Phase V. Monitoring and Adaptive Management Strategy for the River/Riparian Restoration Plan

Middle Rio Grande
San Acacia to San Marcial, New Mexico

Example Data Collection Field Guide
For Volunteers

Vegetation Monitoring on Sand Bars

Prepared for:
Save Our Bosque Task Force

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Introduction

The success of the Save Our Bosque restoration program is contingent upon instituting a monitoring program that will serve as the foundation of an adaptive management plan. Monitoring is necessary to determine the response of the restoration projects in the San Acacia to San Marcial reach to the variable Rio Grande hydrology. An effective restoration plan will create favorable biotic and abiotic habitat conditions and reduce or eliminate those factors that stress the habitat. One focus of the monitoring program is to identify the most important stressors and learn how to mitigate their impact. Monitoring will also assess the river's long term ecological (biotic) and morphological (abiotic) trends that define the composition and functionality of riparian and aquatic habitat. It is important to quantify both temporal and spatial variability in the channel and riparian habitat. Monitoring these variable conditions will provide a roadmap to future trends and the probability of the success of restoration projects.

The Biological Opinion (USFWS, 2001) states that "…(a)daptive management principals will be used, if necessary, to obtain successful restoration of silvery minnow and flycatcher habitats." "Monitoring for the effectiveness of each restoration project to benefit the silvery minnow and flycatcher will be conducted at each site annually for a period of at least *fifteen years* post-project completion in order to assess whether native riparian habitats are self-sustaining and successfully regenerating…". The justification and authorization of monitoring restoration projects is firmly established and inherently linked to endangered species recovery.

Volunteer data collection presents an opportunity to stimulate community interest in river restoration, educate students and the general public, and potentially reduce monitoring costs. There are a number of monitoring tasks that can be conducted by volunteers to indicate status and trends associated with plants, soil, water and animal resources. This example field guide outlines sampling procedures and methods that are relatively simple, quick and inexpensive that can be preformed by volunteers on river sand bars.

The initial development and format of this field guide was prepared by Karen O'Brien (a Tetra Tech employee) as a New Mexico Tech class project. It was initially submitted to the Save Our Bosque Task Force. The Fish and Wildlife Service at Bosque del Apache National Wildlife Refuge has enlisted volunteers who have used the field guide to monitor sand bar vegetation on the Refuge. Its purpose was to enable volunteers to participate in a unique program to monitor long term vegetation encroachment and channel changes and gain insight into river processes. It represents an opportunity to conduct hydrographic data collection on a reach of the river that is undergoing significant channel narrowing and loss of habitat. The data will be fundamental to helping understand the river's changing morphology.

Background

In a little less than 100 years, the Middle Rio Grande has gone from the dominant feature in a river valley to a canal-like floodway with only limited natural river processes. In some reaches, key river functions such as drainage, channel migration and pulse flooding have been permanently altered or curtailed. Upstream reservoir regulation has altered the frequency, duration, timing and magnitude of seasonal flooding that has in turn affected sediment transport in the river and adversely impacted river channel morphology. The loss of frequent overbank flooding has encouraged vegetation encroachment, sand bar accretion and channel narrowing.

The rapid vegetation encroachment and channel narrowing observed throughout the middle Rio Grande over the last five years highlights how quickly the river has responded to recent climatic conditions and regulated flows. Restoration activities and river training and maintenance practices that have been in place for years have been ineffective in sustaining the channel morphology. As proposed river restoration projects are implemented, an adaptive management plan and subsequent monitoring will enable resource managers to comprehend the habitat response. Some restoration projects may fail to meet expectations and by monitoring both success and failure, improved restoration techniques and maintenance can be applied in the future.

There are two types of channel restoration activities planned; those projects that will reconstruct the physical system and those activities that will initiate processes to renew channel functions. Channel widening, bank destabilization and channel relocation are examples of reconstructing the physical system. Channel mowing and disking is an example of a process that will stimulate a more dynamic channel leading to changes in geometry. Almost all the proposed river restoration projects will depend on frequent channel forming and overbank flows. Without these flows on frequent basis, maintenance will be required to sustain the restored conditions. Monitoring will then be necessary to indicate when maintenance is needed. Ecosystem response to restoration will not be immediate. The development of wet meadow vegetation may take years. Similarly, the response of target species to habitat changes may not be immediately apparent. Restoration and the subsequent adaptive management actions are intended to provide opportunities for native species. The response of these species to restoration may require years to measure.

The riparian vegetation regenerative processes in the Rio Grande have been curtailed. Prominently missing in the hydrologic cycle are the destructive flows that initiated channel migration, eroded banks to remove the trees, and reworked the sand bars in the active channel. The invasion of salt cedar in the channel correlated with reduced flood frequency and duration in the Middle Rio Grande. Upstream reservoir storage, flow regulation and diversion and channelization all contributed to a less active river channel. The magnitude, frequency and duration of the channel forming discharges quickly and significantly decreased in the early to mid 1900s. The combination of vegetation encroachment and sediment deposition lead to channel narrowing (reduction in top width). In terms of cause and effect, the invasion of non-native vegetation

invasion was the result of a less active channel. Once the vegetation became established, channel stability was enhanced.

The channel narrowing process can be easily outlined. The seasonal high flows of the past moved vast quantities of sediment in the river creating and transforming large sand bars. These open alternate bar and point bar features exposed at low flows are remnants of the last high flow event and are the primary areas of vegetation establishment. If the last flood event was high enough, the upper surface of these sand bars may not be inundated again for several years. These areas are the prime recruitment areas for salt cedar. If the portions of the sand bars with salt cedar seedlings are not reworked within a two or three year period after germination, the seedlings will not be removed by subsequent flooding. When sand bars with salt cedar plants are flooded, slower flow velocities induce sediment deposition, gradual vertical accretion of the sand bar and eventual sand bar attachment to a bank or island. Water management and the control of peak flows in the Rio Grande basin have stabilized the sand bars and resulted in channel narrowing.

Data Collection

Introduction

It is not necessary to have a technical or scientific background to collect this data. It is important, however, to have a fundamental understanding of the purpose the data collection. The focus of the monitoring effort is to quantify and document the rate of change, particularly vegetation growth, on open sand bars. Understanding rates of vegetation encroachment, sand bar stabilization, and loss of the active channel will support an adaptive management strategy to improve the river environment. The following data collection methods and techniques have been selected to quantify the trends in river channel narrowing. These methods are designed to be simple to perform and yet are valuable to understanding how to keep the river healthy and active.

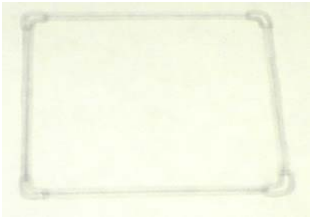
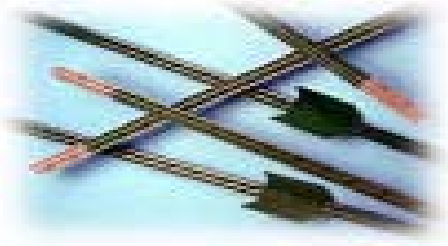
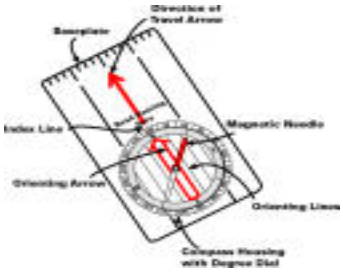
The key monitoring variables, as well as the procedures and methods to monitor restoration may be adjusted over time as restoration data and knowledge is compiled assimilated. The Adaptive Management Plan Work Group (Work Group) will determine the necessary parameters and required monitoring frequency to support adaptive management practices. Some key variables will be monitored only after spring flooding and conversely, other parameters may be monitored either seasonally or year round.

Equipment List

The following equipment list is relatively inexpensive and readily attainable:

- ✓ Camera
- ✓ Compass
- ✓ Small spade or shovel and several 1-quart freezer ziplock bags
- ✓ Cloth measuring tape or a metal tape measure
- ✓ A five meter line marked in 1 meter increments
- ✓ Small sledge hammer for driving the T-post
- ✓ Several fence posts (T-post 5 ft long)
- ✓ A 1 meter square grid box (made of pvc pipe or wood) for counting plants.

The required equipment to perform the sand bar monitoring is shown is the following figures.

Grid Box 	**5-meter Transect Line** 
Cloth Measuring Tape 	**Small Spade** 
Camera 	**Fence Post** 
Sledge Hammer 	**Compass** 

Data Collection Instructions

There are nine prescribed tasks to be completed on each selected sand bar. The following instructions are outlined for each task. The Field Data Worksheets are located at the end of the instructions.

Task 1. Determine the pace count.

1) Mark out a distance of 20 meters using the 5-meter transect line.
2) Starting with your shoe heal on line 1, count your paces until you reach line 2. Note: Take normal steps, do not exaggerate your stride or baby step.
3) Record 20-meter pace count on page 2 of the data worksheet (Figure 1).

Task 2. Pace off the length and width of the sand bar.

1) Estimate the approximate midpoint of the sand bar and set a T-post on the ground for reference (do not install the fence post yet).
2) Pace off the length of the sand bar through the midpoint and record it on data worksheet page 2.
3) Pace off the width of the sand bar through the approximate midpoint and record it on data worksheet page 2 (Figure 1).
4) Your length and width lines should cross at the approximate location of the fence post.

Task 3. Compute the sand bar length and width dimensions.

1) Use your pace count and the following formula to figure the length and width of the sand bar.
2) Formula: 20 meters/ X paces = Y meters per step.

   X paces * Y meters per step = _____ meters.

Pace Count = 30 paces in 20 meters = 0.67 meter/step

Length of sandbar = 150 paces
Width of sandbar = 100 paces

0.67 meter * 150 paces = 100.5 meters
0.67 meter * 100 paces = 67.0 meters

3) Record sandbar dimensions onto data worksheet page 2.

4) Draw a rough sketch of sandbar (Figure 1).

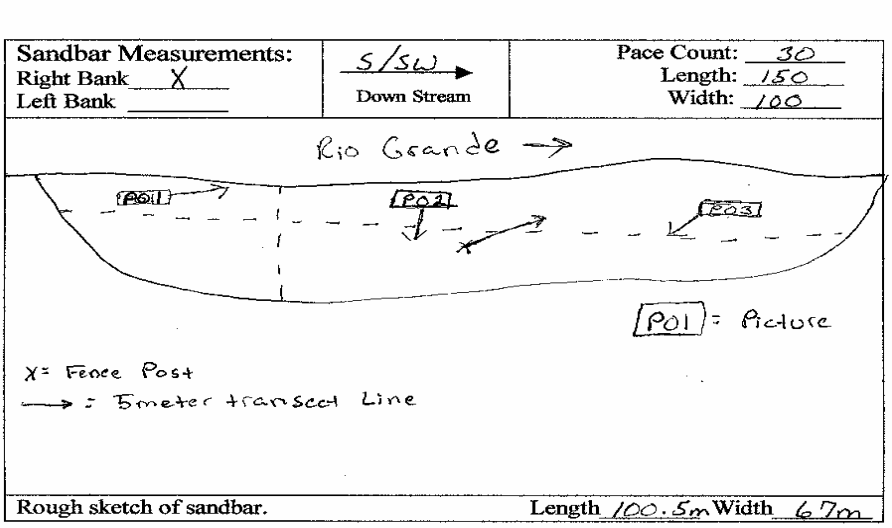


Figure 1. Data Worksheet

Task 4. Set the fencepost.

1. From the sand bar length and width estimates, determine the approximate midpoint of the sandbar.
2. Use the small sledgehammer to drive the fence post into the sand bar until it stands about 3 feet above the ground.

Task 5. Establish a 5-meter transect line in a random direction.

1) Stake out the 5-meter transect line in a random direction from the fence post. Note: A random direction can be used by the position of the minute hand of your watch using 12:00 pointing upstream.
2) Use the compass to locate the direction of the 5-meter transect line and mark the direction of the 5-meter transect line in degrees on page 2 of the data worksheet.
3) Indicate the estimated location of the 5-meter transect line on your sandbar drawing (see Figure 2).

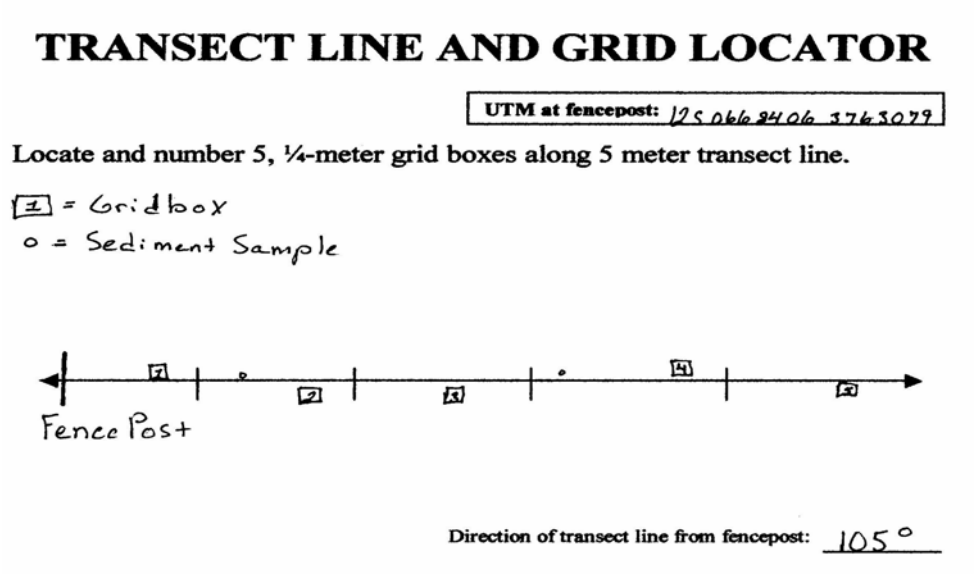


Figure 2. Data worksheet page 2

Task 6. Place grid box along the transect line and collect plant data.

1) Place the grid box in a random location within the first meter along the 5-meter transect line.
2) Count the number of woody plants and record the number and their height (in cm) within the grid box on data worksheet page 1 (Figure 3).
3) Identify the herbaceous grasses and weeds within the grid box and record the stem counts on data worksheet page 1 (Figure 3).
4) Record the location of the grid boxes along the 5-meter transect line on data worksheet page 2 (Figure 2).
5) Repeat steps 2 through 4 for the four remaining 1-meter segments of the 5-meter transect line.

PLANT DATA

UTM at fencepost: 12S 0686406 3763079

	Grid box	Common plant name	Stem count	Height cm	Information
1	1	Cockle bur	1		2, 6 Saltcedar is
2	1	Saltcedar	13	35cm	the prominent woody
3	1	Fireweed	20		plant. It covers most
4	2	Cotton wood	2	20cm	of the Sand bar
5	2	Cockle bur	1		
6	3	Saltcedar	20	35cm	4 Cotton wood saplings
7	3				intermingled with salt-
8	3				cedar.

Figure 3. Data worksheet page 1

Task 7. Collect and record sediment samples.

1) Select random two samples locations along 5-meter transect line.
2) Clear the surface debris from sample location.
3) Use the spade to remove a section of soil about 1' foot deep. Cut into the sand bar so that the layers will face the sun to help determine the soil characteristics and color.
4) Use the spade to cut a clean vertical slice out of the soil (Figure 4). Put the vertical slice into the ziplock bag.
5) Use the cloth measuring tape or metal tape to measure the thickness of the sediment layers.

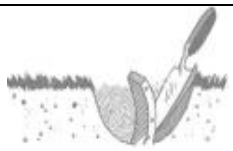


Figure 4. Soil sample

6) Record sediment layer data on data worksheet page 3 (Figure 5).
7) Repeat steps 2 through 6 and combine the two sediment samples into one ziplock bag.

SEDIMENT LAYER DESCRIPTION

Sample # 1			Sample description terms:
Layer #	Thickness (cm)	Description	
1	2 ½ cm	Sand, Fine, Grayish Brown	**Clay**
2	6 cm	Sand, Course, Reddish Brown	**Silt**
3	3 cm	Clay, Gray	**Sands**
			Fine
			Course
			Gravel

Figure 5. Data worksheet page 3

Task 8. Record photographs.

1) Take at least four pictures in the following directions from the mid-bar fence post:
    a. Looking upstream
    b. Looking downstream
    c. Looking east or west or across the river
    d. Looking 180 degrees from the third picture (generally east or west)
2) Take extra photographs of areas of dense vegetation, backwaters, or any interesting features on the sandbar.
3) To record the approximate the location of any extra photographs, take a pace count from the fence post to the photograph position. Record the location, photograph number, compass direction at the fence post, and the compass direction of the photograph view on data worksheet page 3 (Figure 6).
4) Mark the estimated location of the photograph on the rough sketch of the sandbar (see Figure 1).

PHOTO POINT DATA

UTM at fencepost: 12S0668406 3763077

Photo	Direction from Stake	Direction of Picture	Pace	Brief Description
P01	SE	N	50	Tamarisk about 30cm high
P02	E	W	25	higher sediment elevation
P03	SW	S/SE	32	Sporadic cottonwood sapling

Figure 6. Data worksheet page 3

Task 9. Observations and notebook entries

Any observations that are recorded will be helpful when reviewing photos and data in the future. Be as specific as possible when making notes. The following are valuable observations that could be recorded:

a. General flow direction across the sand bar;
b. The number and relative location of islands or sandbars in the river reach;
c. Overall vegetation density and type on the study sand bar;
d. Any evidence of erosion or scour on the sand bar;
e. Backwater habitat around the sand bar;
f. Fine sediment or mud (silt and clay) surface deposits;
g. Aeolian (wind blown) sand movement;
h. Evidences of recent flooding.

Plant Identification Guide

The following plant identification guide is divided into forbs, grasses, sedges and woody vegetation.

FORBS

Common sunflower
Helianthus annuus

Info:

Forbs
Annual
Native

Source: Robert R Kowal
http://Wiscinfo.coit.wok.edu/herbarium

Curly dock
Rumex crispus

Info:

Forbs
Perennial
Introduced

Source: Stephen L Solheim
http://Wiscinfo.coit.wok.edu/herbarium

Curly dock
Rumex crispus

Info:

Forbs
Perennial
Introduced

Source: Merel R. Black
http://Wiscinfo.coit.wok.edu/herbarium

English plantain
Plantago lanceolata

Info:

Forbs
Annual
Introduced
Height 9 – 24 inches

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

English plantain

Plantago lanceolata

Info:

Forbs
Annual
Introduced
Height 9 – 24 inches

Source: Merel R. Black
http://Wiscinfo.coit.wok.edu/herbarium

Field bindweed

Convulvulus arvensis

Info:

Forbs
Perennial
Introduced

Source: Michael Clayton
http://Wiscinfo.coit.wok.edu/herbarium

FORBS

Fireweed
Kocia scoparia

Info:

Forbs
Annual
Introduced

Source: Kenneth J. Sytsma
http://Wiscinfo.coit.wok.edu/herbarium

Lamb's quarter
Chenopoduim album

Info:

Forbs
Annual
Introduced

Source: Kenneth J. Sytsma
http://Wiscinfo.coit.wok.edu/herbarium

Saltmarsh aster
Aster subulatus

Info:

Forbs
Annual
Native

Source: Karen Reidhead
Bosque Del Apache Herbarium

Saltmarsh aster
Aster subulatus

Info:

Forbs
Annual
Native

Source: USDA, NRCS. 2001
http://plants.usda.gov

Smartweed
Polygonum pensylvanicum

Info:

Forbs
Annual

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

Smotherweed
Bassia hypssifolia

Info:

Forbs
Annual

Source: USDA, NRCS. 2001
http://plants.usda.gov

Valley redstem

Ammannia coccinea

Info:

Forbs
Annual
Native

Source: USDA, 1995-
Midwestern Wetland Flora
http://plants.usda.gov

Barnyard grass

Echinochloa crusgali

Info:

Tends to prefer moist areas and is commonly found on disturbed sites.

Grass
Annual
Introduced
Height: 30 –90 cm

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

Barnyard grass

Echinochloa crusgali

Info:

Tends to prefer moist areas and is commonly found on disturbed sites.

Grass
Annual
Introduced
Height: 30 –90 cm

Source: Hugh H. Iltis
http://Wiscinfo.coit.wok.edu/herbarium

Bearded sprangle-top

Leptochloa facicularus

Info:

Weedy Grass
Annual
Height: up to 3ft

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

Cupgrass

Eriochloa gracilis

Info:

Grass
Annual
Native
Height: 2 to 3 feet
Hairy leaf blades

Source: Jim Stritzke
http://www.agr.okstate.edu

GRASSES

Fall panic grass
Panicum dichotomiflorum

Info:

Weedy grass
Annual
Height: Up to 7 feet

Source Peter Sforza
http://www.ppws.vt.edu

Foxtail barley
Hordendeum jubatum

Info:

Weedy grass
Perennial

Source: Robert W. Freckmann
http://Wiscinfo.coit.wok.edu/herbarium

Saltgrass
Distichlis spicata

Info:

Grass
Perennial
Native

Forms salt crystals on leaves

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

Saltgrass
Distichlis spicata

Info:

Grass
Perennial
Native

Forms salt crystals on leaves

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

Sandbur
Cenchrus longispinus

Info:

Grass
Perennial
Native
Height: 8 – 80 cm

Source: Dennis W. Woodland
http://Wiscinfo.coit.wok.edu/herbarium

Sandbur
Cenchrus longispinus

Info:

Grass
Perennial
Native
Height: 8 – 80 cm

Source: Emmet J. Judziewicz
http://Wiscinfo.coit.wok.edu/herbarium

Yellow bristlegrass
Setaria glauca

Info:

Grass
Annual
Height: up to 50 inches

Source: Hugh H. Iltis
http://Wiscinfo.coit.wok.edu/herbarium

Yellow bristlegrass
Setaria glauca

Info:

Grass
Annual
Height: up to 50 inches

Source: Robert w. Freckmann
http://Wiscinfo.coit.wok.edu/herbarium

SEDGES

Chufa (Yellow nutsedge)

Cyperus esculentus

Info:

Sedge
Perennial
Noxious weed

Source: Province of British Columbia
Ministry of Agriculture and Food
http://www.agf.gov.bc.ca

Common spikerush

Eleocharis palustrus

Info:

Sedge
Perennial
Native

Source: Kitty Kohout
http://Wiscinfo.coit.wok.edu/herbarium

SEDGES

Common spikerush
Eleocharis palustrus

Info:

Sedge
Perennial
Native

Source: Kitty Kohout
http://Wiscinfo.coit.wok.edu/herbarium

Dwarf spikerush
Eleocharis parvula

Info:

Sedge
Perennial
Up to 4 inches tall

Source: USDA, NRCS, 1997 – Northeastern Wetlands Flora

Hardstem bulrush
Scirpus acutus

Info:

Sedge
Perennial
Native

Source: Robert W. Freckmann
http://Wiscinfo.coit.wok.edu/herbarium

Hardstem bulrush
Scirpus acutus

Info:

Sedge
Perennial
Native

Source: Hugh H. Iltis
http://Wiscinfo.coit.wok.edu/herbarium

Three-square bulrush
Scirpus pungens

Info:

Sedge
Perennial

Source: Robert W. Freckmann
http://Wiscinfo.coit.wok.edu/herbarium

Three-square bulrush
Scirpus pungens

Info:

Sedge
Perennial

Source: Hugh H. Iltis
http://Wiscinfo.coit.wok.edu/herbarium

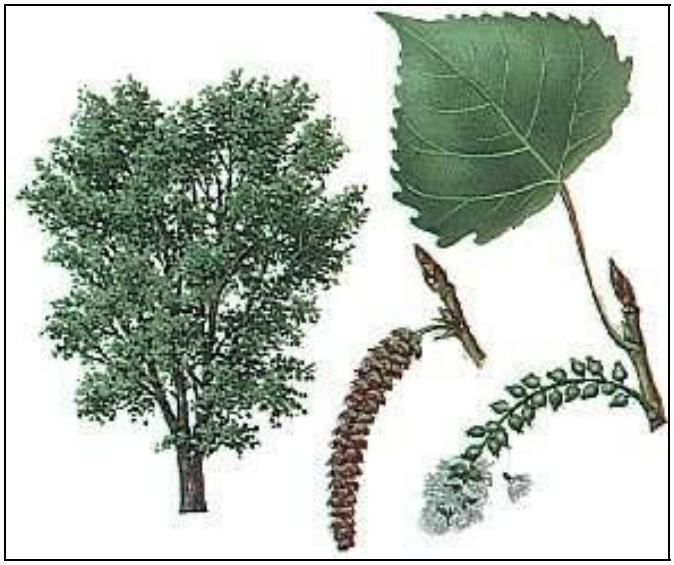
Fremont cottonwood sapling

Populus deltoides

Info:

Tree
Perennial
Native

Source: Karen Reidhead
Bosque Del Apache Wildlife Refuge



Fremont cottonwood

Populus deltoides

Info:

Tree
Perennial
Native

Source: José Manuel Sánchez de Lorenzo Cáceres
http://www.floraguide.es

Gooding's Willow
(Black Willow)
Salix goodingii

Info:

Tree
Perennial
Native

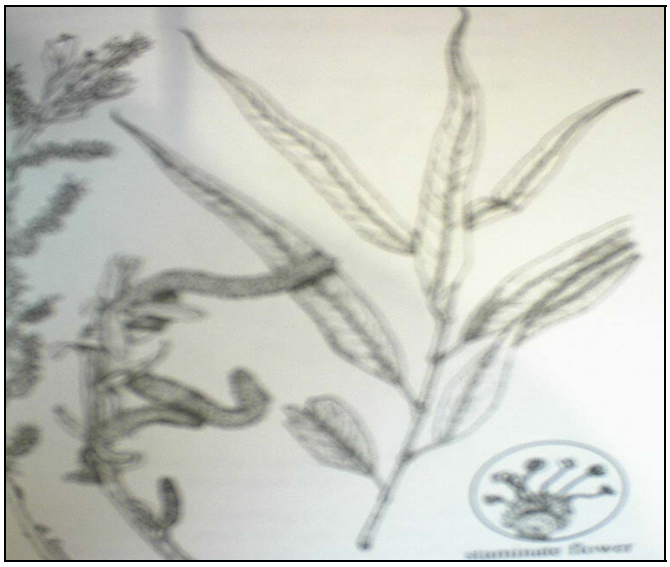
Source: Karen Reidhead
Bosque Del Apache Herbarium

Gooding's Willow
(Black Willow)
Salix goodingii

Info:

Tree
Perennial
Native

Source: Karen Reidhead
Bosque Del Apache Herbarium



Gooding's Willow (Black Willow)

Salix goodingii

Info:

Tree
Perennial
Native

Source: Jack Carter
Trees and Shrubs of New Mexico

Sandbar willow (Coyote willow)

Salix exigua

Info:

Woody shrub
Perennial

Leaves: average 4 inches long, 5\16 inches wide persistently hairy

Source: Merel R. Black
http://Wiscinfo.coit.wok.edu/herbarium

Sandbar willow (Coyote willow)

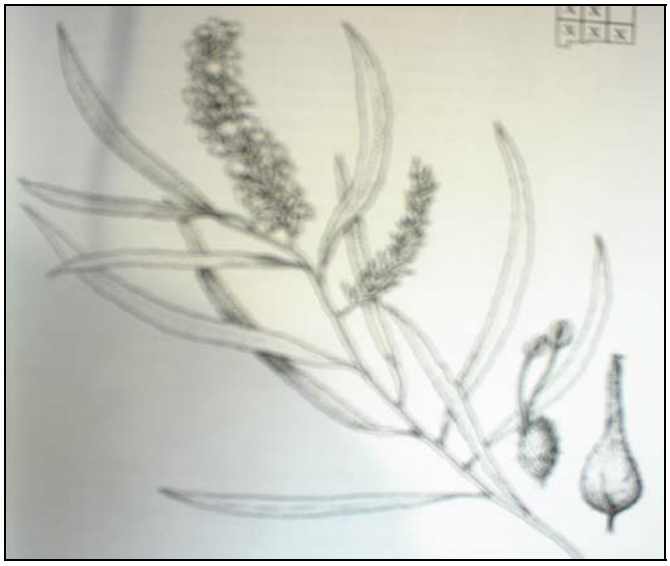
Salix exigua

Info:

Woody shrub
Perennial

Leaves: average 4 inches long, 5\16 inches wide persistently hairy

Source: Merel R. Black
http://Wiscinfo.coit.wok.edu/herbarium



Sandbar Willow (Coyote willow)

Salix exigua

Info:

Woody shrub
Perennial

Leaves: average 4 inches long, 5\16 inches wide persistently hairy

Source: Jack Carter
Trees and shrubs of New Mexico

Russian Olive

Elaeagnus angustifolia

Info:

Tree
Perennial
Introduced

Easily identified due to lance-shaped leaves that are dull green above and silvery with brown dots below.

Source: Dennis W. Woodland
http://Wiscinfo.coit.wok.edu/herbarium

Tamarisk (Saltcedar)

Tamarix ramosissima

Info:

Tree
Perennial
Introduced

Source: Karen Reidhead
Bosque Del Apache Wildlife Refuge

Soil Characteristics Guide

This section provides guidelines to assess soil characteristics. After the soil sample has been prepared and the layers distinguished in the soil slice on the sand bar, the layer soil type can be determined. It is valuable to recognize the different sizes of sediment in the soil. These sediment sizes include cobbles, gravels, sands, silts and clays. Cobbles and gravels will generally be absent on the sand bars. If sediment particles greater than 2 mm are observed, they will most likely be gravel. The size range of gravel is 2 – 64 mm. It should be noted where on the sand bar gravel is observed.

- Sand will generally be the largest particle in the soil. The sand size range is 0.0625 to 2 mm. When sand is rubbed between the fingers it will feel rough and the particles can be easily seen with the naked eye. Sandy soils are well drained and will retain water when extracted from the sand bar.
- Silt is a sediment particle whose size is between that of sand and clay. The silt size range varies from 0.004 to 0.0625 mm. Silt will feel smooth and powdery. When wet it feels smooth but not sticky. Soils comprised of silts are able to retain water and are conducive to plant growth.
- Clay is the smallest sediment particle (> 0.004 mm). Clay is smooth when dry and sticky when wet because it has a cohesive quality. It will bind with water. Soils high in clay content are called heavy soils.

There are several easy methods to determine the soil type. These include the rope test, soil plasticity test and the ribbon test.

Rope Test

Squeeze a moist, but not muddy, one inch ball of soil in your hand and rub the soil between your fingers.

- *Sandy soil* feels gritty and loose. It won't form a ball and falls apart when rubbed between your fingers.
- *Silty soil* is smooth, slick, partially gritty and sticky and forms a ball that crumbles easily. It is a combination of sand and silt/clay particles.
- *Clayey soil* is smooth, sticky and somewhat plastic feeling. It forms ribbons when pressed between fingers. Clayey soil requires more pressure to form a ball than loam soil, but does not crumble apart as easily.

Plasticity Test

Mold a moist or wet sample of soil into a ball and attempt to roll it into threads as thin as 1/8-inch in diameter.

- Cohesive material can be successfully rolled into threads without crumbling. For example, if two inch (50 mm) length of 1/8-inch thread can be held on one end without tearing, the soil is cohesive.
- If a sample breaks easily by hand, it is either a fissured cohesive material or a granular material. To distinguish between the two, pulverize the dried clumps of the sample by hand or by stepping on them.
- If the clumps do not pulverize easily, the material is cohesive with fissures. If they pulverize easily into very small fragments, the material is granular.

Ribbon Test

Create a roll of soil about 1/2 or 3/4 inch in diameter and about 3 to 5 inches long. Place the material in the palm of the hand and starting with one end, flatten the roll, forming a ribbon 1/8 to 1/4 inch thick by squeezing it between the thumb and forefinger.
The sample should be handled carefully to form the maximum length of ribbon that can be supported by the cohesive properties of the material. If the soil sample holds together for a length of 8 to 10 inches without breaking, the material is considered to be both plastic and highly compressive clay.

Field Data Worksheets

The following field data worksheets are provided as guidelines. The worksheets can be revised and printed out for use in the data collection tasks.

PLANT DATA

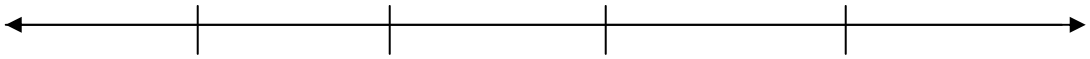
UTM at fencepost:

	Grid Box	Plant Name	Stem Count	Height (cm)	Comments
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					

TRANSECT LINE AND GRID LOCATOR

UTM at fencepost:

Locate and number 5, 1-meter grid boxes along 5 meter transect line.



Direction of transect line from fencepost: _____

Sandbar Measurements: Right Bank _____ Left Bank _____		Pace Count: _____ Length: _____ Width: _____
Downstream →		
Rough sketch of sandbar.	Length_____ Width_____	

PHOTO RECORD

UTM at fencepost:

Photo No.	Compass Direction[1]	View Direction[2]	Pace	Description
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

[1]Direction from T-Post (compass direction N, E, S, W, NE, SE, SW, NW)
[2]Compass direction for photo view (N, E, S, W, NE, SE, SW, NW)

SEDIMENT LAYER DESCRIPTION

Sample #			
Layer No.	Thickness (cm)	Description[1]	Size[2]
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

[1]Moisture content (wet, moist, dry); Color (brown, red, gray, light, dark).
[2]Clay, silt, sand, gravel (fine, course); clayey, silty sand, etc.