VEGETATION SURVEY HANDBOOK

NATURAL HERITAGE NEW MEXICO

DEPARTMENT OF BIOLOGY

UNIVERSITY OF NEW MEXICO

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Natural Heritage New Mexico Vegetation Survey Protocols

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Plot Establishment Guidelines and Techniques

Locating a plot: How plots are located varies with the survey/experimental design. For mapping/classification purposes where the intent is to place a plot in a stand of homogeneous vegetation, aerial photos and/or field reconnaissance generally determine where a plot is going to be established. Plots should be allocated to cover the range of variation in a study area (with the help of soils/geology and topographic maps), but for logistical purposes this usually still entails landscape cluster sampling by a team usually in a small target watershed with a variety of habitats and vegetation types (but clusters should be widely separated). Where a map/photo is available, plot locations can be determined beforehand with prescribed UTM locations (often used in map validation) and navigated to with a GPS.

Plot size and design: Standard plots (STP) are typically 400 sq. meters and either circular with an 11.3 m radius or square and 20 m on a side. These are the typical dimension for a forest or closed woodland. They can vary in dimension depending on the vegetation type. For riparian types, long and narrow (10 x 40 m) plots, fitted into the linear structure of a river bar or terrace is a common design. In large, for open savanna or grassland types, the plots may need to be larger (50 x 50 m or more) to capture tree numbers successfully and sub-sampled to determine shrub/herbaceous cover. This sub-sampling is done with a series of 40, 1 m quadrat frames or a set of 3 to 5, 10 x 10 m quadrats in which species covers are estimated and then averaged. For small patch communities, i.e. vegetation around a spring or a cryptogam community, the plot size may be as small as a 10 x 10 by itself or even a single quadrat frame in the latter case. Use a cloth tape or a self winding "Spencer" tape to measure the boundaries. Species lists include all identifiable species found within the plot.

Monumenting a plot: Typically, the plot will be monumented in the center of a circular or square plot; or sometimes at the corners of square or rectangular plots, or if there are transects such as in a monitoring plot, at each end of a transect. Monuments are usually 3/8" rebar driven 0.5 m or more into the ground to ensure stability. They can extend anywhere from 5 cm to 1 meter above the surface depending on the circumstances. Where aesthetics is not an issue and for ease of relocation, the rebar should be covered with ½ inch PVC pipe that can act as visible extensions of the rebar. The rebar should be tagged with permanent steel tags that are wired near the base with bailing wire or similar gauge. Where possible, have the tag flush with the ground.

Photo points: The intensity of photo documentation varies with the purpose of the project. At a minimum, there should be a single photo taken from above the center monument stake or GPS location in a direction that best encompasses the character of the plot. Additional photos can be taken at 90 degree angles from each other around the central monument (if there is a slope, photos should be across the slope, up slope and down slope). In the case of transects, photos should be taken from both ends looking back along the line. **Record the azimuth (direction of the photo) and the focal length of lens being used.** Photos taken off monuments back at the plot or at elements of special interest are not normally considered for repeat photography.

Instructions and Forms

General Plot Description:

(General Plot Desc. Form 2 or Standard Form - Page 1)

PLOT ID: (seven-character alphanumeric code)**. [Required]**
This is the master NMNHP record identification number for all sampling at the site. All subsequent sampling or other independent data at the site will be tied to this number. It must be unique and is formatted as follows:

[1] Suggested citation Muldavin, E.H., E.R. Milford, and Y Chauvin. 2009 (updated 2023). Natural Heritage New Mexico Vegetation Survey Protocols. Natural Heritage New Mexico Report No. 426. University of New Mexico. 15.p (https://nhnm.unm.edu/publications-search)

Record in order: the year (2-digits), the first and second initial of lead surveyor as designated under the Surveyors field (2-characters) or the assignment as designated for the project (2-characters), and the plot ascension number (3-digits).

Example (lead surveyor): The 33rd plot sampled in 1991 by Hank Gleason would be entered as 91HG033.
Example (project assignment): The 54th plot sampled in 2003 at Bandelier would be entered as 03BD054.

Monitoring data are assigned sub-record monitoring numbers under the PLOT ID, as are any quadrat sample numbers.

Monitoring / Analytical plots (AP) are variable, but the general design is two parallel 30 m transects spaced 5 m apart within a 13.3 x 30 m macroplot (400 sq. meters). 1 m quadrat frames are placed at every third meter and cover estimated to the nearest 1% class and the median height measured to the nearest 1 cm. Since the exact spot is re-measured over time, the tapes must drawn tight, through shrubs not around¸ and as near the ground as possible. The quads should be aligned along one side of the tape with the inside of the corner of the frame at the position mark on the tape. Precision is key to good data in monitoring, particularly grasslands.

Along each line, 150 point intercepts are read for basal cover (intercept at ground level) at every 20 cm, starting from a different random location on the line for each monitoring session.

Quadrat framing and point intercept are the most precise methods and other ocular estimates of cover must be calibrated to them (plot cover estimated using scalars).

PLOT TYPE: [**Required]**

RP = Releve or Reconnaissance plot. Full species list of both plot and stand are recorded and their abundance estimated. Both releve and standard plots include an in depth floristic analysis that not only allows for community classification, but also provides species richness and diversity. May also include Element Quality Ranking using the ranking form.

STP = Standard plot are primarily used for plant community classification and all identifiable species within the plot are recorded and their abundance estimated. Site information includes GPS location, 4 photos showing the general character of the site, along with a detailed description of the site.

QP = Quick plot are generally used for vegetation mapping ground control or rapid assessment. They are the same size as standard plots but only the dominant and most common species are recorded in each strata along with their abundance and total cover for the strata to ensure proper identification of the type to the plant association level. Ground cover should also be recorded. Site info includes as a minimum the GPS location, two photo showing the general character of the site, along with a brief description of the site to provisionally rank the quality of the occurrence. Other attributes may be included depending on the project.

OPT = Observation point with mostly qualitative data on an occurrence, including: dominant species recorded with their abundance, location, community type and size; and at least one photo.

AP = Analytical plot are variable, but the general design is two parallel 30 m transects spaced 5 m apart within a 13.3 x 30 m macroplot (400 sq. meters). 1 m quadrat frames are placed at every third meter and cover estimated to the nearest 1% class. Median height is measured to the nearest 1 cm. Since the exact spot is re-measured over time, the tapes must drawn tight, through shrubs not around¸ and as near the ground as possible. The quads should be aligned along one side of the tape with the inside of the corner of the frame at the position mark on the tape. Precision is key to good data in monitoring, particularly grasslands. Quadrat framing and point intercept are the most precise methods and other ocular estimates of cover must be calibrated to them (plot cover estimated using scalars). Analytic plots usually include full species list of both plot and stand with sub-sampling of abundance (usually quadrat based).

OVP = Observation video plot; community type or size is interpreted from either video or aerial photography.

OSP = Observation scope plot is used for surveys of plants growing on steep cliff faces that are otherwise inaccessible.

OPP = Observation photo points are generally used as supplemental points for vegetation mapping or to record the location of other element occurrences (i.e. specific plants or animals) and include GPS location and short description of photo.

FSP = Floristic survey plot is used for general plant inventories when site information is not required and location encompasses an area greater than a standard size plot. Quantitative data is not recorded.

PROJECT: Project code – for example: LANL98. If no code is available, enter temporary project designation. **[Required]**

SUBPROJECT: Subproject code if applicable

MO DATE YEAR: Two digit month, day and year numbers. **[Required]**

PA: Plant Association (community type) to which vegetation data refers to. Use six (seven) letter species acronyms. For example: PINPON/QUEGAM. Whoever makes the CT determination must date and initial the designation. Refer to the NMNHP vegetation classification for current types and acronyms. If the type does not appear to match any on the list, assign a temporary name and indicate your reasoning behind the assignment in the **PA COMMENT** field. If you are uncertain about what to call it, enter **UNCLASS**.

PA Comment: Comments on plant association designation. Indicate whether it was assigned in the field or in the office; was vegetation key used or an analysis of the quantitative data etc. If you assigned a new acronym, indicate your reasons for the designation and any specific decision rules you have developed. If CT is questionable, make notes concerning the problem.

Key: Check off if a community key was used to determine the plant association.

Map Unit is usually assigned in the office

FIELD POINT ID: Alphanumeric code for GPS point assigned on field maps from GIS for plot location target (this is an approximate location based on imagery and should be evaluated for stand consistency prior to plot placement).

SURVEY SITE: Name assigned to the plot site at the time it is sampled, or the name of the site on a Survey Site form if it had been previously surveyed.
Naming guidelines:
1. Do not use element names in the site name
2. Use local place names when available or features on topographic maps.
3. Avoid names that are too generalized such as “Spring Site” or “Flat Top Mountain.”
   Good examples: “Lower Big Gyp Mountain East”, “Animas Canyon Main Spring”
4. Avoid using temporary GIS-based designations such as “Site 6b” or “polygon 41”

SURVEYORS: Last names and initial of first name of sampling personnel**, led by the person responsible for botanical determinations**.

LOCATION/ DIRECTIONS: Provide a brief description or place name that further defines where the survey site is located, so that a person reading the plot does not have to reference a map to know approximately where the site is, e.g., “the upper north slope of Freelove Canyon.” Give the directions as necessary to ensure that the plot can be relocated with ease, as needed. Directions to remote areas can be given as arrow marked routes on a topo map, or by a sketch on the back of the form. Indicate if the route is marked on the back or on a topo map.

COUNTY and STATE: Abbreviations. (NMNHP code for the county assigned when entered into Biological Conservation Database − BCD).

MAP NAME: Map used to locate and mark plot, usually the USGS 7.5' topographic quadrangle map name. If duplicate maps are used, indicate by adding 1, 2, 3 etc. at end of map name.

FIELD MAP #: Which copy of the quad map was the plot marked on.

MARGNUM: Margin number on the field map associated with the mapped plot position. Each plot position within the map is marked with a dot and associated margin number. The margin number for the plot is also placed along the margin of the topographic map. Associated with each margin number is a margin note indicating the PlotID, CT acronym and, in parentheses, the 10,10 (described below).

10,10: The 10,10 is an imaginary grid over the topo map, (10 cells across and 10 cells down) to facilitate locating the dot at a later time on the map. For example, (5,6) indicates 5 cells across from left to right and 6 cells down from top to bottom. This would be almost half way across the map, and more than half way down.

GPS Unit: Write name and number of GPS unit used, such as: Garmin 1, 2, 3, etc. or Trimble 221230 (UNM Number).

GPS File: List the name of the file, either default point assigned by unit or name designated by user.

UTM: Enter **Easting** and **Northing** UTM coordinates and **Zone**. Datum as either **NAD27** or **WGS84**. If something else was used, please indicate such in the comment field.

PREC (PRECISION): +/- meters from GPS unit:

MONUMENT: Check off if plot is permanently marked, indicate with what (rebar, PVC, etc.), where it is located (such as center of plot) and height of marker (note whether ft or m). Indicate if it was used as a photo point.

PHOTO PT.: Indicate if there is a permanent photo point established and describe its location, e.g., "over the plot monument" or elsewhere and how it is monumented for repeat photography. Indicate the height of the camera (**CAM Ht)** from the surface of the ground to the mid-point of the lens.

LOG #: Indicate name or number assigned to the photo log. Check box for either digital or film pictures (D☐ / F☐**)**.

PHOTOGRAPHER: record the initials of the person taking the photographs

PP1 – PP8: Photo points: Indicate each photo taken of, or from the plot, with indication of direction (**AZM**), focal length (**FocLen)** and subject (**Notes)**. e.g., "looking N across entire plot" or "looking to the western horizon towards the Tularosa Basin." Photos should have plot numbers, date and project name on a chalk board, flip pad or something similar, and a reference to show scale, but preferably not people (at least not in the center of the picture). High precision repeat photo points should be done on a tripod and the height indicated along with the focal length of shot.

OTHER SITE PHOTOS: indicate if other photos were taken of the PA and surrounding landscape.

ELEV: Elevation *in feet* unless otherwise noted.

SLOPE %: Enter the angle of the slope on which the plot occurs in *percent slope.*

ASPECT: Enter the *azimuth (0-360 degrees)* of the slope aspect on which the plot occurs.

SLOPE SHAPE: Enter one of the following codes to indicate the vertical shape of the slope on which the plot lies.
S - straight or even
R - rounded or convex
D - depression or concave
P - patterned (micro-relief of hummocks and swales)
U - undulating pattern or low ridges or knolls and draws
X – other, explain in landform comments section.

LANDFORM: (six number code)**.** Enter the landform name (or describe it as best you can in the comments field below) and the **code** as classified in the **NMNHP Landform Classification Handout**.

LANDFORM/GEOLOGY/SOIL COMMENTS: Additional comments of landforms and rock types in the EO and surrounding landscape and comments on soils including soil texture by feel using standard SCS techniques and the soil triangle and/or evidence of dune formation and/or erosion.

SITE /VEG SUMMARY: Is a description (a "word picture") of the site and community sampled. Indicate stand dominants, the structure and physiognomy of the community along with a landscape position and site features narrative (including geomorphology, soils and geology). Indicate successional status if known (e.g. climax (old growth); young second growth). Reserve other condition comments for Condition section below. Use clear, complete sentences and avoid extraneous personal comments that do not belong in a scientific database (no jokes please or comments in bad taste; these plots are long-term records that will be read again and again in the future).
Adjacent Communities: Indicate surrounding plant associations and the spatial relationships (e.g. the occurrence is a matrix community with other smaller patch communities within it, or vice versa). Indicate the width and nature of ecotones to other communities.
Disease/exotics: Dwarf mistletoe damage (give a rating of average % extent spread of within and among trees); insect damage (SPRUCE BUDWORM); fungal rot and rusts.
Animal use evidence: Wildlife browse damage, sightings and sign (bird calls, tracks, scat and animal disturbances such as beaver dens, gopher holes etc., and remember the insects).
Condition (Disturbance, Fragmentation, Erosion): Describe disturbances both natural and otherwise, their extent, intensity and time frame: livestock grazing utilization and impacts; roads, number and distance from; logging and fuelwood cutting; buildings and obstructions; and fires, floods, landslides, significant recent erosion features, etc. Estimate frequency and degree of disturbance (light, moderate, heavy, etc.). Indicate degree of element fragmentation, i.e., reduced patch size and corridors, and other watershed -level impacts (dams, parking lots, settlements).
Distance: If relevant, note the distance in kilometers to the nearest human disturbance such as roads, dams, clearcut, housing mine dump, etc.).

On the Standard Data Form the summary description is condensed space wise, but should include the above information from Site/Veg Summary to Distance.

SURFACE ROCK TYPE: Enter the code for the dominant surface rock type:

Igneous

ANDE - andesite
BASA - basalt (including obsidian)
DIGA - diorite to gabbro
GRBG - granite and biotite granite
IFAL - igneous felsic(acid) alluvium
IGTU -.igneous type unknown
IMAL - igneous mafic(basic) alluvium
LATI - latite
MIIG - mixed igneous
PUMI - pumice
QUMO - quartz monzonite
RHYO - rhyolite
SCOR - scoria (porcelanite), clinker
TRSY - trachyte and syenite
WETU - welded tuff (tufa)

Metamorphic

ARGI - argilliate
BISC - biotite schist
CAAR - calcareous argillite
GNBG - gneiss and biotite gneiss
MEAL - metamorphic alluvium
METU - type unknown
MIME - mixed metamorphic
MISC - mica schist
PHYL - phyllite
QUAR - quartzite
SCHI - schist
SILI - siltite
SLAT - slate

Sedimentary

CACO – calcareous conglomerate
CASA - calcareous sandstone
CASH – calcareous shale
CASI - calcareous siltstone
CLAY – claystone
CONG - conglomerate
DOLO - dolomite
LIME - limestone
MISE - mixed sedimentary
MUDS - mudstone
RESH - red shale
SAND - sandstone
SCAL – sedimentary calcareous alluvium
SETU - type unknown
SHAL - shale
SILT - siltstone
SNCA – sedimentary non-calcareous alluvium

Miscellaneous

ASHT - ash (of any origin)
CLAL - clayey alluvium
DUNE - sand dunes
GLTI - glacial till, mixed origin
GRAL - gravelly alluvium
GYPS - gpysum
LOES - loess
MIAL - mixed alluvium (full range of textures)
MIRT - mix of two or more rock types
NONE – no surface rocks
NORE – not recorded
SAAL - sandy alluvium
SIAL - silty alluvium

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PLOTDIM(m): Plot size and shape entered in meters.

L/R: Plot Radius or Length - enter plot radius (for circular plots) or length (for rectangular plots). Indicate units of measurement. Note: a 400 m squared plot has a radius of 11.3 m (37.1 ft); a 100 m squared plot has a radius of 5.6 m (18.5 ft)

PLOT W: Enter width if a rectangular plot shape is used. Enter 0 (numeric) if a circular plot shape is used. Indicate units of measurement

OCC SIZE: (hectares/acres). Occurrence or total stand size surrounding the plot. Indicate if the area was estimated on the ground or from a map. This information is very important for accurate mapping.

EO/PA MAPPED: indicate whether or not the EO boundaries were mapped on an aerial photo, topo map, or sketched on the back of the form. **List number(s) of aerial photos used**. Use sketch maps to help explain relationship among stands and plots in the area as necessary. A **solid** line indicates an actual boundary and a **dashed** line indicates a boundary of unknown extent.

MANAGEMENT/CONSERVATION/ OTHER COMMENTS: Comment on any stewardship (new or additional) needed to ensure continued existence of the community occurrence, and chances (and means) of bringing it about. Any other pertinent comments go here as well, e.g., "... clearing of competing vegetation has been tried in the past but without success". Comment on the conservation attributes of the occurrence, long-term viability and threats. Also, add miscellaneous comments from all sections. Again, no jokes please or comments in bad taste.

FORMS CHECKOFF: please indicate if other forms were used besides those given.
Forms: ☐ Floristics ☐ Trees ☐ Soils ☐ Quadrats ☐ Point/Line Intercept ☐ EO Assessment ☐ Site Evaluation

Floristic Inventory (Form 3)

PLOT ID: (seven-character alphanumeric code)**.** NMNHP standard record tracking number (see general description – Form 2).
BOTANIST: Name of person responsible for assessing the botany.

DATE: Date of vegetation inventory. Two-digit month, day and year numbers.

GROUND SURFACE: Enter % cover fraction for each of the following types of cover as they occur over the surface of the plot (use either HCC or BV, but not both) (the total cover must add up to 100%).
S - exposed soil: particles < 1/16 in. (2 mm dia.)
G – gravel: particles 1/16 to 3 in. dia. (2 mm to 7.5 cm dia.)
R - rock as composed of cobbles, stones and bed rock: particles > 3 in. (>7.5 cm dia.)
L - litter and duff. Litter includes dead and detached vegetation, freshly fallen leaves, needles, twigs < 2 in. (5cm), bark, fruits, seeds; duff is decomposed litter (fermentation layer and humus layer)
HCC – herbaceous canopy cover is the total combined canopy cover of forbs and graminoids, including attached litter and current years standing dead annuals, and does not include overlapping cover where canopies interlock
BV - basal veg, the percent of soil surface covered by plant bases
WO – woody, downed debris: > 2 in. (5 cm dia.)
M - microphytic (cryptogams) crust cover; mosses, lichens and algae on soil surface (excludes cover found on logs, rocks and tree bases)
WA – water, standing pools of water or streams if within the plot.

VEGETATION COMPOSITION AND ABUNDANCE CONVENTIONS: All species within the plot **and/or** in the stand, depending on plot type, are listed by Strata/lifeform categories (See the NMNHP species list for lifeform classification of individual species).

SPECIES NAME: Use the accepted acronyms from the current NMNHP species list or spell out the species scientific name. **Do not use common names**. If the species is not on the list, spell it out.

Tree species can occur in several height strata and should be listed separately under different acronyms representing different operating taxonomic units (OTU's). A number is attached to the end of the acronym to indicate which strata the OTU is from. For example: PINPON0 represents *Pinus ponderosa* seedlings of the forb layer, PINPON1 represents saplings < 1 in.

dia. of the dwarf shrub layer, PINPON2 are saplings 1 in to 2 in. dia. of the shrub layer, and PINPON3 are mature trees of the tree layer.

If you do not know the name of a species, but know the genus or family, enter those acronyms or **spell out the name**. Otherwise indicate unknowns with the code UNIDT for unknown trees; UNIDS for unknown shrubs; UNIDDS for dwarf shrub, etc. for each different unknown species with in the different lifeforms. The species ID number will differentiate them.

SPECIES ID NUMBER: Each species that is listed has a line number on the form associated with it by strata/lifeform (T1, S3, G10, F20, etc.). Blank species number lines are available on the forb side of the form for additions: grasses, shrubs, and trees. **Circle the species number when a voucher has been taken for that species**.

Ht: Modal height of each species to the nearest *meter* for trees, nearest *half meter* for shrubs, and *decimeter* for grasses and forbs, but measured in meters. For example a 3dm high grass would be recorded on the data sheet as 0.3m.

P: Phenology. Use "*****" for flowering or "**@**" for fruiting; "**X**" if it is a dead annual; and leave blank if vegetative.

VOUCHERS: When a **voucher specimen** is taken for species identification, the species ID number **MUST BE CIRCLED** on the plot sheet, and the plot number and species number put on the plant tag or collection sheet of the voucher.

Voucher Tag Format:

Plot ID	Date
Species ID #	Project

05YC001	3/30/05
G5	BAND-Val

If an unknown species from a previous data form is referred to on the current data sheet, **be sure the plot and species ID numbers** that the plant refers to are recorded on the current data sheet and the species ID number is **circled**. For example if you're at plot 05YC001 and you collect UNIDG5 (G5 should be circled on this plot form), then at plot 05YC004 you have the same unknown grass that is the 2nd grass on this data form; **circle G2** and write **05YC001-G5** after the species ID number. If you **know the genus or family, enter those acronyms** or **spell out the name** before the plot ID number.

Data sheet from 05YC004:

```
|G1 MUHMON                    | @| 20 |  .4||                    |  |    |    ||
|G2 BROMUS - 05YC001-G5       |  |  5|  .2||                    |  |    |    ||
|G3                           |  |    |   ||                    |  |    |    ||
```

Circle G2

TREES: usually single bole with lateral branches, and with the potential to grow over 5 m tall (some may be less than 5 m such as various *Juniperus* spp.). See NMNHP species list for lifeform classification for verification.

SHRUBS: usually multi-stemmed woody species, spiny rosettes or succulents (cacti, yuccas and agave etc.) with the potential to grow greater than 0.5 m, but less than 5 m tall.

DWARF SHRUBS: usually multi-stemmed woody species, spiny rosettes and succulents (cacti, yuccas and agave etc.) less than 0.5 m. Small suffrutescent species that are only woody at or near the base or at the root-crown are usually considered forbs, e.g., *Eriogonum*. See the NMNHP species list for lifeform classification.

GRAMINOIDS: grasses and grass-like plants such as sedges and rushes, but not showy flowering monocots such as iris, lily or dayflower (Iridaceae, Liliaceae or Commelineceae).

FORBS: non-woody perennial and annual species that are not grass-like (includes monocots of the Iridaceae, Liliaceae, Commelineceae).

TOTAL COV. (BY STRATA): percent aerial cover for tree, shrub, dwarf shrub, graminoid and forb layers. This the total canopy cover of a strata as projected over the surface, regardless of species, and does not include overlapping cover where canopies interlock within a strata. ***Note: cover cannot exceed 100%.** For graminoides an additional category is added for **% green** which includes the current years growth (green or tawny), but disregards the standing dead litter (grey).

COV.: percent cover for each species within the plot is estimated by either directly using the precision guidelines below, *or* the Modified Domin-Krajina scale in Table 1 (both are at the bottom of Floristics-Form 3 and Standard Data Form).

Be sure to check box on data sheet to indicate which cover type is used.

Percent Cover Estimation Precision Guidelines:

+0 ─ species outside the plot, but within the stand

+ ─ for < .05% (trace <0.2m^2/400m^2)

0.1% ─ for .05 - < 0.5% (>0.2m^2 - <2.0 m^2 /400m^2)

0.5% – For .5 - < 1% (>2.0 m^2 - <4.0 m^2 /400m^2)

1-10% to the nearest 1% (each % equals 4m^2/400m^2)

10-30% to the nearest 5%

30-100% to nearest 10%

Table 1. Cover Scale - Domin-Krajina cover-abundance scale.

Scalar	Cover Range	Concept	Midpoint Value	Data Value	m^2 / 400m^2
+0	N/A	Outside quadrat	0.001	.001	
+	<0.05%	Solitary or very few	0.025	.025	<.2m^2
1	0.05- 0.124%	very scattered	0.0875	0.1	0.2m^2 - <.5m^2
2	0.125- 0.99%	scattered	0.56	0.5	.5 m^2 - <4 m^2
3	1.0 - 4.9%	common	3.0	3.0	4m^2 - <20m^2
4	5.0 - 9.9%	well-represented	7.5	7.5	20m^2 - <40m^2
5	10.0- 24.9%		17.5	17.5	40m^2 - <100m^2
6	25.0- 32.9%	abundant	29.0	29.0	100m^2 - <132m^2
7	33.0 - 49.9%		41.5	41.5	132m^2 - <200m^2
8	50.0 -74.9%	luxuriant	62.5	62.5	200m^2 - < 300m^2
9	75.0 - 94.9%		85.0	85.0	300m^2 - <380m^2
10	95.0 -100.0%	full cover	97.5	97.5	380m^2 - 400m^2

STANDARD DATA FORM
The Standard Data Form is a combination of the General Plot Description (Form 2) and the Floristic Inventory (Form 3) on a single page, with the data fields in the same order as the previous forms. This form can be used for Standard Plots, Quick Plots, and Observation Points.

STANDARD DATA FORM – Page 2 is a continuation of the floristic inventory portion of the data form when more space is needed for additional species.

QUICK PLOT/OBSERVATION POINT FORM
This form is a condensed version of the Standard Data Form and has 3 observation points per page.

TREE INVENTORY FORM
In forested plots, the total number of trees is counted by species and size class. For each species and size class the count would be done using a dot/line matrix:

. .
. . One dot is used as each of the four corners and represents one tree. Lines are then used to connect the dots and cross from corner to corner.

 Each line also represents one tree. A complete box =’s 10 trees.

For each species, the size class is divided into three categories. The upper box is a count of the live trees in the stand. The two lower boxes are divided into stumps (which are trees that have been cut) and snags (which are standing dead trees).

Element Occurrence Condition Evaluation

The ranking of a plant community element occurrence (EO) within a site focuses on three sets of factors: condition, landscape, and size. These are based on concepts originally developed by the Natural Heritage Network and The Nature Conservancy, and derived from protocols developed by the New Mexico Natural Heritage Program as part of its statewide wetland/riparian assessment project. All factors are weighted based on their importance for evaluating ecosystem function and biodiversity value. These weights vary depending on the type of ecosystem being considered, e.g., riparian communities are weighted strongly on hydrological regime, whereas upland communities may receive more emphasis on fire regime. For the pilot project, weighting specifications were developed for upland plant community occurrences. Where information is lacking for any given variable it is not considered in the ranking process. The overall intent is to create a set of consistent criteria for each element that can be used universally to compare occurrences not just at the local level, but the regional and national as well.

Condition Factors

There are nine condition factors that relate directly to the status of a given element occurrence (Table 1); these factors are usually based on direct field measurements of representative stands within a site. Exotic encroachments are considered to be very important indicators of ecosystem health in riparian systems (10 weight) and moderate indicators in uplands (5 weight). There are separate categories for exotics in the canopy versus the understory because of their differing effects on ecosystem structure and function. Structural diversity and cover reflect changes to the expected natural expression of a community as a function of utilization, e.g., logging and fuelwood removals, grazing, etc. Similarly, species richness is a measure of departure from the norm as a result of disturbance. The measurement of fuel loads speaks to the possibility that a given EO might be adversely affected or catastrophically removed due to human-induced fire hazards (fuel loads might be weighted higher in a non-fire-adapted riparian system than in a fire-adapted upland one). Erosion, although a natural process, can also be accelerated as function of disturbance, but the effect of disturbance will vary from community to community. Streambank conditions apply to wetland/riparian occurrence only. Contaminants range potentially from excess nitrogen from sewage outfalls to radioactive dumps. Lastly, parasites and infestations (insect, fungal or microbial) are perhaps some of the best measures of ecosystem health.

Landscape Context Factors

Beyond immediate impacts, an element occurrence is also subject to landscape-level processes that affect its condition and perhaps more importantly its long-term sustainability. Accordingly, there are seven landscape-level parameters considered in the ranking process that can be evaluated through a combination of field studies, historical inquiry and GIS-based map analysis. The first three center on the hydrologic regime and pertain primarily to wetland/riparian community assessment. Stream flow changes, lateral stream movement, and channel condition are best addressed through analysis of historical records, monitoring, and field assessment. Analogously, fire patch size and fire frequency can be addressed by a reconstruction of the past record through tree-ring fire-scar evidence and historical photography, as well as current stand structures as they might reflect fire history.

The last two parameters, landscape impact/fragmentation and landscape community diversity and function, can be evaluated to some degree through field studies. However, GIS-based map analysis can be a powerful evaluation tool because it can reveal the pattern and underlying structure of a site and the relationship of any given element to the landscape. This type of analysis requires detailed and accurate spatial information, e.g., good vegetation maps, road and impact coverages, high-resolution digital elevation models, etc.

Size Factor

Because of its importance in ecological assessment, size is considered independently of condition and landscape context. Greater size implies greater buffering against impacts and hence greater stability and long-term viability within the context of the natural dynamics of the ecosystem.

Table 9.5.1.1. Soil texture classes.

Soil texture	Abbreviation
Gravel	g
Very coarse sand	vcos
Coarse sand	cos
Sand	s
Fine sand	fs
Very fine sand	vfs
Loamy coarse sand	lcos
Loamy sand	ls
Loamy fine sand	lfs
Sandy loam	sl
Fine sandy loam	fsl
Very fine sandy loam	vfsl
Gravelly sandy loam	gsl
Loam	l
Gravelly loam	gl
Stony loam	stl
Silt	si
Silt loam	sil
Clay loam	cl
Silty clay loam	sicl
Sandy clay loam	scl
Stony clay loam	stcl
Silty clay	sic

Clay	c

able 9.5.1.2. Terms for rock fragments.

Shape and size [mm]	Adjective
Spherical and cubelike:	xxx
2 - 75	gravelly
2 - 5	fine gravelly
5 - 20	medium gravelly
20 - 75	coarse gravelly
75 - 250	cobbly
250 - 600	stony
> 600	bouldery
Flat:	
2 - 150	channery
150 - 380	flaggy
380 - 600	stony
> 600	bouldery

Table 9.5.1.3. Modifier for rock fragments.

Rock fragments by volume [%]	Adjectival modifier
< 15	no modifier
15 - 30	gravelly loam
30 - 60	very flaggy loam
> 60	extremely bouldery loam

The distinction between a mineral and an organic horizon is made by the organic carbon content. Layers which contain > 20 % organic carbon and are not water saturated for periods more than a few days are classed as organic soil material. If a layer is saturated for a longer period it is considered to be organic soil material if it has:

- = 12 % organic carbon and no clay, or
- = 18 % organic carbon and >= 60 % clay, or

- 12 - 18 % organic carbon and 0 - 60 % clay.

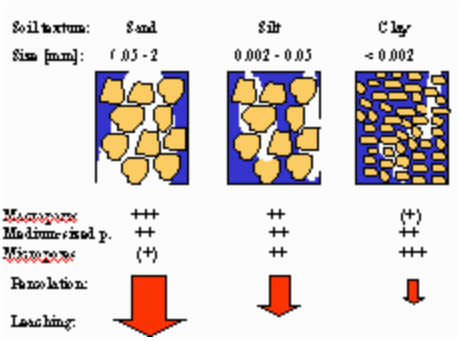

Figure 9.5.1.2. Relationship between soil texture and pore size.

Information provided by: http://www.soils.wisc.edu