOT SPECIES TOTAL PERCENT CANOPY COVER CLASS

Estimate the total canopy cover class of the foliage for each plant species across all layers over the entire subplot area. A rapid canopy cover estimate is made, ignoring overlap among species. For species that occur in only one layer, the total and layer canopy cover classes are identical. For each species, when applying cover class, ensure that the total cover class represents no more than the sum of cover assigned for all layers, but is also at least as large as the greatest cover class assigned to any one layer. For species occurring in more than one layer, it may be useful to keep track of actual % cover estimates in crib notes to ensure the total cover class is estimated correctly.

When collected: Each unique species present on current subplot

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

SUBPLOT SPECIES CANOPY COVER CLASS LAYER 1 AND 2 (0-6 ft)

Estimate the total canopy cover class of the foliage for each plant species in Layers 1 and 2 combined, 0 to 6 feet above the ground, over the entire subplot area. A rapid canopy cover estimate is made, ignoring overlap among species. For plants rooted in the subplot, but with no foliage in the combined Layer 1 and 2, enter 0 or leave blank. Cover class assigned to any one layer cannot be greater than the value assigned for the total cover class for that species.

When collected: Each unique species present on current subplot

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

SUBPLOT SPECIES CANOPY COVER CLASS LAYER 3 (>6-16 ft)

Estimate the total canopy cover class of the foliage for each plant species in Layer 3, >6 to 16 feet above the ground, over the entire subplot area. A rapid canopy cover estimate is made, ignoring overlap among species. For plants rooted in the subplot, but with no foliage in the Layer 3, enter 0 or leave blank. Cover class assigned to any one layer cannot be greater than the value assigned for the total cover class for that species.

When collected: Each unique species present on current subplot

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

SUBPLOT SPECIES CANOPY COVER CLASS LAYER 4 (> 16 ft)

Estimate the total canopy cover class of the foliage for each plant species in Layer 4, >16 feet above the ground, over the entire subplot area. A rapid canopy cover estimate is made, ignoring overlap among species. For plants rooted in the subplot, but with no foliage in the Layer 4, enter 0 or leave blank. Cover class assigned to any one layer cannot be greater than the value assigned for the total cover class for that species.

When collected: Each unique species present on current subplot

Field width: 1 digit

Tolerance: +/- 1 canopy cover class

MQO: At least 90% of the time

Values: Canopy Cover Classes –

t <1% 4 21-40%

1 1-5% 5 41-60%

2 6-10% 6 61-80%

3 11-20% 7 81-100%

**UNKNOWN SPECIES SPECIMEN COLLECTION AND HANDLING**

When you encounter a species you cannot identify quickly and confidently using field guides, follow these basic steps:

1. Assign a valid NRCS PLANTS Genus or Unknown CODE and appropriate unknown number to the specimen
2. Record if you collected the specimen, and if not explain why not in the species notes\
3. When a specimen is collected, enter the specimen label number on a 1-gallon plastic bag using a sharpie
4. In addition, record on the baggie:
   * + Date
     + Collector name
     + State
     + County
     + Natural community where found
     + Substrate conditions – soil moisture, landscape position
     + Species associates – common or diagnostic plants occurring with unknown plant
     + Species notes
5. Place only one unknown specimen in each baggie.
6. Describe any newly encountered unknown species in Plot Species Notes
7. Record the quadrat occurrence or canopy cover estimate for the subplot in which the plant was encountered, as for any identified species.
8. Store the specimens in a safe place to avoid crushing during plot work, and then store in a cold cooler during transport from the field to the office
9. Once the specimens are returned to the office, they should be refrigerated until they can be pressed or delivered to a botanist for identification. Specimens must be pressed within a week of collection if they will not be identified within that timeframe.
10. When delivering to a botanist for identification, provide an email address to which final identification can be delivered.
11. When a final identification is made, revise the species codes in the appropriate data sheets.

Example of Data to be Included on Specimen Baggie

Label #: CAREX1-18-2 (unknown carex, unknown #1, plot 18, subplot 2)

Date: 8/6/2011

Collected by: DHB

State: VT

County: Bennington

Natural Community: mature Northern Hardwood forest

Substrate: well-drained loamy soil, shallow to bedrock, eastern exposure, 2200’ elevation

Associates: DRIN5, HULU2, OXMO, MACA4