Riparian Monitoring of Wadeable Streams Protocol Implementation Plan for Park Units in the Southern Colorado Plateau Network

Standard Operating Procedure (SOP) #4

Measuring Vegetation

Version SCPN_Riparian_SOP4_20180930

Revision History Log:

Previous Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #

This SOP is adopted from the Northern Colorado Plateau Network's SOP #6 Measuring Vegetation, Version 1.14 (March 2018) in Weissinger, R., D. Witwicki, H. Thomas, A. Wight, K. Lund, and M. Van Grinsven. 2018. Riparian monitoring of wadeable streams protocol for park units in the Northern Colorado Plateau Network: Version 1.05. Natural Resource Report NPS/NCPN/NRR—2018/1636. National Park Service, Fort Collins, Colorado

This SOP describes methods used to conduct vegetation sampling in a reach. SCPN vegetation sampling includes *cover* of dominant species along cross-section transects, *frequency* of exotic plant species in 1-m^2 quadrats, canopy closure, *density* of tree species by diameter in a 5-m belt, and a census of all large diameter trees (≥25 cm at breast height) in the reach (Figure 1). A list of necessary equipment for these procedures can be found in SOP #1.

A two-person team comprised of a data recorder and an observer skilled in plant identification can efficiently complete the tasks described below. Generally, it will be easiest to record point-intercept data first, then record exotic frequency and canopy closure as you walk back along the transect. It is important to record understory measures first as they are susceptible to trampling

impacts. In dense vegetation, tree density measures in the 5-m belt may require two passes along the transect.

For all vegetation sampling, record the full Latin name of each species the first time it is encountered at a reach. Any additional times the species is encountered, use the six-letter code composed of the first three letters of the genus and specific epithet.

1. Point-Intercept Cover

Point-intercept sampling is used to sample vegetation on seven cross-section transects of varying length at a 0.5 m intervals.

1.1 Cross-section transects

Fill out the top of the data sheet including:

Park Code: Use the standard 4-letter code to indicate the park unit.
Reach ID: A pre-assigned, unique code provided for each stream reach.
Transect #: 1-7, upstream to downstream.
Observer: Record the initials of the person calling out the intercept data.
Recorder: Record the initials of the person recording the data.
Date: Use the format mm/dd/yyyy

Record point-intercept data for understory species and tall shrubs.

A. Stand on the downstream side of the transect and work from river right to river left. River right and river left are determined while looking downstream.

B. Start at 0.5 m on the tape and move forward 0.5 m for each consecutive point. The final point sampled is the last half meter interval before the transect end point.

C. If there is a shrub canopy layer taller than 1.5 m from the ground surface, use a densiometer to sample the top canopy layer.

a) Position a fully extended monopod (1.5 m tall) on the downstream side of the tape at the correct point. Extend the laser out perpendicular to the tape so that you are sampling on the upstream side.
b) Use the bubble on the monopod to level the laser.
c) Position the densiometer on the monopod just above the laser.
d) Use the bubbles inside the densiometer to level it in both directions.
e) With both the monopod and the densiometer leveled, determine what species of vegetation, if any, is located at the crosshairs of the densiometer.
f) Record the species in the top canopy on your data sheet (see section F below).

Tree species taller than 1.5 m from the ground surface are not recorded with the densiometer. Trees are only recorded when hit by the laser at a height of under 1.5 m.

D. Sample vegetation less than 1.5 m tall and the ground surface.

a) Position the monopod on the downstream side of the tape at the correct point. Extend the laser out perpendicular to the tape so that you are sampling on the upstream side.
b) Use the bubble on the monopod to level the laser. With the laser leveled, push the button to sample the point. **Be careful not to point the laser at anyone's eyes. It can cause serious damage.**

E. Once you have recorded a hit, move the uppermost vegetation away so that you can take subsequent hits for lower canopy and surface layers. If it is difficult to keep the monopod level and record hits, have one person hold the monopod level while a second person reads and records hits. On a windy day, it is important to turn the laser on for just a second to record a hit.

F. With the laser leveled, record every plant species it intercepts. Record each canopy species no more than twice, a maximum of one live hit and one dead hit, even if it is intercepted several times. Record the following information for each point:

1. **Top Canopy** - Record the species of the top plant intercepted in the "Top canopy" column (Figure 2). The top canopy may be a species intercepted by the densiometer or the laser. If a plant cannot be identified to species, follow the instructions below to name and collect a specimen. If a plant is not intercepted, leave this column blank. After the species code, write "-D" if the part of the plant intercepted by the laser is dead.

2. **Lower canopy layers** - From the top canopy species, move down the laser and record species intercepted in the order that they occur. Use the "Lower canopy" columns (Figure 2) to record all additional species intercepted by the laser. Record the plant as dead following the guidelines above. You may also intercept litter and woody debris, but it must be elevated above the soil surface to be considered a lower canopy layer (Table 1). If you hit more than two lower canopy layers, be sure to record them on the back of the data sheet under "Additional canopy layers". If you do not encounter lower canopy layers leave these columns blank.

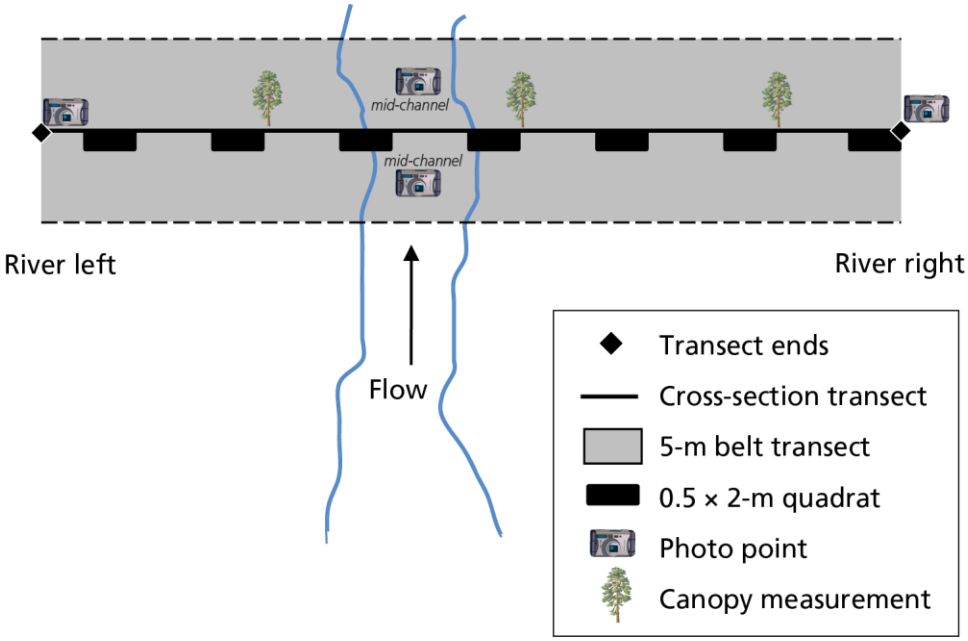
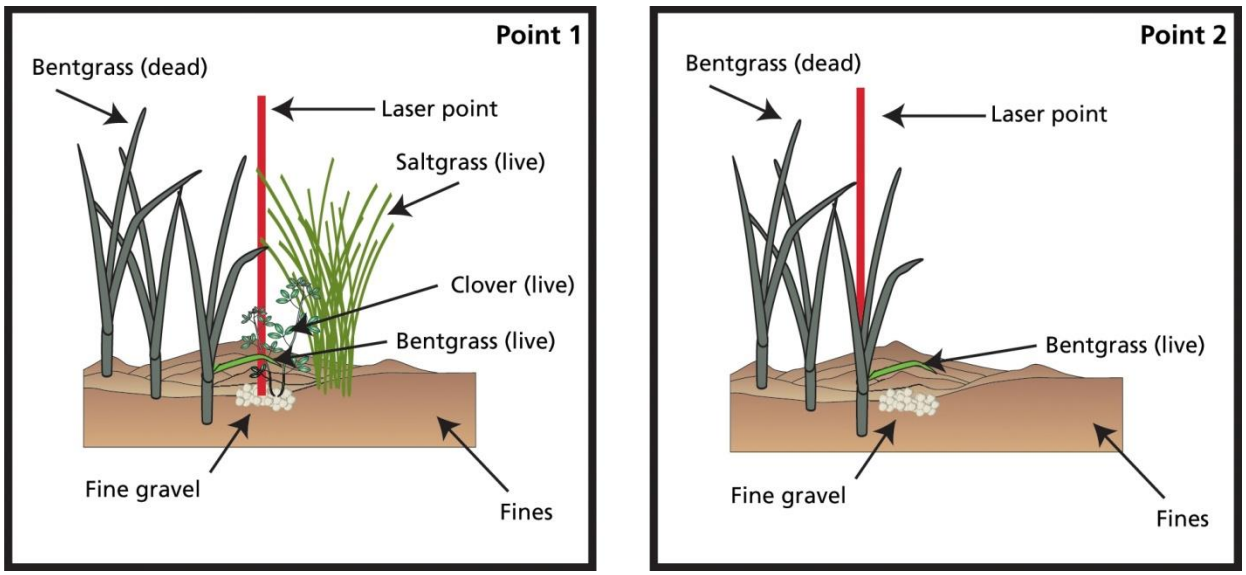


Figure 1. Locations of vegetation sampling along each permanent cross-section transect. Understory vegetation is sampled using a point-intercept method at 0.5 m intervals along the cross-section. Canopy closure is sampled at 10 m intervals on the cross-section. Seedling, sapling, and overstory tree density is recorded in a 5-m belt transect, and exotic plant frequency is sampled in 0.5 m x 2-m quadrats. A census of large diameter trees occurs at the reach scale.



Point	Top canopy	Lower canopy		Soil surface	Disturb.
		1	2		
1	disspi	agrsto - D	meloff	GF	
2	agrsto - D	L		agrsto	
3	bacsal - D	poapra	L	F	ant
etc.					

Additional canopy layers

Point	Lower Canopy		
	3	4	5
1	Agrsto		

Figure 2. Point-intercept cover along a transect and sample data sheet. Points 1 and 2 show the first two points on a transect. In Point 1, the laser is touching saltgrass (*Distichlis spicata*), dead bentgrass (*Agrostis stolonifera*), clover (*Melilotus officinalis*), live bentgrass, and fine gravel. Record bentgrass twice for one dead and one live intercept. Notice that additional canopy hits are recorded in the "Additional canopy layers" section on the back of the data sheet. In Point 2, the laser touches dead bentgrass, then touches litter, and finally the bentgrass plant base. The sample data sheet above shows how to record these two points on the data sheet. Notice that all plants are recorded using six-character abbreviations (adapted from Herrick et al. 2005).

Table 1. Abbreviations and definitions of litter and woody debris as lower canopy layer classes for point-intercept sampling.

Code	Lower canopy cover type	Definition
L	Litter	Detached dead plant material that is less than 2.5 cm in diameter and elevated above the soil surface
WD	Woody debris	Detached woody plant material that is 2.5 cm or greater in diameter and elevated above the soil surface

3. **Surface Features** - In the "Surface" column record whether the laser intercepts a plant base (Figure 3) or a surface feature (see Figure 2). Use the abbreviations of surface features defined in Table 2 to record all other surface features.

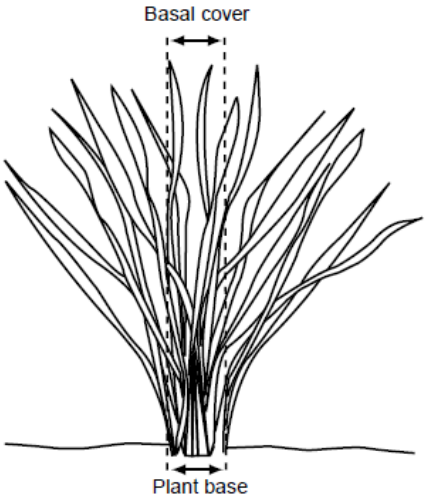


Figure 3. Area defined as plant base and included as basal cover (from Herrick et al. 2005).

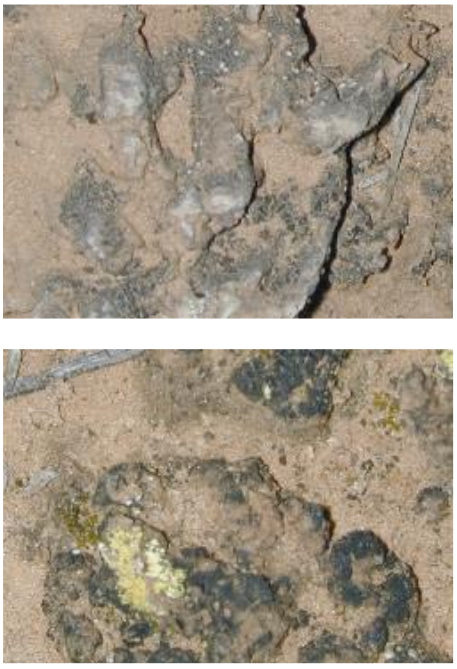


Figure 4. Photos of biological soil crust (from Belknap et al. 2008). Dark areas in the upper photo are dark cyanobacteria. The lower photo includes substantial areas of lichen (yellow and black areas) and moss (green areas) in addition to dark cyanobacteria.

Table 2. Abbreviations and definitions of surface feature classes for point-intercept sampling.

Code	Surface Feature	Definition
F	Fines	Loose mineral particles 0-2 mm in diameter
GF	Gravel, Fine	Particles >2-16 mm in size; ant to beetle-sized
GC	Gravel, Coarse	Particles >16-64 mm in size; beetle to baseball-sized
CB	Cobble	Particles >64-256 mm in size; baseball to basketball-sized
BL	Boulder	>256 mm in size; larger than a basketball
BR	Bedrock	Exposed bedrock
WA	Water	Flowing or pooled water
BSC	Biological soil crust	Biological soil crust composed of dark cyanobacteria, lichen, and/or moss (see Figure 4)
L	Litter	Detached dead plant material less that is than 2.5 cm in diameter
WD	Woody debris	Detached woody plant material that is 2.5 cm or greater in diameter and is in direct contact with soil
SL	Scat, livestock	Any type of livestock scat
SW	Scat, wildlife	Any type of wildlife scat

4. **Disturbance** - Record whether the laser intercepts a disturbance on the soil surface in the "Disturb." column (Figure 2). Use abbreviations from Table 3 to label the type of disturbance. Leave this column blank if there is no disturbance.

Table 3. Abbreviations and definitions of soil-surface disturbance classes for point-intercept sampling.

Code	Disturbance type	Definition
Ant	Ant mound	Holes and mounds created by ants
Bike	Bicycle	Disturbances caused by non-motorized bicycles
Trail	Tracks and trails	Defined tracks or trails from wildlife, livestock, or humans
Camp	Campsite	Bare ground or other disturbances caused by camping
Auto	Motor vehicle	Disturbances caused by any motorized vehicle, including two tracks and roads
Flood	Recent flooding	Recent flooding indicated by flattened vegetation, mud, and debris lines
Other	Other	Any other disturbance, such as beaver activity, old slash piles from exotic plant removal, etc. Make a note in the visit comments with the specifics of what you encountered.

1.1.1 Unknown Plants

Sometimes it may be difficult or impossible to determine the specific identity of individual plants encountered during sampling. Crews may be unfamiliar with a plant or unable to distinguish one species from other similar species at the time of sampling. Before sampling, review previously collected unknown species from the stream and use existing unknown names whenever possible.

When an unknown plant is encountered

A. Search the immediate area surrounding the point or transect, looking for specimens of the unknown plant that are more readily identifiable (i.e., due to the presence of flowers or fruits from current or previous seasons).

B. If an identifiable specimen cannot be found, create a unique name using the following code: unk + 4 letter park code + reach number + your initials + collection number for the reach (e.g., unkZION-P1-ST1). Record this code in the appropriate column on your vegetation sampling data sheet instead of the species name.

C. Take a photograph of the unknown plant.

D. As you proceed through the reach, continue to attempt to find identifiable specimens of unknowns.

E. It is permissible to identify a plant only to the genus level if no identifiable parts are present for keying, or if hybridization makes species delineation difficult. Record the full Latin name of the genus followed by "sp." (e.g., *Opuntia* sp., *Tamarix* sp., etc.).

Collecting unknown plants

Once it has become apparent that no identifiable plants can be found or that a plant with identifiable features cannot be keyed out in the field, a collection of the plant should be made.

A. Collect specimens from outside of the monitoring transects whenever possible.

B. Attempt to collect as many identifiable parts as possible, including flowers, fruits, leaves, and roots. It is especially important to collect roots of forbs and grasses. You may need to collect from more than one plant to achieve this goal.

C. If you must collect from inside a monitoring reach, remove only a minimal amount of plant material. Do not remove roots of perennial species that are collected within the transect.

D. Wrap a piece of masking tape around the plant and use a fine-point permanent marker to label it with the unknown species code.

E. Carefully place the specimen inside a resealable plastic bag labeled with the reach number, unknown species code, date, and collector.

F. Place the sample in your backpack and in a shady spot until you get back to camp. Attempt to identify the plants when you return to camp.

G. If the specimen cannot be identified right away but can still be identified within one

week, preserve the bag in a cooler as soon as possible. Make sure the specimen does not get wet. If a cooler is not available or if plant identification will occur after one week, place the plant between two sheets of newspaper and store it in a press.

H. Fill out an unknown species data sheet for each specimen. It is especially important to fill out data sheets for specimens that do not have identifiable characteristics in this sampling year, but may be identified in future years.

Data sheets

When filling out the data sheet, give a detailed description of each characteristic. This allows greater potential for future identification when crews return to the site. Fill in the top of the data sheet and record the following information:

- **Unknown Code:** unk + 4 letter park code + reach number + your initials + collection number for the reach (e.g. unkZIONP01-ST1).
- **Plant Type and General Description:** Circle the appropriate categories and provide a succinct description of the overall appearance (e.g., tiny *Eleocharis*).
- **Most Salient Feature:** A unique characteristic that identifies the plant from others.
- **Leaf Characteristics (optional):** Describe the leaf type, leaf margin, leaf surface, petiole, etc.
- **Stem Characteristics (optional):** Describe the shape, pubescence, markings, and color of the stem, as well as the bud characteristics.
- **Flower Characteristics (optional):** Describe the floral formula, location (axillary or terminal), habit (indeterminate or determinate), pubescence, and color.
- **Microhabitat Characteristics:** Describe the microhabitat in which it was found if unique in the reach (e.g., wash bottom, limestone outcrop, etc.).
- **Collected:** Circle yes or no, whether a specimen was collected.
- **Best Guess:** Preliminary guess about species in field.

Annotating data sheets

When updating data sheets with identified plants, draw a line through the unknown code and write in the correct species code in the nearest available space. Initial and date the change on the data sheet.

2. Exotic Plant Frequency

Record the presence of all exotic plant species rooted in 0.5-m x 2-m quadrats placed every 5 meters along each cross-section transect.

A. The quadrat is oriented so that the long end lies on the transect tape and the upstream side of the transect is sampled beginning at 0 m (Figure 1). Use engineering rulers to delineate the quadrat starting at the 0-m mark on the transect tape and ending on the 2-m mark.

B. Record each exotic plant species rooted in the quadrat. All live annual and perennial exotic plant species, or species that were alive earlier in the growing season, are recorded. For any plant rooted underneath the sampling frame, count ones that are rooted at least 50% within the quadrat.

C. Sample exotic plant frequency in quadrats beginning at 0 m, 5 m, 10 m, 15 m, and every 5 m thereafter for the entire length of the transect. Do not sample quadrats that start on the transect and extend beyond the transect end point.

3. Canopy Closure

Canopy closure is recorded every 10 m along the transect starting at the 5-m mark (i.e., 5, 15, 25 m, etc.) using a modified concave spherical densiometer.

A. Hold the densiometer 12" in front of you at elbow height with your elbows steadied against your torso. Level the densiometer using the bubble level. Position your body so that your forehead is visible at the top of the mirror as you take the reading (Figure 5).

B. Count the number of point intersections covered by live or dead vegetation above the V (maximum is 17). Do not count canyon walls or cutbanks.

C. Four measurements are made: (1) facing downstream, (2) facing the right bank, (3) facing upstream and, (4) facing the left bank. Keep the densiometer in the same place as you rotate it and yourself for each reading. It does not matter what order you take the readings.

Occasionally, you may not be able to take the measurement at one of the standard locations because a tree trunk is blocking that location. If this occurs, move down the transect 0.5 m (i.e., move to 5.5 m) until you can hold the densiometer in the correct location. Do not move the location of the densiometer along the transect for branch obstructions. You should be able to move the densiometer up or down a centimeter or so in order to take the measurement.

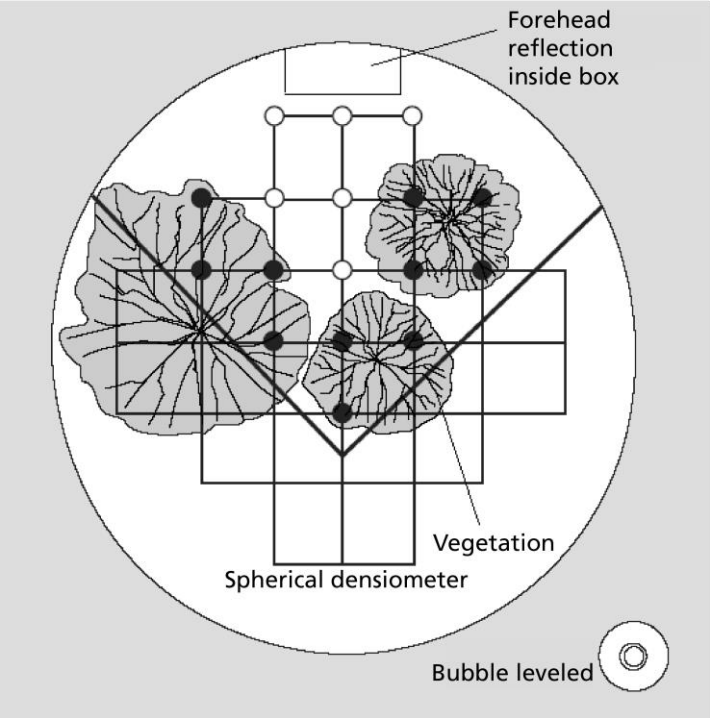


Figure 5. A modified concave spherical densiometer. Note the bubble level, the right angle marking the area sampled, and the 17 points of intersection. Closed circles represent line intersections where vegetation is present and consequently counted in measurement of canopy closure (example shows 11 out of 17 points) (from Fitzpatrick at el. 1998).

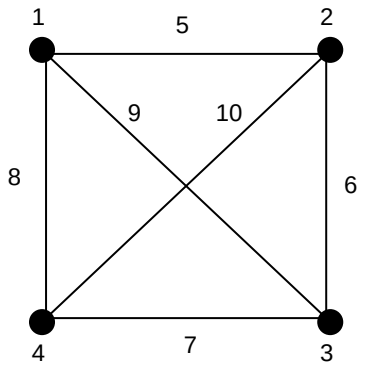
4. 5-m Belt

Tree density by size class is recorded in a 5-m belt that is centered on each cross-section transect (2.5-m upstream and 2.5-m downstream). Seedlings, saplings, and overstory trees are sampled simultaneously.

4.1 Seedling density

A. Use a 2.5 meter pole to determine the boundaries of the 5-m belt on each side of the cross-section transect.

B. Use a dot tally to record the density of all live exotic and native tree seedlings ≤1.37 m in height or ≤2.5 cm DBH. A dot tally is created by forming the following figure as you count stems:



C. Tree cotyledons are seedlings and are counted in the 5-m belt when identifiable. Cottonwood (*Populus* species) cotyledons are most commonly encountered (Figure 6).



Figure 6. Cotyledons of *Populus* species. Look for the distinct shovel-shaped leaves.

D. *Tamarix* species and *Salix exigua* are not considered trees during this tally.

E. The goal of seedling density is to count discrete young individuals.
- Multiple "suckers" that originate from the same location and stump sprouts (including beaver-browsed stumps and/or traumatized trees broken off below DBH) are considered one seedling.
- If any of the suckers or stump sprouts are >2.5cm DBH, measure each one as a sapling and do not count any as seedlings.
- Do not count attached branches of larger trees, partially or completely covered by soil at the base, as seedlings.
- Do not count suckers originating from the exposed roots of a live tree.
- If live sprouts are arising from a dead-looking main trunk, measure only the main trunk and do not count any live sprouts as seedlings.

F. At sites with high densities, estimate density using the following categories: 100-250, 251-500, 501-1000, and >1000 individuals.

G. After completing a belt, add up the dot tally marks for each species and write in the numeric total in the "Total" row.

Sampling adjustment if two transects cross
If two transects cross, do not sample the lower numbered transect's belt area where it overlaps with the higher numbered transect. Note on the data sheet where tallying stops, and at what point it restarts if necessary. Use this rule for seedlings, saplings, and overstory trees in the 5-m belt.

4.2 Sapling and overstory tree density

Record DBH of live and dead saplings and mature trees >2.5 cm DBH in a 5-m belt.

A. Measure all individuals rooted more than 50% within the 5-m belt. If a tree is rooted near the belt transect boundary, use a tape or pole to measure the perpendicular distance between the tree and the transect line.

B. Record the tree species. Use "-D" to denote dead individuals. Record unknown species using the guidelines in Section 1 of this SOP.

C. Measure the diameter at breast height (DBH) of the stem or trunk using the guidelines below. Trees greater than 25 cm DBH are also recorded in the reach census.

- If using the 15-cm plastic calipers, record to the nearest 0.5 cm.
- If using the DBH tape, record to the nearest 0.1 cm.
- Do not measure secondary stems that lean more than 45 degrees (these are considered branches).

Measuring DBH:

- Use the DBH tape to measure the diameter of the tree at 1.37 m above the ground surface (breast height; Figure 6A).
- If the tree is on a slope, stand on the uphill side of the tree to measure DBH (Figure 6B). If the ground surface on the uphill side of the tree is blocked by a debris pile, move around the tree to where you can determine the location of the ground surface and measure DBH there.

Using the DBH tape

1. Hook the end of the tape into the bark and run the tape around the trunk, ensuring that the tape is straight and pulled perpendicular to the axis of the trunk. Bowed tapes will give an overestimate of trunk diameter.

2. Wrap the tape tightly around the tree and read the number where the tape crosses the zero mark at the beginning (hook end) of the tape (see Figure 7).

3. Make sure that you are reading the correct side of the DBH tape. Often one side has standard centimeters and the other side has units calibrated to give the diameter in centimeters when wrapped around the circumference of the tree. Read the calibrated side of the tape.

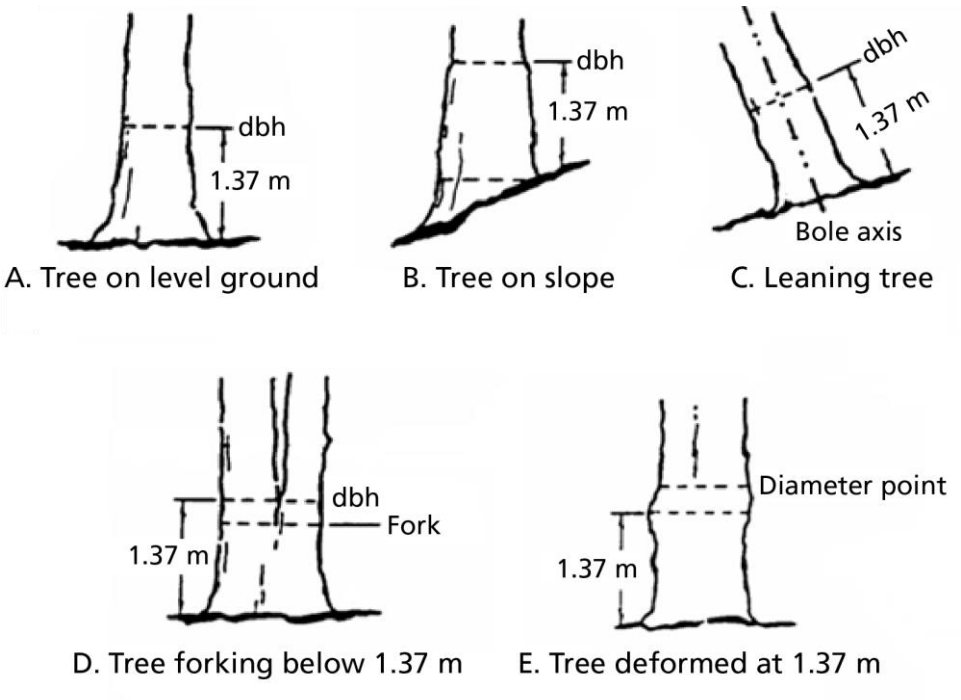


Figure 6. Locations of diameter at breast height (DBH) measurements for a variety of bole forms. DBH measurements will always be taken perpendicular to the bole axis as illustrated (modified from USDA Forest Service 2005).

Common stem irregularities (see Figure 6)

- *Trees missing bark or wood at breast height* - Record diameter of the wood and bark that is still attached to the tree.
- *Curved, leaning, or flood-trained trunks* - Find the point equivalent to breast-height (1.37 m) by measuring along the curvature of the bole on the upper surface of the main trunk. For flood-trained trees, count the main stem as live when there are live branches growing from it, even if the main stem looks dead (Figure 6C).
- *Trees that fork at breast height* - If forking influences DBH, the diameter should be measured below the fork.
- *Trees that fork below breast height* – Measure the DBH of each side of the fork (Figure 6D).
- *Trees with swellings, bumps, depressions, and branches at breast height* - Measure diameter immediately above the irregularity at the place it ceases to affect normal stem form (Figure 6E).



Figure 7. The proper method for securing a DBH tape.

5. Reach Census

All individuals of woody species within the reach with a DBH greater than or equal to 25 cm are tagged and measured. This includes large individuals of species that are considered shrubs in other parts of the protocol (e.g., *Tamarix* spp., *Salix exigua*, etc.).

A. Start at one end of the reach and work your way to the other end. It is often easiest to sample all of the woody species between two adjacent transects before taking down the tagline and setting up a new transect. The area sampled includes:

- the area between Transect 1 and Transect 7
- the active riparian zone and any surfaces in a direct line between the headpins.

B. Locate a woody species, hereafter referred to as tree, with a diameter at breast height of ≥25 cm.

C. If the tree is not tagged, affix a pre-numbered tag to the tree using a nail. *Make sure to attach a tag with a number that has not already been used at the plot*.

- When establishing a reach, tag trees in numeric order.
- When revisiting a reach, use tree tags from a different numeric series to add individuals to the census. For example, if tags 1-80 were used during establishment, use tags 100-199 during the subsequent visit for new trees.
- Align the nail so that it enters the tree at breast height (1.37 m). If the tree forks below breast height, both forks should be tagged.

- Drive the nail into the tree at an angle, so that the tag hangs down and away from the tree. Leave several centimeters of nail exposed so the tree has ample space for growth.

D. Record the tag number and species of the tree. If a tree is dead, write ("-D") after the species name. If the species is unknown, write UNKT-D.

E. Measure DBH using the notes in Section 4.2 of this SOP.

- Measure just above the nail.
- Measure to the nearest 0.1 cm, making sure to read the correct side of the DBH tape.
- Sometimes flooding will alter the ground surface so that the nail is no longer at breast height during a revisit. Leave the nail in its current location and measure diameter just above the nail.

F. Record Crown Health

Evaluate the density of each tree's crown in relation to crowns of the same species located in a similar position within the canopy, and from a similar habitat. Crown health codes are defined in Table 4 and listed at the bottom of the data sheet. Classes 1 through 4 refer to the estimated amount of the foliage that is intact, expressed as a percent. Class 5 is used to designate standing dead trees with an overall height greater than 1.37 meters that are still rooted to the ground.

Class 6 should only be used to record trees that were previously tagged and standing but have fallen down since the last reach visit. This class is used in order to not confuse fallen trees with missing data. After a tree has been recorded once as class 6, it does not need to be recorded on the data sheet on subsequent reach visits.

Standing dead trees whose diameters fall below 25 cm since the last reach visit (usually due to decay) should be recorded as class 5. A comment should also be included in the Notes/Conditions field explaining why a tree < 25 cm dbh was recorded on the data sheet. After a tree has been recorded once as class 5 and < 25 cm dbh, it does not need to be recorded on the data sheet in subsequent reach visits.

Table 4. Crown health classes for forest species

Crown Health Class	Description
1	90-100% live foliage
2	50-89% live foliage
3	16-49% live foliage
4	0.1 – 15% live foliage
5	standing dead
6	dead and down

G. Record Location

Record the location of the tree relative to the transects and/or headpins including river right or river left. For reaches with a high density of trees, you may also want to record the location of the tree in the GPS (see SOP #3 for further instructions) to help returning crews relocate them.

H. Record Conditions/Notes

Any significant damage to a living tree should be recorded. Scan each tree carefully for signs of damage, including but not limited to beaver browsing, recent fire scars, lighting strike scars, mistletoe infestation, bark beetles, cankers, stem decays, wood-boring insects, tent caterpillars, or broken or dead top.

6. Plant Walk

At each monitoring reach a comprehensive plant walk is conducted covering the entire reach. Names of all plant species observed are recorded during the walk, noting date and approximate time spent looking. The objective of the plant walk is to record as many species as possible. The walk can be done in increments as the work schedule allows. When scheduling allows, consider conducting the plant walk before beginning plot monitoring as a good way of vegetation team calibration.

References

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Point Intercept

Data entered by: Data verified by: p.1

SCPN Riparian Monitoring

Park Code: **Reach ID:** **Date:** **Page _____ of _____**

Observer: **Recorder:** **Transect:** 1 2 3 4 5 6 7

Point (m)	Top Canopy	Lower canopy 1	Lower canopy 2	Soil surface	Disturb.
0.5					
1					
1.5					
2					
2.5					
3					
3.5					
4					
4.5					
5					
5.5					
6					
6.5					
7					
7.5					
8					
8.5					
9					
9.5					
10					
10.5					
11					
11.5					
12					
12.5					

Point (m)	Top Canopy	Lower canopy 1	Lower canopy 2	Soil surface	Disturb.
13					
13.5					
14					
14.5					
15					
15.5					
16					
16.5					
17					
17.5					
18					
18.5					
19					
19.5					
20					
20.5					
21					
21.5					
22					
22.5					
23					
23.5					
24					
24.5					
25					

Additional canopy layers can be added on other side

Top canopy
Species code*
Lower canopy layers
Species code*, litter (L), woody debris (WD)
Plant Status
*If part of plant touching laser is dead, write "-D" after species code.

Surface Feature
F = Fines
GF = Gravel, fine (ant to beetle)
GC = Gravel, coarse (beetle to baseball)
CB = Cobble (baseball to basketball)
BL = Boulder
BR = Bedrock

Surface Feature
WA = Water
BSC = Biological soil crust
L = Litter
WD = Woody debris
SL = Scat, livestock
SW = Scat, wildlife

Disturbance
Ant = Ant mound
Bike = Bicycle
Trail = Trail
Camp = Campsite
Auto = Motor vehicle
Flood = Recent flooding
Graze = Recent grazing
Oth = Other

Point Intercept p.2

Additional canopy layers

Point (m)	Lower Canopy		
	3	4	5

Point (m)	Lower Canopy		
	3	4	5

Point (m)	Top Canopy	Lower canopy		Soil surface	Disturb.
		1	2		
25.5					
26					
26.5					
27					
27.5					
28					
28.5					
29					
29.5					
30					
30.5					
31					
31.5					
32					
32.5					
33					
33.5					
34					
34.5					
35					
35.5					
36					
36.5					
37					
37.5					

Point (m)	Top Canopy	Lower canopy		Soil surface	Disturb.
		1	2		
38					
38.5					
39					
39.5					
40					
40.5					
41					
41.5					
42					
42.5					
43					
43.5					
44					
44.5					
45					
45.5					
46					
46.5					
47					
47.5					
48					
48.5					
49					
49.5					
50					

Canopy Closure and Exotic Frequency

Data entered by: Data verified by:

SCPN Riparian Monitoring

Park Code: **Reach ID:** **Date:**

Observer: **Recorder:** **Transect:** 1 2 3 4 5 6 7

Spherical Densiometer

5-m	_____	_____	_____	_____	35-m	_____	_____	_____	_____	65-m	_____	_____	_____	_____
15-m	_____	_____	_____	_____	45-m	_____	_____	_____	_____	75-m	_____	_____	_____	_____
25-m	_____	_____	_____	_____	55-m	_____	_____	_____	_____	85-m	_____	_____	_____	_____
										95-m	_____	_____	_____	_____

Exotic Frequency – Quadrats

- All live annual and perennial species, or species that were alive earlier in the growing season.
- Rooted at least 50% within the quadrat.

	Meter																			
Species	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95

5-m Belt Transect

Data entered by: Data verified by:

SCPN Riparian Monitoring

Park Code: **Reach ID:** **Date:**

Observer: **Recorder:** **Transect:** 1 2 3 4 5 6 7

Tree Seedlings (<1.37 m tall or ≤2.5 cm DBH) *live only*

Species	Tally	Total

Density Classes: 100-250, 251-500, 501-1000, >1000

Trees (>2.5 cm DBH) *live or dead*

Species	DBH

Trees (>2.5 cm DBH) *live or dead*

Species	DBH

Reach Census

Data entered by: Data verified by: Pg _____ of _____

SCPN Riparian Monitoring

Park Code: **Reach ID:** **Date:** **Observer:** **Recorder:**

Tag #	Species	DBH	Crown Health	Location	Notes

Crown Health
1 = 90-100% live
2 = 50-89% live
3 = 16-49% live
4 = 0.1 - 15% live
5 = standing dead
6 = dead and down

Notes
Examples include: beaver browsing, fire scar, lightning strike, canker, tent caterpillar infestation, etc.

Unknown Plant Species

Data entered by: Data verified by:

SCPN Riparian Monitoring

Park Code: **Reach ID:** **Date:** **Recorder:**

Transect: 1 2 3 4 5 6 7 **Position on transect (m) / method:** **Photo #s:**

Unknown species code (e.g., unkZION-P02-KL1): _____

Plant Type & General Description: *tree shrub grass forb other*_____

Forbs and grasses: *annual perennial*

Perennial Grasses: *bunchgrass rhizomatous*

General Description:

Most salient feature:

Leaf Characteristics (optional):

Leaf Type: (compound/simple, arrangement, etc.)

Margin:

Other: (pubescence, sap, stipules, etc)

Stem Characteristics (optional): (shape, pubescence, bud)

Flower Characteristics (optional): (color, location, floral formula)

Microhabitat Characteristics:

Collected: *Yes* *No* Collected by:

Best Guess:

Confirmed to be:

Identified by: Date:

Example Data Sheet:

Point Intercept

Data entered by: S. Kast Data verified by: J. Doucette p.1

NCPN Riparian Monitoring

Park Code: CARE Reach ID: F-14 Date: 8-4-11 Page 1 of 1

Observer: J. Doucette Recorder: K. Lund Transect: 1 2 3 4 5 (6) 7

Point (m)	Top Canopy	Lower canopy 1	Lower canopy 2	Soil surface	Disturb.
0.5	Tama sp.	Tama sp.-D		L	
1	Tama sp.-D	L		L	
1.5	Tama sp.	L		L	
2	Tama sp.	Chrnau-D		F	
2.5	Chrnau	L		GC	
3				F	
3.5				CB	
4		L		F	
4.5				WA	
5				WA	
5.5				WA	
6				WA	
6.5				WA	
7				WA	
7.5				WA	
8				WA	
8.5				WA	
9				WA	
9.5				CB BL	
(*)10	Mel alb	Phrau-D	Ele pal	F	
10.5	Sal exi	Phrau-D	Muh asp	F	
11	Muh asp			F	
11.5	Ela ang	Oxy ace		F	
12	Sal exi	Oxy ace	Ely smi	F	
12.5				F	

Point (m)	Top Canopy	Lower canopy 1	Lower canopy 2	Soil surface	Disturb.
13		WD		Sal exi	
13.5	Ela ang			F	
14	Sal exi			F	
14.5				F	
15				F	
15.5	Ela ang			F	
16		L		F	
16.5				F	
17	Sal exi			F	
17.5	Chrnau	Chrnau-D		L	
18	Chrnau-D	Chrnau		L	
18.5	Sal exi			F	
19				F	
19.5	Sti hym			F	
20	Chrnau-D			F	
20.5	Chrnau	Chrnau-D		L	
21	Chrnau	L		F	
21.5	Chrnau-D			F	
(*)22	Sal exi	Chrnau-D	Sti hym-D	Sti hym	
22.5	Sal exi			Sal exi	
23	Chrnau-D	Psolan		L	
23.5	Chrnau	Chrnau-D		L	
24	Atr can	Atr can-D		L	
24.5	Psolan	Chrnau-D		F	
25	Chrnau	Chrnau-D		F	

Additional canopy layers can be added on other side

Top canopy
Species code*
Lower canopy layers
Species code*, litter (L), woody debris (WD)
Plant Status
*If part of plant touching laser is dead, write "-D" after species code.

Munkenbergia aspenifolia
Eleagnus angustifolia
Oxytenia acerosa

Surface Feature
F = Fines
GF = Gravel, fine (ant to beetle)
GC = Gravel, coarse (beetle to baseball)
CB = Cobble (baseball to basketball)
BL = Boulder
BR = Bedrock

Tamarix sp.
Chrysothamnus nauseosus
Melilotus alba

Elymus smithii
Stipa hymenoides
Psoralidium lanceolatum

Surface Feature
WA = Water
BSC = Biological soil crust
L = Litter
WD = Woody debris
SL = Scat, livestock
SW = Scat, wildlife

Phragmites australis
Eleocharis palustris
Salix exigua

Disturbance
Ant = Ant mound
Bike = Bicycle
Trail = Trail
Camp = Campsite
Auto = Motor vehicle
Flood = Recent flooding
Graze = Recent grazing
Oth = Other

Atriplex canescens
Sporobolus cryptandrus
Salsola sp.

Example Data Sheet:

Point Intercept p.2

Additional canopy layers

Point (m)	Lower Canopy		
	3	4	5
10.0	Elepal-D		
22.0	Stihym		
25.5	Spocry-D		

Point (m)	Lower Canopy		
	3	4	5

Point (m)	Top Canopy	Lower canopy		Soil surface	Disturb.
		1	2		
25.5	Chrnau-D	Chrnau	L	F	
26	Chrnau-D	Spocry		Spocry	
26.5	Psolan			L	
27		L		F	
27.5				F	
28	Psolan			L	
28.5	Sals. sp-D			F	
29		L		F	
29.5	Psolan			F	
30	~ end of transect ~				
30.5					
31					
31.5					
32					
32.5					
33					
33.5					
34					
34.5					
35					
35.5					
36					
36.5					
37					
37.5					

Point (m)	Top Canopy	Lower canopy		Soil surface	Disturb.
		1	2		
38					
38.5					
39					
39.5					
40					
40.5					
41					
41.5					
42					
42.5					
43					
43.5					
44					
44.5					
45					
45.5					
46					
46.5					
47					
47.5					
48					
48.5					
49					
49.5					
50					

Example Data Sheet:

Canopy Closure and Exotic Frequency

Data entered by: W. Plafcan Data verified by: S. Karinen

NCPN Riparian Monitoring

Park Code: NABR Reach ID: A-04 Date: 6/27/12

Observer: W. Plafcan Recorder: K. Lund Transect: 1 (2) 3 4 5 6 7

Spherical Densiometer

5-m	0	0	0	0	35-m	12	1	6	1	65-m						
15-m	0	0	0	0	45-m	13	12	10	11	75-m						
25-m	12	11	7	12	55-m	8	4	3	9	85-m						
										95-m						

Exotic Frequency – Quadrats

Species	Meter 0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95
BROTEC	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓										
(*) ~~unkNABR-A-04-KL1~~		✓	✓		✓															
BRO JAP				✓		✓		✓												
Meli sp.					✓															
POA PRA								✓												
MEL OFF									✓											
AGR CRI												✓								

No Exotics

No Exotics

(*) IPO ROS (native), KL 7/23/12
(Ipomopsis roseata)

Bromus tectorum
Bromus japonicus
Melilotus species
Poa pratensis
Melilotus officinalis
Agropyron cristatum

Example Data Sheet:

5-m Belt Transect

Data entered by: S. Karinen Data verified by: W. Platean

NCPN Riparian Monitoring

Park Code: NABR Reach ID: A-05 Date: 6/12/11

Observer: S. Karinen Recorder: K. Lund Transect: 1 2 3 (4) 5 6 7

Tree Seedlings (<1.37 m tall or ≤2.5 cm DBH)

Species	Tally	Total
Populus angustifolia	☒☒☒☒☒☒☒☒☒	90
Acer negundo	☒☒☒☒☒	55

Density Classes: 100-250, 251-500, 501-1000, >1000

Trees (>2.5 cm DBH)

Species	DBH
Ace neg	3.0
Ace neg	2.9
Ace neg	9.7
Ace neg	5.5
Ace neg-D	4.8
Ace neg	5.6
Ace neg	5.5
Ace neg	3.6
Ace neg	3.1
Ace neg	4.1
Ace neg	3.4
Pop ang	3.4

Trees (>2.5 cm DBH)

Species	DBH
Populus angusti'folia	4.9
Pop ang	3.9
Pop ang	5.6
Pop ang	4.7
Pop ang	9.6
Pop ang	3.3
Pop ang	3.4
Pop ang-D	4.1
Pop ang	2.8
Pop ang	3.3
Pop ang	3.1
Pop ang	2.6
Pop ang	5.9
Pop ang	4.2
Pop ang	5.9
Pop ang	7.0
Pop ang	6.6
Pop ang	3.7
Pop ang-D	19.7
Acer negundo	2.1

Example Data Sheet:

Reach Census Data entered by: J. Doucette Data verified by: W. Plafcan Pg 1 of 1

NCPN Riparian Monitoring

Park Code: ARCH Reach ID: C-07 Date: 6/7/2011 Observer: J. Doucette Recorder: K. Lund

Tag #	Species	DBH	Crown Health	Location	Notes
301	Populus fremontii	26.2	3	River left (RL), upstream (US) of T7. Clump of 10 POPFRE's.	
302		37.3	2	"	
303		31.3	1	"	
304		40.3	1	"	
305		44.8	2	"	
306		36.9	2	RL. Between T6 & T5.	Cankers on trunk.
307		41.6	2	" Same tree as #306.	
308		36.0	1	RL. Just downstrm (DS) of T5.	
309		42.3	1	" Same tree as #308.	
310		41.2	2	RL. Between T5 & T4.	Beaver browsed.
311	POP FRE	31.8	2	RL. DS of T4.	
312		37.0	2	Just DS of T3R.	
313		32.5	1	Just US of T3R.	
314		36.1	1	River right (RR). Between T2 & T3.	
315		27.3	2	"	
316		41.3	2	"	
317		30.0	2	RL. Between T2 & T3.	
318		29.4	2	" Same tree as #317.	

Crown Health
1 = 90-100% live
2 = 50-89% live
3 = 16-49% live
4 = 0.1 - 15% live
5 = standing dead
6 = dead and down

Notes
Examples include: beaver browsing, fire scar, lightning strike, canker, tent caterpillar infestation, etc.

Example Data Sheet:

Unknown Plant Species

Data entered by: K. Lund Data verified by: S. Karinen

NCPN Riparian Monitoring

Park Code: ARCH Reach ID: C-02 Date: 05/26/11 Recorder: K. Lund

Transect: 1 2 3 4 5 6 (7) Position on transect (m) / method: 71.9m Point-intercept Photo #s: PS261313 – PS261316

Unknown species code (e.g., unkZION-P02-KL1): unkARCH C02-KL2

Plant Type & General Description: *tree* *shrub* *grass* (*forb*) *other* _____

Forbs and grasses: (*annual*) *perennial*

Perennial Grasses: *bunchgrass* *rhizomatous*

General Description: Small forb, cauline leaves opposite with a slightly swollen node. Lower (basal) leaves contorted around stem. Leaves sessile.

Most salient feature: Buds, distinctly long, green w/prominent venation & ridges.

Leaf Characteristics (optional):

Leaf Type: (compound/(simple), arrangement, etc.) Linear, mostly basal

Margin: Hyaline margin, at least on lower part of cauline leaves

Other: (pubescence, sap, stipules, etc)

Stem Characteristics (optional): (shape, pubescence, bud)

Has glands

Flower Characteristics (optional): (color, location, floral formula)

Not blooming yet!
Calyx ridged



Microhabitat Characteristics:

Growing in Salix forest
Only specimen found on transect

Collected: *Yes* (*No*) Collected by:

Best Guess: Caryophyllaceae? Silene?

Confirmed to be: Silene antirrhina

Identified by: S. Topp Date: 6/8/11