CITY OF AUSTIN WATERSHED PROTECTION DEPARTMENT

CITIZEN RIPARIAN MONITORING PROTOCOL

A **Riparian Zone (**the land adjacent to the creek) acts as a buffer between the aquatic (water) and terrestrial (land) environments, serving to minimize impacts to water quality and quantity. The **ecological functions** of the riparian zone include: erosion control, water filtration, bank stabilization, temperature regulation, floodwater control, carbon sequestration, groundwater recharge, and plant and animal habitat and food source. As a riparian zone becomes increasingly **degraded** (reduced in quality or value) these basic goods and services can be changed. Changes in how the water moves across the land and through the creek are the primary causes of this impairment in ecosystem function. In addition, changes in the vegetation community, soil health, and width of the riparian zone can also lead to losses in ecosystem function. The goal of riparian zone restoration is to restore the natural processes necessary to maintain ecosystem function. In general, an increase in riparian buffer size can increase ecosystem function. (Figure A).

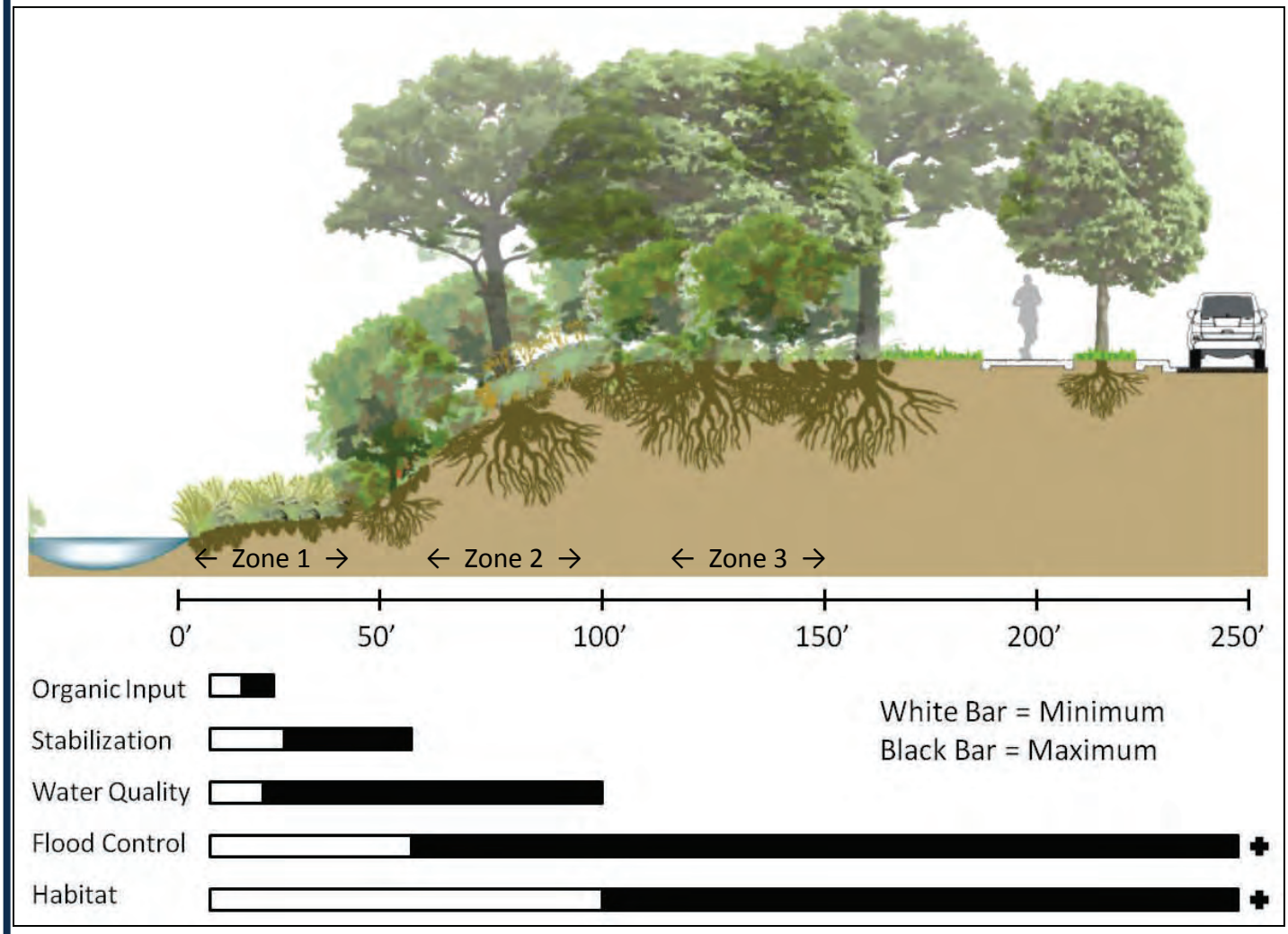


Figure A: Riparian buffer widths required to provide ecosystem services. White bar represents the minimal distance necessary to obtain associated benefit. Black bar represents the distance at which full benefits are being provided by the riparian zone.

CITIZEN RIPARIAN MONITORING PROTOCOL

METHODS

Your riparian study area should consist of an approximately 300-foot stream segment that best represents the area. A representative study area should include both healthy and degraded riparian sections but should attempt to capture average conditions. Select three sample plots (30 x 30 feet each) along the study area, on both sides of the stream bank (if possible). The edge of the plots begin at the edge of the active stream bed. active stream bed is where the water normally flows in small rain events. Mark the corners of your sampling plots with flags. This tool is designed to be used between April and November, when leaves are on trees. Annual monitoring of the same sample plots over time is essential for tracking long-term restoration progress and changes are best captured if the monitoring takes place within the same month every year.

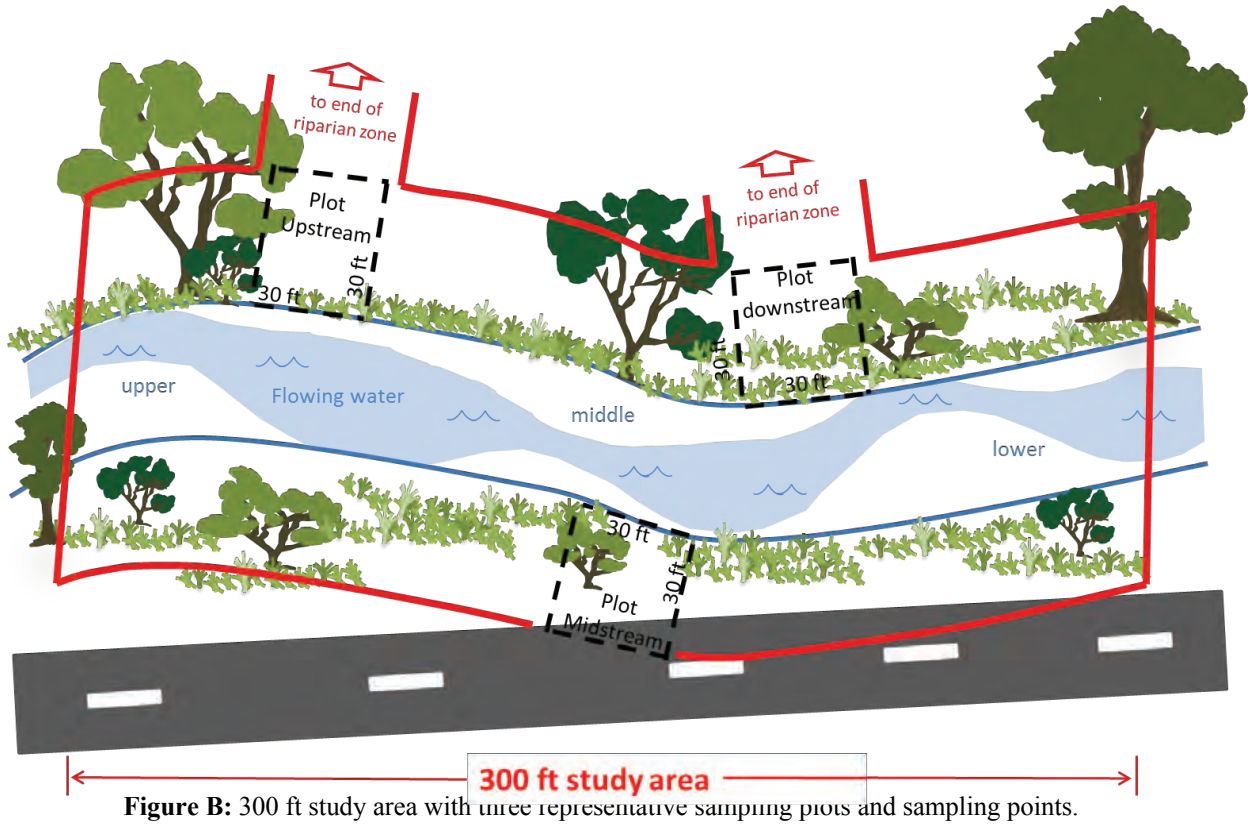


Figure B: 300 ft study area with three representative sampling plots and sampling points.

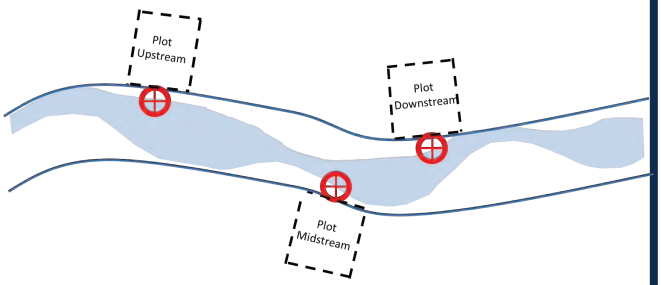
Tools and equipment include: Datasheet, Manual, 300 ft measuring tape, 100 ft measuring tape, flags, clipboard, Central Texas Wetland Guide, and COA Invasive Species guide. Bring trash bags to help cleanup while doing this monitoring

Additional documentation consisting of photographs, GPS coordinates, and detailed notes should be taken when possible. Taking photos is a great way to track changes over time. Marking the location where photos were taken enables tracking changes over time.

Within the study area, follow the detailed methods for each parameter listed on the following pages. Record all information on the Citizen Riparian Monitoring Protocol worksheet at the end of this document. Once the worksheet has been completed, circle the appropriate boxes on the scoresheet. Add up each section on the scoresheet to determine the health of your riparian zone.

SAMPLE PARAMETERS

1. Channel Shading. Riparian vegetation shades the stream, which keeps the water cool. Cool, shaded water can maintain higher dissolved oxygen and reduced algal growth, which makes better habitat for aquatic life. Stand at the water's edge near each of the three plots and select the category that best represents the shading over the stream surface. If there is no water in the stream at the time of your survey, stand in the center of the channel. Include shading resulting from trees, shrubs, tall grasses (>6ft), cliff walls and structures.



0 (poor) 0 to 25% channel shade

1 (marginal) 25 to 50% channel shade

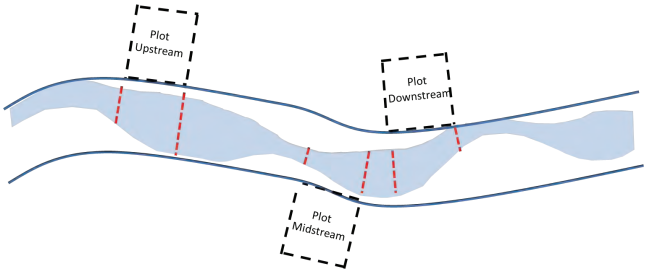
2 (suboptimal) 50 to 75% channel shade

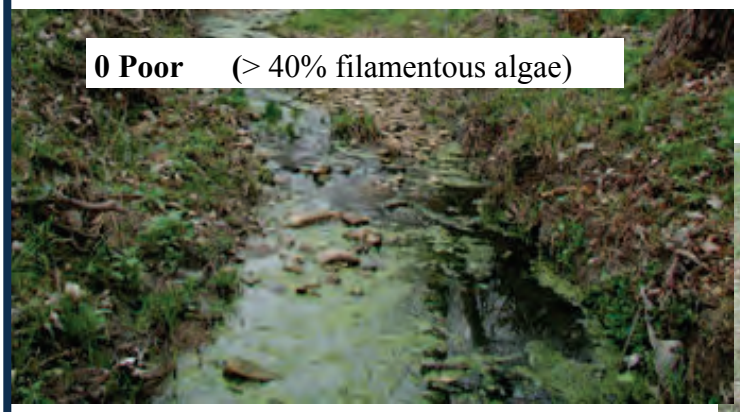
3 (optimal) > 75% channel shade

Figure C: Representative images of the different channel shading scores.

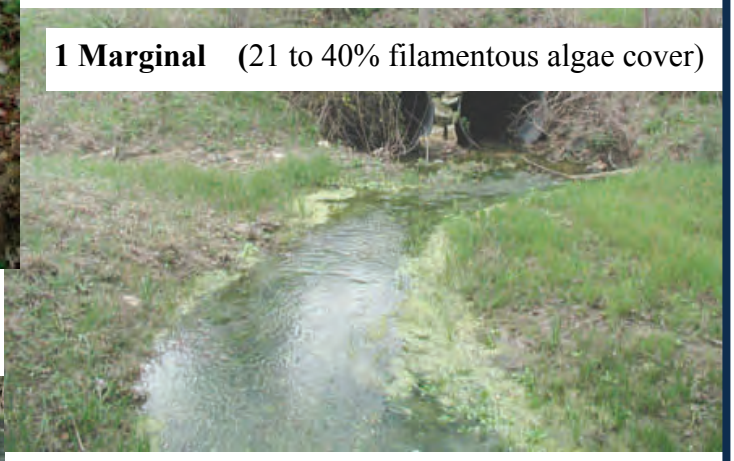
SAMPLE PARAMETERS

2. Filamentous Algae Cover. Excessive algae may be an indication of high nutrient inputs that can negatively impacting aquatic life by decreasing dissolved oxygen. This parameter is used only when the stream has water. Skip this parameter if the creek is dry. Standing at the edge of the water, and within the boundaries of each plot, select the category that best represents the cover of filamentous algae in the stream channel.

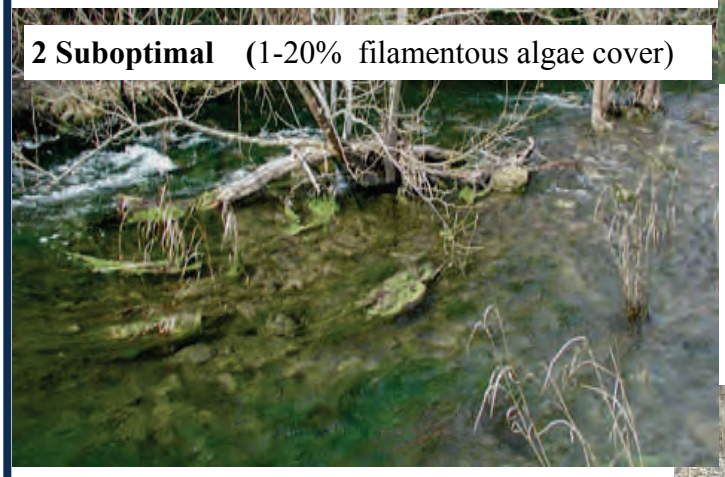




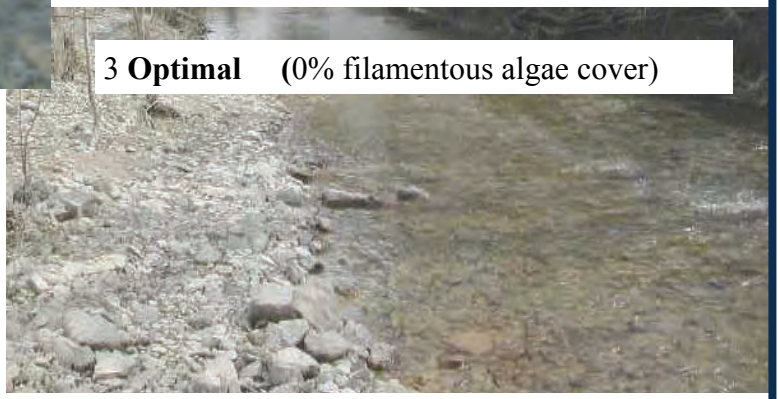
0 Poor (> 40% filamentous algae)



1 Marginal (21 to 40% filamentous algae cover)



2 Suboptimal (1-20% filamentous algae cover)



3 **Optimal** (0% filamentous algae cover)

Figure D: Representative images of the different percentages of filamentous algae cover.

3. Riparian Zone Width. A wide riparian zone is essential to filter pollutants, control erosion, reduce flooding, and provide resources for aquatic life. Standing at the edge of water, measure the width of the riparian zone. Measure from the edge of the water, perpendicular to the stream channel, to the end of the riparian zone. It is unnecessary to measure more than 100 ft. For each plot, select the score that best represents the riparian width and average them to obtain the overall site score for this parameter. In urban streams, the edge of the riparian zone buffer is often dictated by a human structure (e.g. house, fence, road, etc.) or management activity (e.g. mowing) that inhibits plant grow and alters the ability of the soil and vegetation to filter surface runoff.

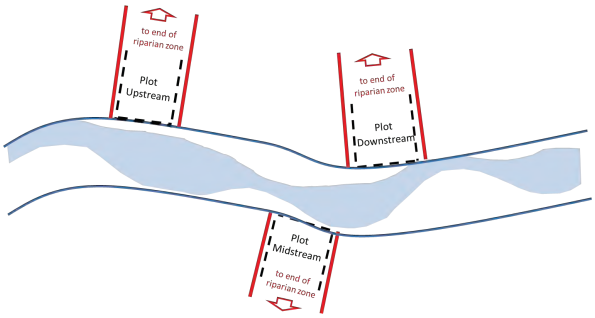
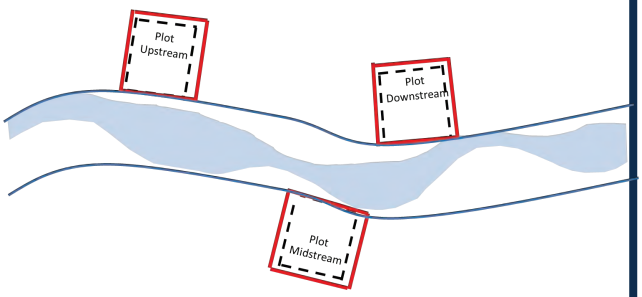


Figure Ei: Start of a riparian width measurement

Figure Eii: End of a riparian width measurement

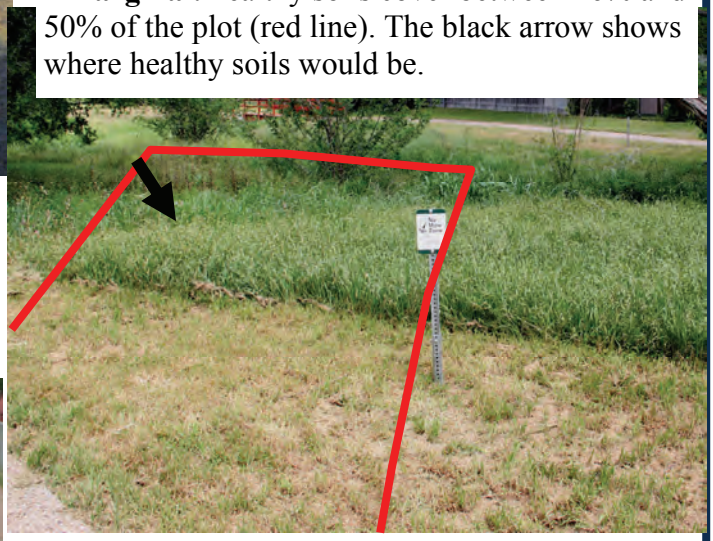
Figure Eiii: Start and end of a riparian width measurement. In this example, the riparian buffer is smaller than the plot

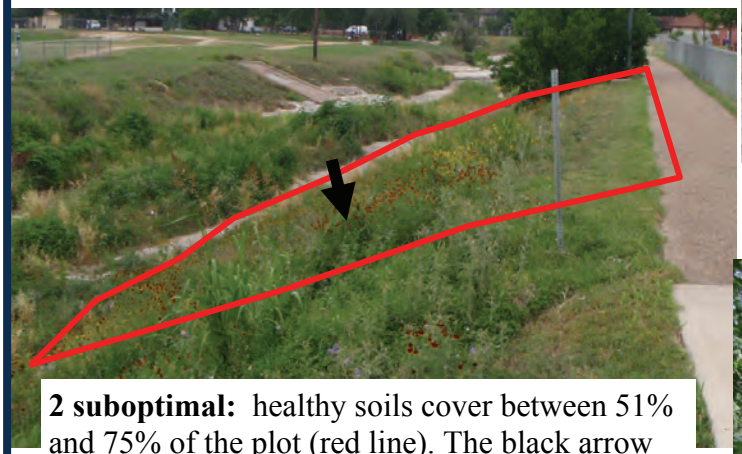
4. Riparian Soil Integrity. Soil quality is affected by vegetation management practices. Frequent mowing and foot traffic can expose, compact and degrade soils. Healthy soils are soft, loose, and rich with organic matter. Riparian soils influence the vegetation composition of the site, as well as wildlife habitat and distribution. Healthy soils allow the full potential of plant growth and infiltration of rainwater. For each plot select the category that best represents the cover of healthy soil in the plot (mowed, compacted, exposed, etc.)



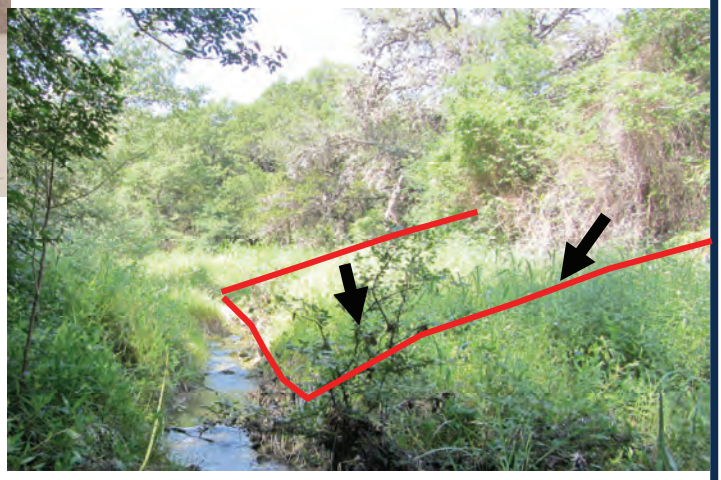
0 poor: Healthy soils cover less than 25% of the plot (red line). Most of the area is compacted, mowed, and/or has impervious cover.

1 marginal: healthy soils cover between 26% and 50% of the plot (red line). The black arrow shows where healthy soils would be.



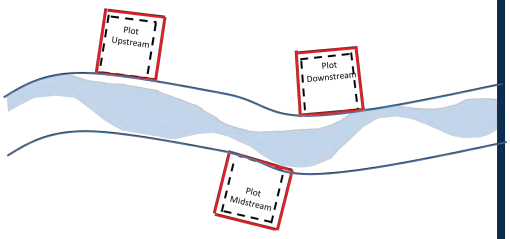


2 suboptimal: healthy soils cover between 51% and 75% of the plot (red line). The black arrow shows where healthy soils would be.



3 optimal: healthy soils cover more than 75% of the plot (red line). Black arrows show where healthy soils would be.

5. Vegetation Structure. The vertical structure of plant communities includes groundcover, understory, and canopy layers. Each layer provides ecosystem services. An increase in structural complexity can increase the diversity of and ecosystem services it provides. Conceptualize the percent cover as the 'shadow' the plants in each could cast. (**Figure F**). Assess the plot while focusing on one vegetation layer at a time and consider only the vegetation within the plot. All branches over the plot are counted as cover, regardless of their trunk location. Within each sampling plot, select the score that best represents the amount of plant cover at each layer and then average the score for each plot (round to one decimal). See examples (pages 7 and 8).



Groundcover (below 1.5ft or knee height):	**0** = <10%	**1** = 10-40%	**2** = 41-75%	**3** = >75%
Understory (between 1.5ft and 15 ft.):	**0** = <10%	**1.5** = 10-40%	**2.5** = 41-75%	**3.5** = >75%
Canopy (above 15 ft.):	**0** = <10%	**2** = 10-40%	**3** = 41-75%	**4** = >75%

Figure F: Riparian Zones

Example 1

Layer	Percent	Score
Groundcover	>75%	3
Understory	<10%	0
Canopy	41-75%	3

The average score for this plot is 2.0

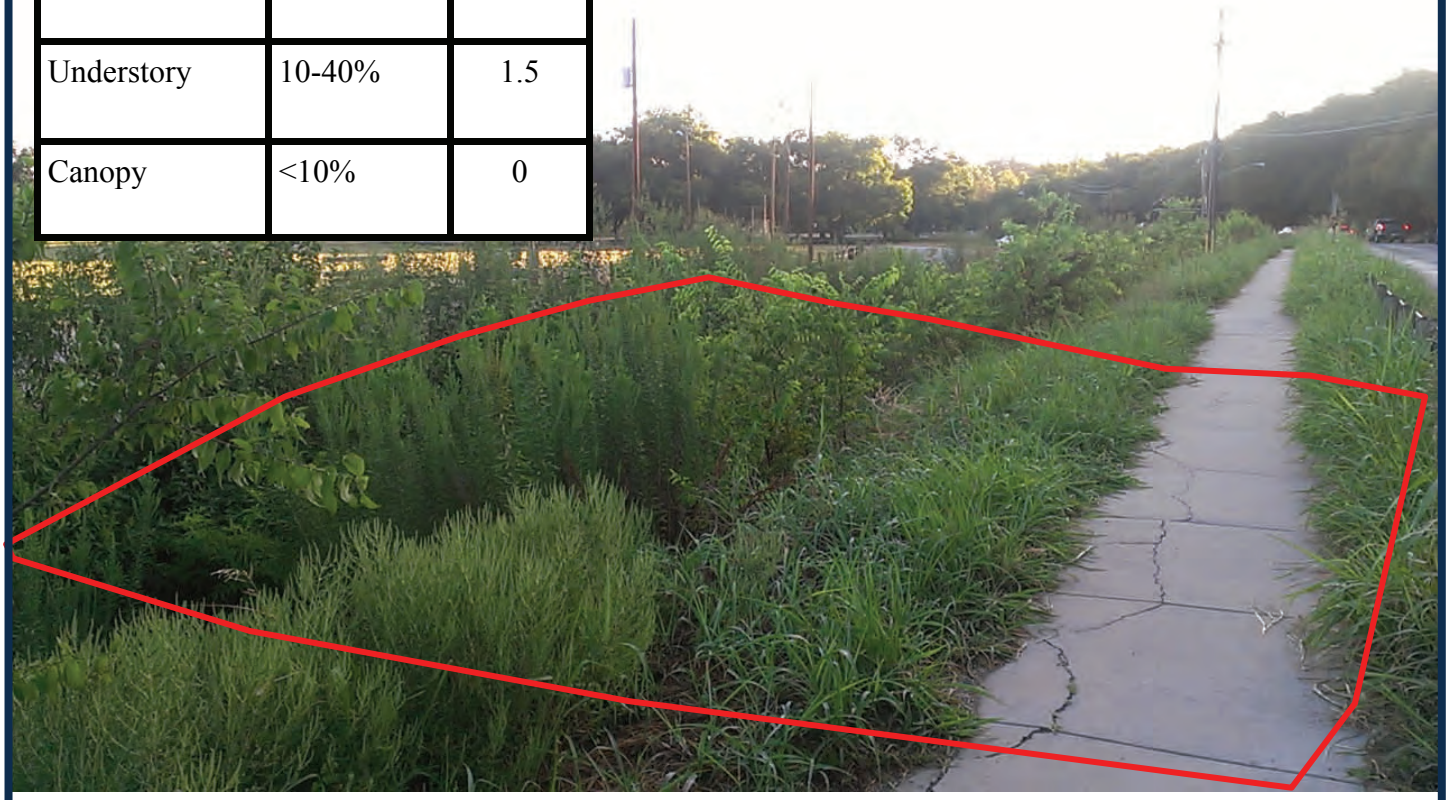
Example 2

Layer	Percent	Score
Groundcover	41-75%	2
Understory	41-75%	2.5
Canopy	41-75%	3

The average score for this plot is 2.5

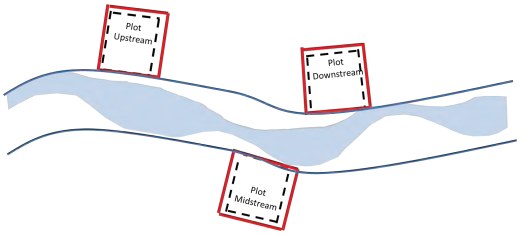
Example 3

Layer	Percent	Score
Groundcover	41-75%	2
Understory	10-40%	1.5
Canopy	<10%	0



The average score for this plot is 1.17 and rounded up to 1.2

6. Native Cover. Sites with mostly native species provide more ecosystem services than areas densely vegetated with invasive species. Increasing cover of invasive species has been linked to altered hydrology and lowered water tables. Within each sampling plot, select the score that best represents the amount of native species cover at each layer and then average the score for each plot (round up for 0.5 and above).



Groundcover (below 1.5ft or knee height):	**0** = <60%	**1** = 60-80%	**2** = 80-95%	**3** = >95%
Understory (between 1.5ft and 15 ft.):	**0** = <60%	**1** = 60-80%	**2** = 80-95%	**3** = >95%
Canopy (above 15 ft.):	**0** = <60%	**1** = 60-80%	**2** = 80-95%	**3** = >95%

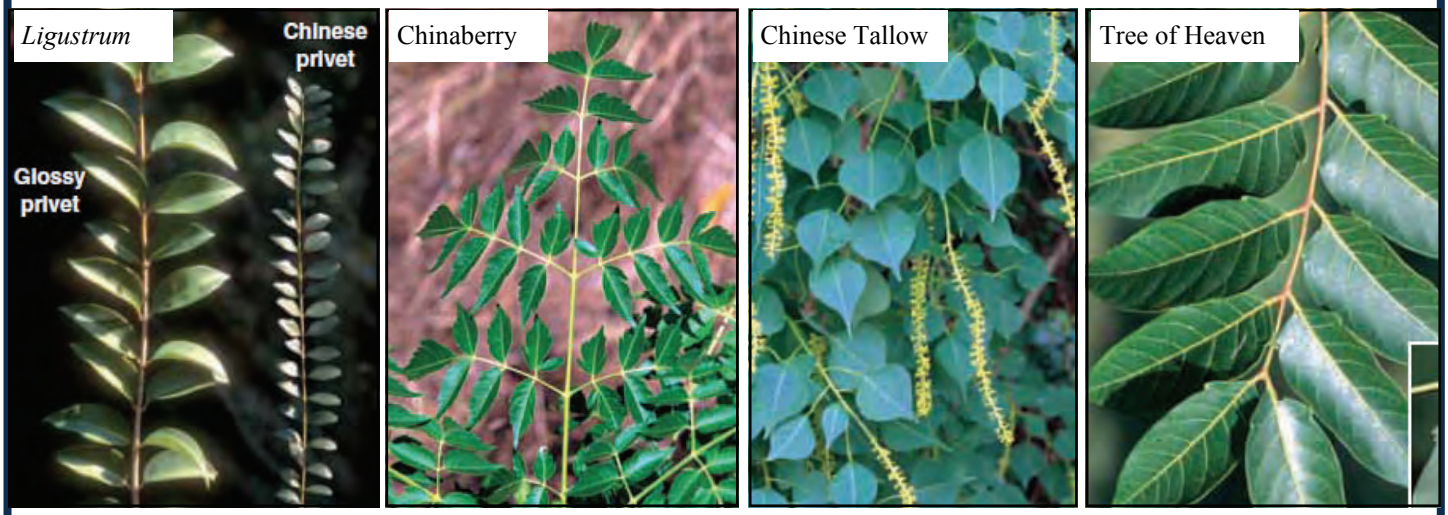


Figure G: Common invasive riparian trees of Austin. Source USDA Invasive Plants in Southern Forests Field Identification Guide. For additional identification information see www.austintexas.gov/invasive.

7. Hydrophytic Plants. Water-loving (hydrophytic) species are commonly found growing in moist soil conditions along the water's edge. The growth of these ecologically sensitive species depends on ability of riparian zone to maintain high moisture levels. Healthy riparian zones absorb water during rain events. The absence of hydrophytic plants can be an indication of soil compaction, erosion, desiccation, and subsequent loss of ecosystem function. Within the channel, in the upper, middle, and lower sections of the 300 ft study area determine the presence or absence of hydrophytic vegetation.

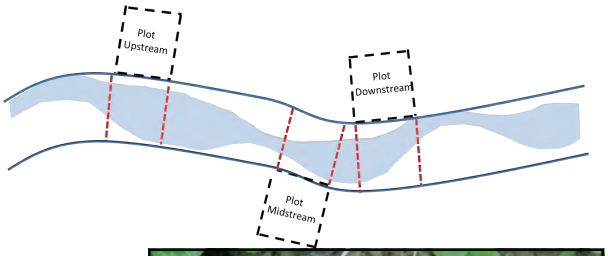
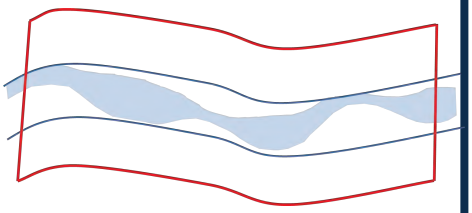


Figure H: Examples of common hydrophytic vegetation of Austin. For additional identification information see www.austintexas.gov/creekside

8. Native Tree Recruitment. The presence of seedlings and saplings of riparian trees is an indication of current and future riparian forest potential. A healthy functioning riparian zone will contain all age classes of native riparian tree species. Absence of one or more size classes is often a result of disruptions to natural ecosystem processes. Absence of seedling and saplings lead to changes in the plant community and species loss. Throughout the **entire 300 ft study area** determine the presence or absence of different sizes of the native riparian trees (**Figure I**). Circle the appropriate size classes present on the worksheet. Some common riparian trees of Austin are listed below (**Figure J**). For additional identification information visit the Texas Forest Service Trees of Texas website (http://texastreeid.tamu.edu/content/links/) or the USDA plant database (http://plants.usda.gov/java/).



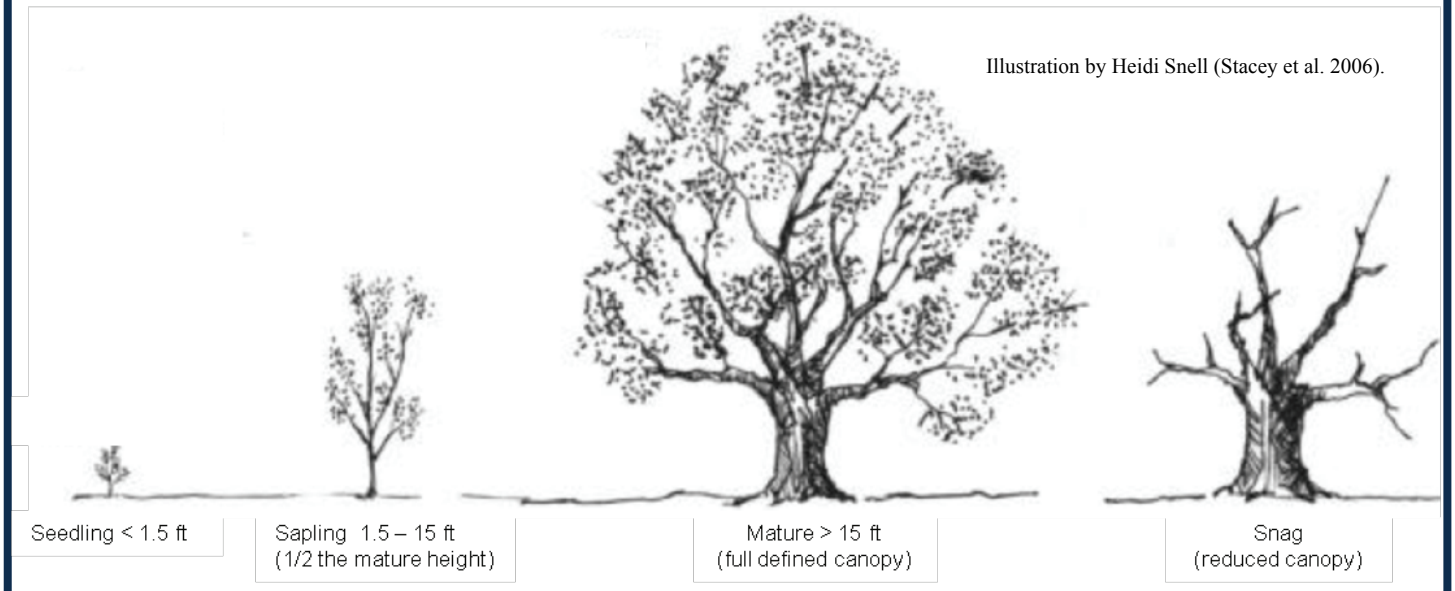


Figure I: Seedlings are defined as 16 inches or less that have sprouted within the last year. Saplings are > 16 inches in height but have yet to reach half their mature height and lack a full defined canopy. Mature trees are approaching their maximum height and display a full developed canopy. Snags are dead trees with little to no vegetation and reduced canopy coverage often resulting from broken limbs.

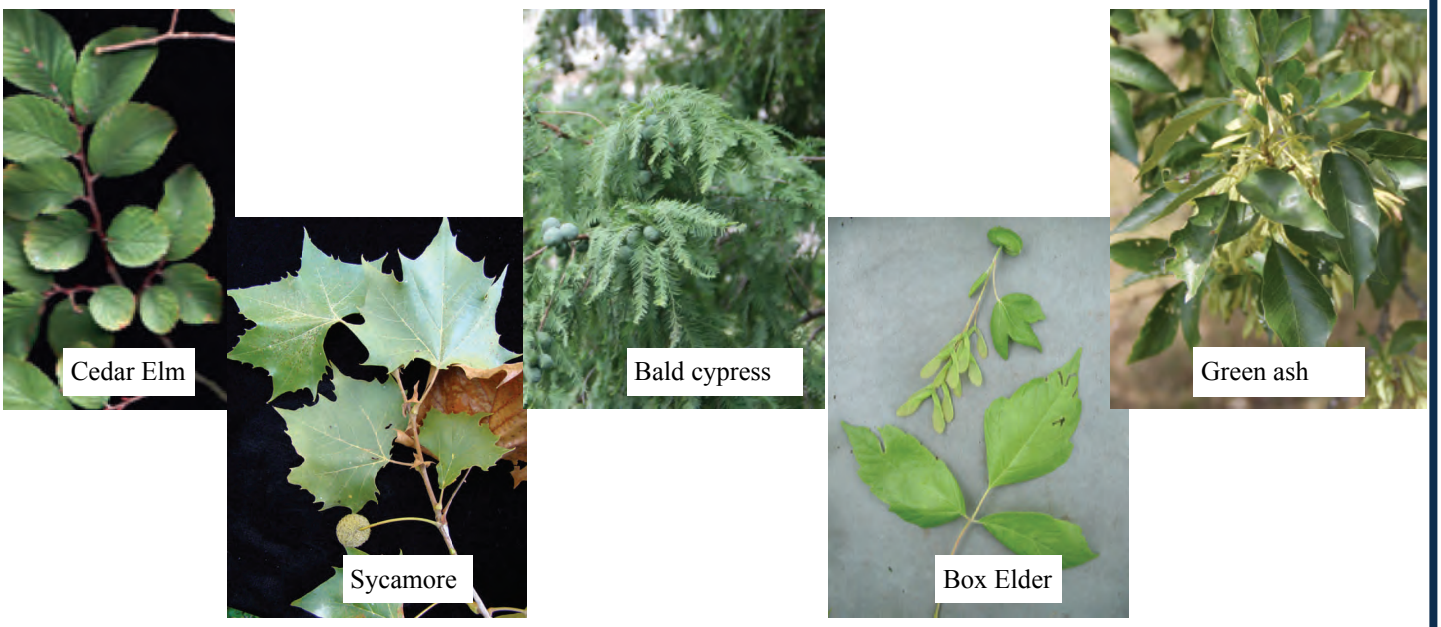
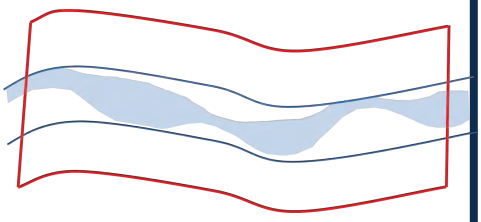


Figure J: Common dominant native riparian trees in Austin. Source USDA-NRCS PLANTS Database

9. Defining Species. Healthy riparian areas in Austin are characterized by the presence of certain native species. Different species characterize different ecoregions, such as the Blackland Prairie and the Edwards Plateau. The size of the area draining to the stream (small headwater vs. large bottomland streams) will also influence the defining species. The presence or absence of these defining plant species can be an indication of riparian zone function. Throughout the **entire 300 ft study area** record the presence or absence of any defining plant species. Be careful to select the correct species list from **Table A** based on your appropriate geographic location (**Figure K**) and size of stream. In general, the active channel or wetted width of a headwater stream ranges from 0-10 feet while bottomland streams are > 10 feet in width.



Edwards Plateau Headwaters	Blackland Prairie Headwaters
• Trumpet vine • Texas persimmon • Silktassel • Yaupon holly • Ashe juniper	• Elbowbush • Possumhaw • Soapberry • Coralberry • Cedar elm
Edwards Plateau Bottomlands	**Blackland Prairie Bottomlands**
• Box elder • Peppervine • Yaupon holly • Poison ivy • Maidenhair fern	• Possumhaw • Soapberry • Coralberry • Poison ivy • Cedar elm • Annual ragweed

Table A: City of Austin defining riparian plant species list (**Figure L, next page**).

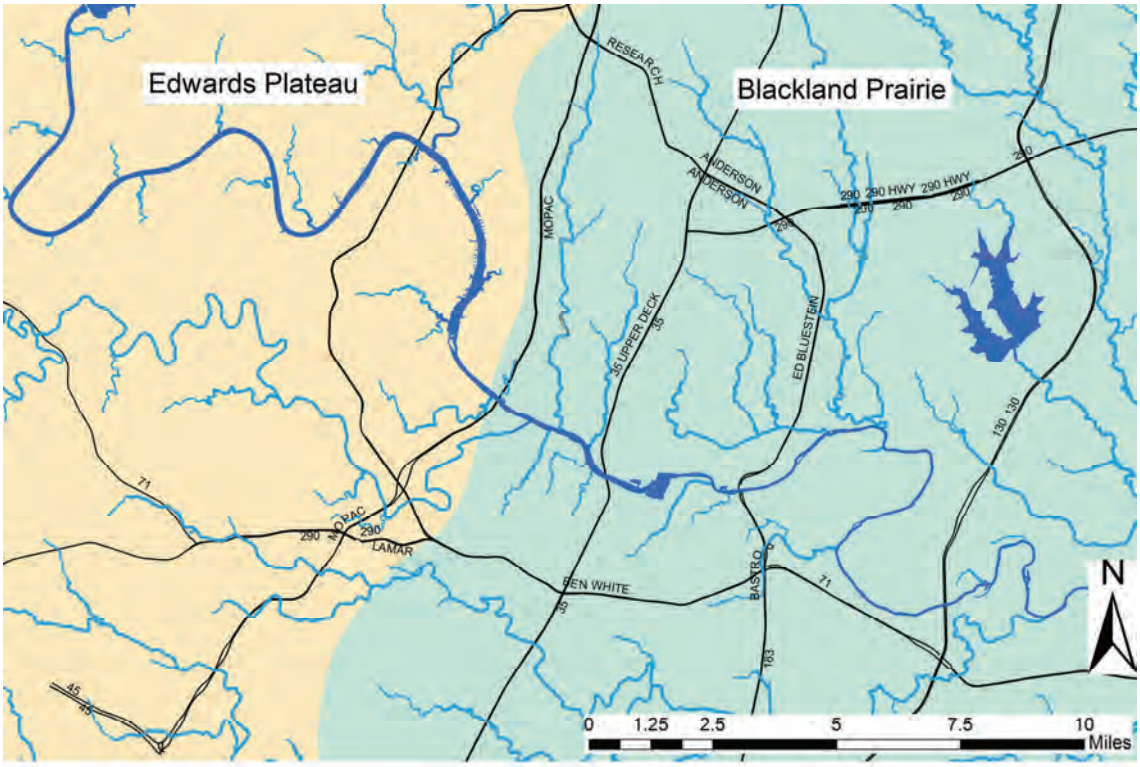


Figure K: Edwards Plateau and Blackland Prairie ecoregions.

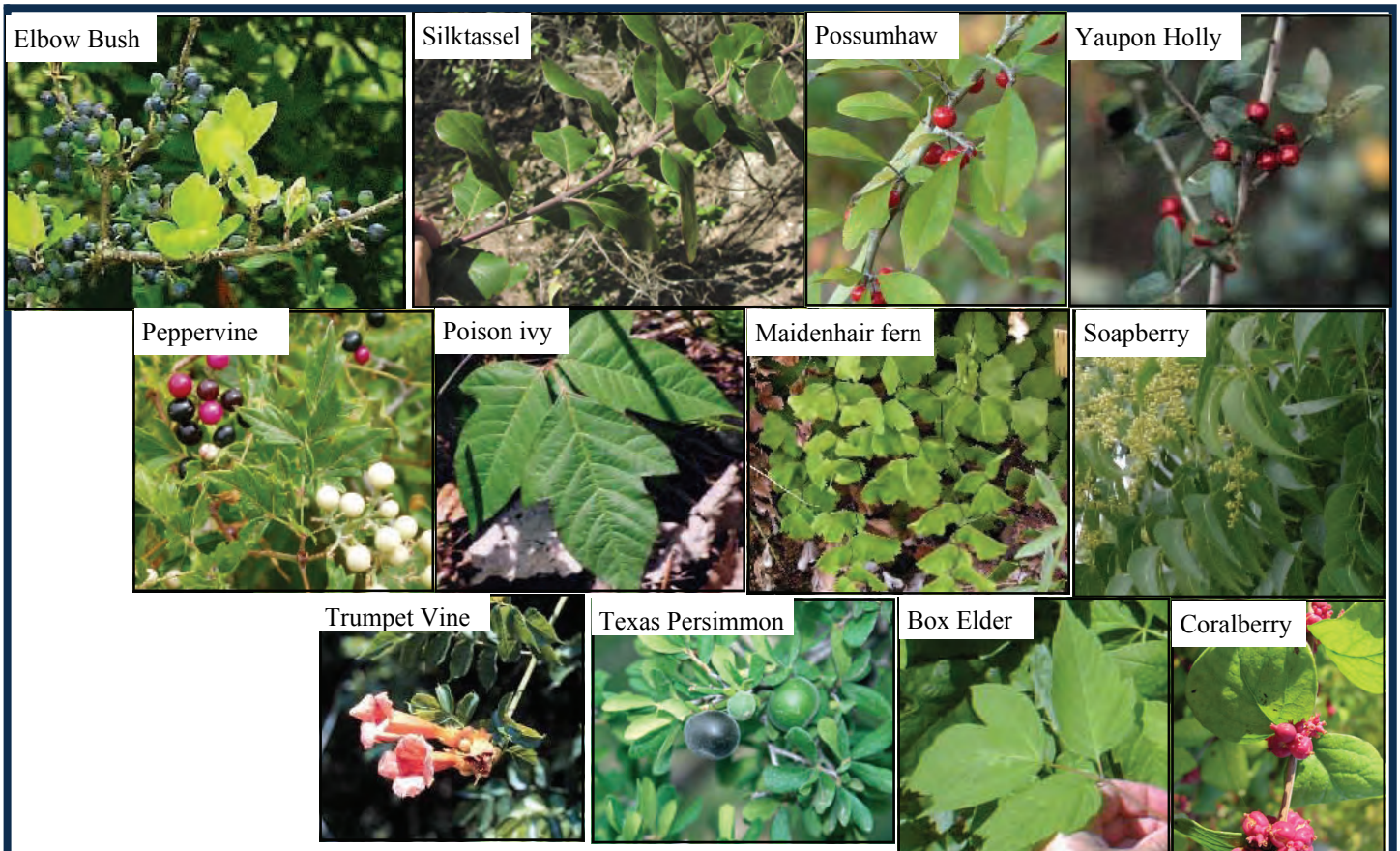


Figure L: Defining plant species. Photo: USDA Plant Database.

10. Large Woody Debris (LWD). Tree branches and trunks that have fallen the in streams dissipate stream energy and improve channel stability. Streams with adequate LWD have greater habitat diversity, a more natural meandering stream shape, and reduced flooding downstream. LWD also provides important habitat for aquatic life. Throughout the **entire 300 ft study area**, record the number of LWD pieces present in the stream channel. LWD is defined as wood pieces, at least six inches in diameter and three feet long, partially exposed to the water or located within the active stream channel. Optimal streams have > 6 LWD pieces; suboptimal streams have 4-6 LWD pieces; marginal streams have 1-3 LWD pieces; and poor streams have no LWD pieces.

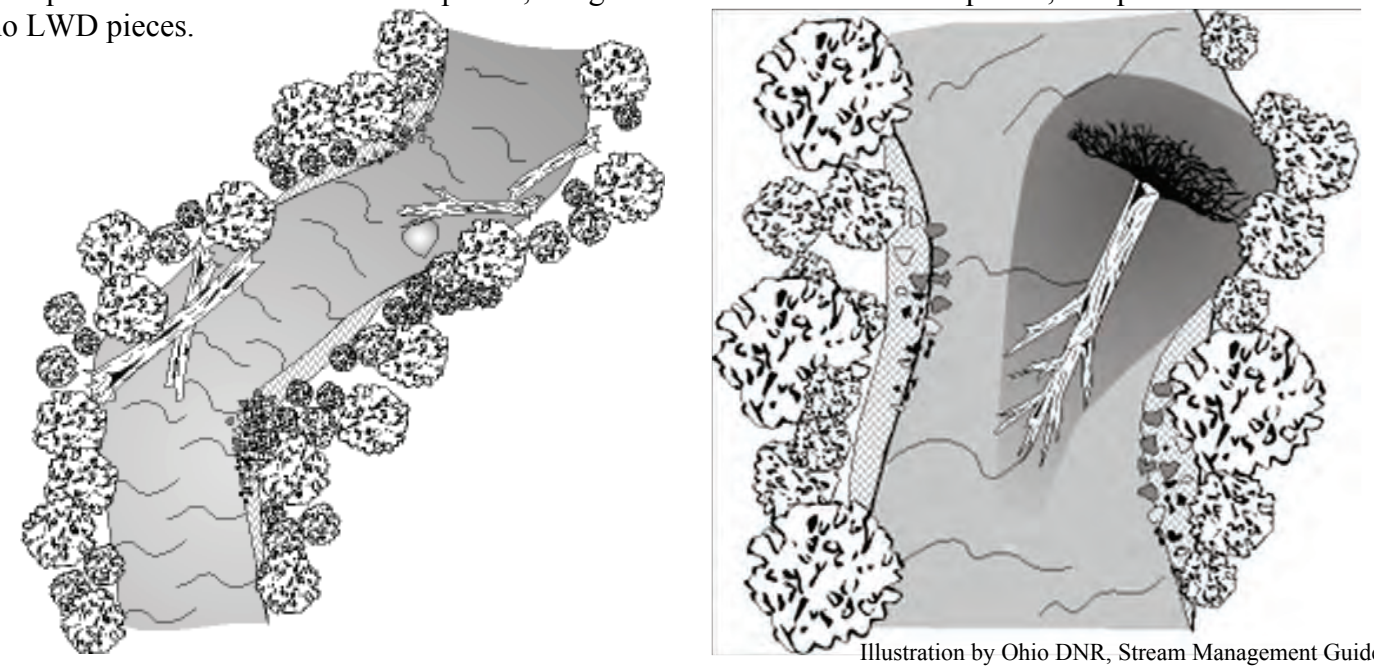


Illustration by Ohio DNR, Stream Management Guide

Figure M: Downed trees and limbs in the creek channel are examples of Large Woody Debris.

CITIZEN RIPARIAN MONITORING PROTOCOL

WORKSHEET

1 **Channel Shading**	**Point upstream** 0 = < 25 % 1 = 26-50 % 2 = 51-75 % 3 = 75-100 %	**Point midstream** 0 = < 25 % 1 = 26-50 % 2 = 51-75 % 3 = 75-100 %	**Point downstream** 0 = < 25 % 1 = 26-50 % 2 = 51-75 % 3 = 75-100 %	**Score** (average of all three plots) _____
2 **Algae Cover**	**Water Plot Upstream** 0 = 100-40 % cover 1 = 40-20% cover 2 = 1-20% cover 3 = 0 % cover	**Water Plot Midstream** 0 = 100-40 % cover 1 = 40-20% cover 2 = 1-20% cover 3 = 0 % cover	**Water Plot Downstream** 0 = 100-40 % cover 1 = 40-20% cover 2 = 1-20% cover 3 = 0 % cover	**Score** (average of all three plots) (skip if dry) _____
3 **Riparian Zone Width**	**Plot Upstream** 0 = < 25 ft. 1 = 26-60 ft. 2 = 60-100 ft. 3 = > 100 ft.	**Plot Midstream** 0 = < 25 ft. 1 = 26-60 ft. 2 = 60-100 ft. 3 = > 100 ft.	**Plot Downstream** 0 = < 25 ft. 1 = 26-60 ft. 2 = 60-100 ft. 3 = > 100 ft.	**Score** (average of all three plots) _____
4 **Riparian Soil Integrity**	**Plot Upstream** 0 = < 25% healthy 1 = 25-50% healthy 2 = 51-75% healthy 3 = > 75% healthy	**Plot Midstream** 0 = < 25% healthy 1 = 25-50% healthy 2 = 51-75% healthy 3 = > 75% healthy	**Plot Downstream** 0 = < 25% healthy 1 = 25-50% healthy 2 = 51-75% healthy 3 = > 75% healthy	**Score** (average of all three plots) _____
5 **Vegetation Structure** For each plot, add Ground, Under-story, and Canopy points and divide by three. For the overall score, add scores from plots 1-3 and divide by 3)	**Plot Upstream** **Ground** 0 = < 10% cover 1 = 10-40% cover 2 = 41-75% cover 3 = < 75% cover **Understory** 0 = < 10% cover 1.5 = 10-40% cover 2.5 = 41-75% cover 3.5 = < 75% cover **Canopy** 0 = < 10% cover 2 = 10-40% cover 3 = 41-75% cover 4 = < 75% cover Average Plot score (one decimal)_____	**Plot Midstream** **Ground** 0 = < 10% cover 1 = 10-40% cover 2 = 41-75% cover 3 = < 75% cover **Understory** 0 = < 10% cover 1.5 = 10-40% cover 2.5 = 41-75% cover 3.5 = < 75% cover **Canopy** 0 = < 10% cover 2 = 10-40% cover 3 = 41-75% cover 4 = < 75% cover Average Plot score (one decimal)_____	**Plot Downstream** **Ground** 0 = < 10% cover 1 = 10-40% cover 2 = 41-75% cover 3 = < 75% cover **Understory** 0 = < 10% cover 1.5 = 10-40% cover 2.5 = 41-75% cover 3.5 = < 75% cover **Canopy** 0 = < 10% cover 2 = 10-40% cover 3 = 41-75% cover 4 = < 75% cover Average Plot score (one decimal)_____	**Score** (average of all three plots, keep one decimal) _____

For each parameter, circle the number in each box and write the average on the right column.

CITIZEN RIPARIAN MONITORING PROTOCOL

WORKSHEET

	Plot Upstream	Plot Midstream	Plot Downstream	Score
6 Native Species Cover G = ground cover U = Understory C = canopy	0= <60% cover 1 = 60-80% cover 2 = 80-95% cover 3 = > 95 % cover G_____ U_____ C_____ Average Plot score (one decimal)_____	0= <60% cover 1 = 60-80% cover 2 = 80-95% cover 3 = > 95 % cover G_____ U_____ C_____ Average Plot score (one decimal)_____	0= <60% cover 1 = 60-80% cover 2 = 80-95% cover 3 = > 95 % cover G_____ U_____ C_____ Average Plot score (one decimal)_____	(average of all three plots) _____

	Upstream section	Midstream section	Downstream section	Score
7 Hydrophytic Vegetation	☐ Hydrophytic plants present	☐ Hydrophytic plants present	☐ Hydrophytic plants present	(Number of sections with hydrophytic plants) _____

8 Native Tree Recruitment	**Along whole study area** **Size Classes Present (circle)** Seedlings Saplings Mature trees Snags	**Score** **0** = 0 to 1size class **1** = 2 size classes **2** = 3 size classes **3** = all size classes _____

9 Defining Species	**Defining species along whole study area:** _____ _____ _____ _____ _____	**Score** (circle) **0** = 0 species **1** = 1-2 species **2** = 3-4 species **3** = >4 species

10 Large Woody Debris	**Along whole study area** **Number of Large Woody Debris Pieces:**_____	**Score** (circle) **0** = no LWD pieces **1** = 1-3 LWD pieces **2** = 4-6 LWD pieces **3** = > 6 LWD pieces _____

Add the scores from each parameter and circle the overall Riparian Score below

Riparian Score (Water present)	**Optimal > 25**	**Suboptimal 17-25**	**Marginal 7-16**	**Poor 0-6**
Riparian Score (Dry)	**Optimal > 23**	**Suboptimal 15-23**	**Marginal 6-14**	**Poor 0-5**