

San Rafael Project 16-13

Post-treatment Monitoring Report

2021



Prepared by

Kathryn R Mahan, Ecological Monitoring Specialist & Alex Makowicki, Ecological Monitoring Technician,
New Mexico Forest and Watershed Restoration Institute
for the Greater Rio Grande Watershed Alliance



Lava SWCD

Contents

Acronyms and Abbreviations	3
Purpose of Report	4
Ecological Context of Bosque Restoration	4
Monitoring and Field Methods	5
Low intensity Field Methods	5
High-intensity Field Methods	5
Estimating Vegetation Cover using eCognition Software	Error! Bookmark not defined.
Personnel Involved.....	6
San Rafael Project	6
Next Steps (Monitoring).....	Error! Bookmark not defined.
References	9
Appendix I - Photopoint Table	10
Appendix II - Photos	11
Appendix III – Current monitoring methods available.....	19
Appendix IV - Modified Hink and Ohmart categories, from NMRAM	20

Acronyms and Abbreviations

Acronym, Abbreviation, or Term	Explanation or Definition as used by NMFWR I
AGL	above ground level; GIS term
BBIRD plots	Breeding Biology Research and Monitoring Database, larger circular plot types
BEMP plots	Bosque Ecosystem Monitoring Program, small rectangular plot types
FEAT	Fire Ecology Assessment Tool
FFI	FEAT/ FIREMON Integrated
FIREMON	Fire Effects Monitoring and Inventory System
FSA	Farm Service Agency, a department of the USDA
GIS	Geographic Information Systems
GRGWA	Greater Rio Grande Watershed Alliance
LIDAR	Light detecting and ranging, a remote sensing technique using light to gather elevation data
NAIP	National Agriculture Imagery Program (aerial imagery)
NDVI	Normalized Difference Vegetation Index; GIS term for a band ratio of the visible red and the near infrared spectral bands and is calculated using the following formula: $(NIR - Red)/(NIR + Red)$
NHNM	Natural Heritage New Mexico
NMDGF	New Mexico Department of Game and Fish
NMED SWQB	New Mexico Environment Department Surface Water Quality Bureau
NMFWR I	New Mexico Forest and Watershed Restoration Institute
NMHU	New Mexico Highlands University
NMRAM	New Mexico Rapid Assessment Method, version 2.0
NRCS	Natural Resource Conservation Service
PC	Plot center
RGIS	Resource Geographic Information System
SWCD	Soil and Water Conservation District
TIFF	Tagged image file format
USDA	United States Department of Agriculture
USGS	United States Geological Survey
WQCC	Water Quality Control Commission
WSS	Web Soil Survey, a soils database of the NRCS

Purpose of Report

This report covers the low-intensity pre-treatment vegetation monitoring assessment performed on a non-native phreatophyte removal project submitted for an historic drainage basin of the Rio San Jose in San Rafael, to the Greater Rio Grande Watershed Alliance in 2016. Following a discussion of the ecological context, and our monitoring methods, we present pertinent background, observations, and assessment results for the project.

Ecological Context of Bosque Restoration

Neither the challenges nor the importance of working in the bosque and other riparian areas in New Mexico today should be underestimated. According to the New Mexico Department of Game and Fish Conservation Division, wetlands and riparian areas comprise approximately 0.6 percent of all land in New Mexico (2012). Despite this small percentage, estimates of New Mexican vertebrate species depending on wetland and riparian habitat for their survival ranges from 55% (New Mexico Department of Game and Fish Conservation Services Division, 2012) to 80% (Audubon New Mexico, 2013). These areas also provide flood mitigation, filtration of sediment and pollutants, and water for a variety of purposes including groundwater recharge (Audubon New Mexico, 2013). In addition, native vegetation such as cottonwoods have cultural significance to many communities.

As much as these areas are disproportionately important to ecosystems and human communities, they are equally disproportionately impacted by disturbance. Anthropogenic impacts with major consequences for our riparian areas include dams, reservoirs, levees, channelization, acequias and ditches, jetty jacks, riprap and Gabion baskets, urbanization, removal of native phreatophytes, grazing by domestic livestock, excessive grazing pressure by native ungulate populations absent natural predation cycles, beaver removal, logging, mining, recreation, transportation, introduction and spread of invasive exotic species, groundwater extraction, altered fire and flood regimes drought and climate change (Committee on Riparian Zone Functioning and Strategies for Management, et al., 2002). Statewide, it is estimated that as much as 90% of New Mexico's historical riparian areas have been lost (Audubon New Mexico, 2013), and approximately 39% of our remaining perennial stream miles are impaired (New Mexico Department of Game and Fish Conservation Services Division, 2012).

New Mexico is fortunate enough to have the Middle Rio Grande Bosque, the largest remaining bosque in the Southwest (USDA USFS, 1996). However, over the past two decades, the number of fires in the bosque has been increasing. Historically, the primary disturbance regime in the bosque has been flooding, not fire, which means the system is not fire-adapted. In fact, native species like cottonwood resprout from their roots after floods and need wet soils to germinate from seed. Flooding also promotes decomposition of organic material and keeps the soil moist which reduces the likelihood of fire. Today, overbank flow is uncommon in many areas of the Rio Grande due to the heavy alteration of the channel and flow regimes (two obvious examples are the structures defining the upper and lower extent of the Middle Rio Grande: Cochiti Dam and Elephant Butte Reservoir). This has led to low fuel moisture content and high fuel loads, as well as increased human presence in the riparian area. As a result, bosque fires are more common and more severe: they kill cottonwoods and other native species, creating spaces which are filled by non-native species such as salt cedar, Russian olive, Siberian elm, and Tree-of-Heaven. We are constantly learning more about how these species can exploit and encourage a riparian fire regime, in addition to many other changes they bring to ecosystems.

Efforts geared toward the removal of these nonnative species can help to reduce fire risk, preserve native vegetation, and be part of a larger effort to restore the bosque and the watershed as a whole to a more natural and functional ecosystem. The Greater Rio Grande Watershed Alliance (GRGWA) has been working on these issues with a variety of collaborating organizations and agencies within the Rio Grande basin for several years. Since 2013, the New Mexico Forest and Watershed Restoration Institute (NMFWRRI) has been working with GRGWA and the Claunch-Pinto Soil and Water Conservation District (SWCD) to begin construction of a geodatabase for all of GRGWA's non-native phreatophyte removal projects as well as to perform the formal pre- and post-treatment monitoring, utilizing the field methods explained below as well as LIDAR analysis where appropriate and available.

Monitoring and Field Methods

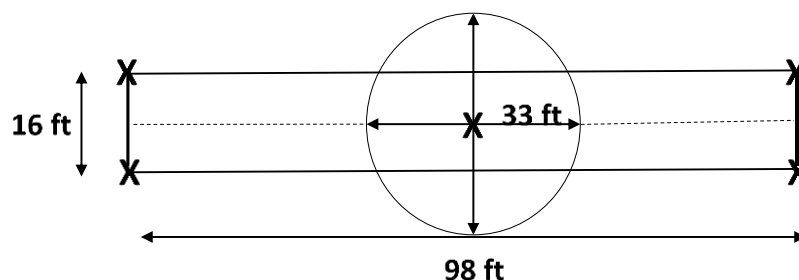
Low intensity Field Methods

Low intensity pre-treatment vegetation monitoring is typically conducted on every GRGWA site using an adapted version of the biotic portion of the New Mexico Rapid Assessment Method (NMRAM), v 2.1. However, the large size of this project (115 acres) and the sparse distribution of target species indicated to us that the NMRAM was not appropriate. NMRAM is best suited for a site around 5 acres, and while we regularly use this protocol outside of this range with open eyes, we do so because we are able to map unique, smaller vegetation community polygons, which did not appear to be the case on this site. For this reason, we did perform a BEMP style plot, establish photopoints, and record field observations. The vegetation analysis was done in the office by our GIS specialist.

Photopoints were established to capture images where vegetation shifts were observed and/or at representative locations throughout the site. Waypoints were marked with a Garmin GPS unit and named sequentially by site. Photos were taken facing north, east, south and west at each point.

High-intensity Field Methods

High-intensity monitoring was also done, in part, on this site. We used an adapted Bosque Ecosystem Monitoring Program (BEMP) style plot. These are 16 x 98-foot rectangles, placed approximately parallel to the river. Within these plots, we measure canopy and species, and vegetation and ground cover. We also used Brown's transects to measure surface fuels.



Personnel Involved

2021 New Mexico Forest and Watershed Restoration Institute Monitoring Team:

- Kathryn R Mahan, Monitoring Program Manager
- Carmen Briones, Crew Logistics Support/ Assistant Manager
- Raymundo Melendez, Monitoring Technician
- Alex Makowicki, Monitoring Technician

2021 New Mexico Forest and Watershed Restoration Institute GIS Team:

- Patti Dappen, GIS Program Manager
- Katie Withnall, GIS Specialist

Other persons contacted:

- Fred Rossbach, Field Coordinator, Greater Rio Grande Watershed Alliance
- Larry Winn, Lava/McKinley Soil and Water Conservation District

San Rafael Project

Project 16-13 is located in a shallow drainage and basin area that historically extended to the Rio San Jose, southeast of Grants, NM.

The average annual precipitation in Grants, NM is 10.5 inches. The average high temperature is 91° F in July, and the average low is 15° F in December and January. (U.S. Climate Data, 2017) According to the NRCS Web Soil Survey, the project area is comprised of 94% Warm Springs loam, 0 to 2 percent slopes, 6.3% Venadito clay loam, 0 to 1 percent slopes, and 0.1% Laporte-Rock outcrop complex, 3 to 20 percent slopes. Ecological sites within this project include R035XA119NM Clayey Bottom, and R070AY001NM Loamy Upland (USDA NRCS, 2016).

The Clayey Bottomland ecological site typically supports a grassland state dominated by western wheatgrass, blue grama, galleta, and alkali sacaton. It can also be found in a shrub-dominated state where dominant vegetation is rabbitbrush, fourwing saltbush, galleta and other grasses, as well as a bare state with sparse annual vegetation (USDA NRCS n.d.).

At the time of this report, there was no information available for the Loamy Upland ecological site.

Pre-treatment monitoring was conducted at this 114.5-acre site on October 28, 2016 as part of an initial treatment as part of a restoration project targeting non-native phreatophytes scheduled for 2016-2017. Post-treatment monitoring was conducted on January 18th, 2021. The project is on large private land, mostly east of San Rafael, NM. One small 2-acre area is located west of HWY 53. The Lava Soil and Water Conservation District (LSWCD) sponsored the project. The project is an initial treatment to remove salt cedar, Russian olive, and Siberian elm trees by extraction and mastication; large Siberian elms used as shade trees near homes will be left. Restoration goals include improving public awareness of bosque restoration efforts, returning the riparian area to a more natural state, promote native plant species, and reducing fire hazard.

16-13 San Rafael

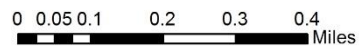
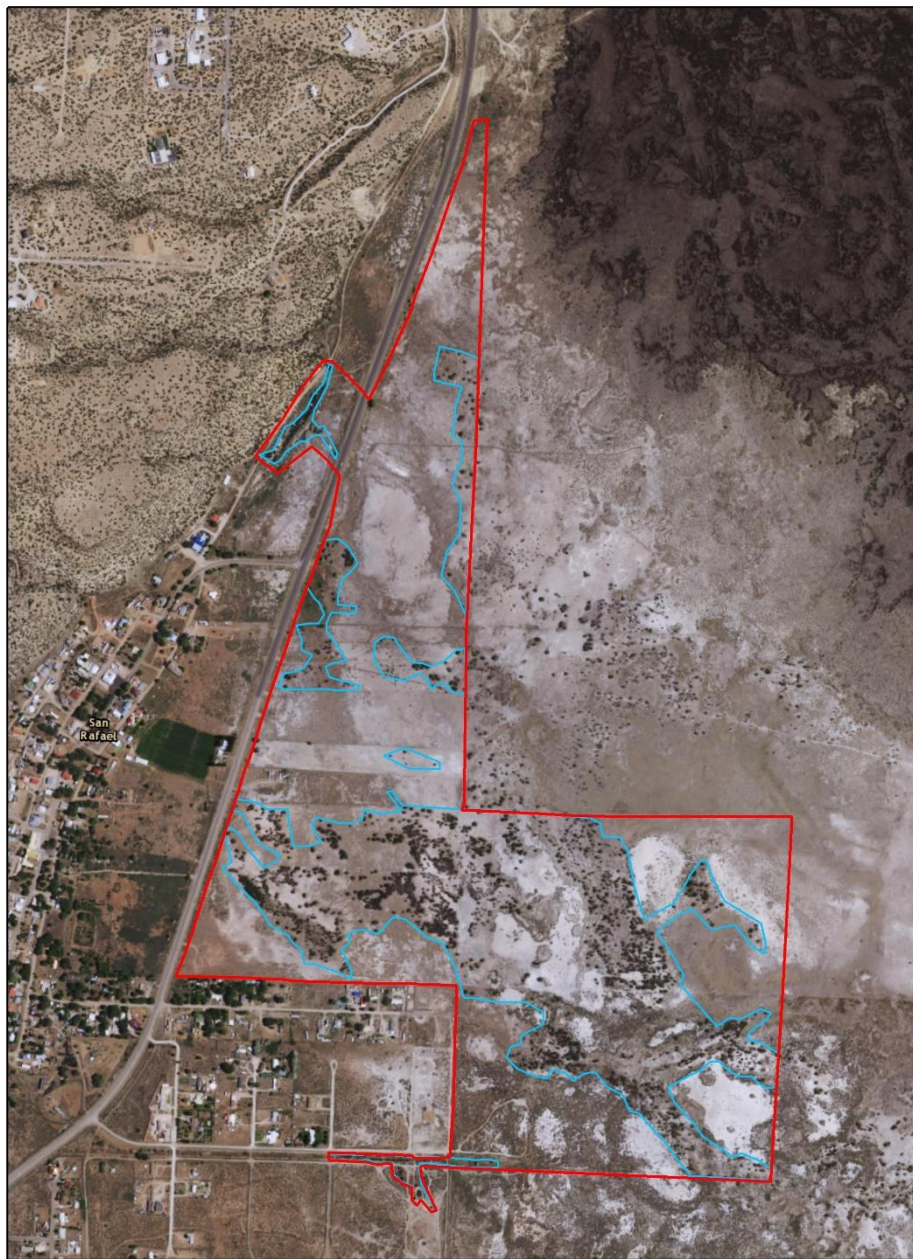


Figure 1. 16.13 San Rafael project outline.

Metrics for 16.13 (January 18, 2021)	Score
Relative Native Plant Community	2
Vegetation Horizontal Patch Structure	2
Vegetation Vertical Structure	1
Native Riparian Tree Regeneration	1
Exotic Invasive Plant Species Cover	1
Project Biotic Score (based on above ratings)	1.5
Project Biotic Rating	D/Poor
Soil Surface Condition	2
Surface Fuels	0.70

No NMRAM was conducted in 2016, instead a BEMP plot was taken. No BEMP plot was taken in 2021, instead a NMRAM was completed. . Overall, the site had little Tamarisk aside from a few individual patches which contained only a few Tamarisks. The site scored a “D” or “Poor”, its lowest scores come from the Vegetation Horizontal Patch Structure and Vegetation Vertical Structure. The Vegetation Vertical Structure metric scored low because of the dominance of the short shrub vegetation structure type. The site was abundant in 4-wing Saltbush and greasewood.

References

- Audubon New Mexico. (2013). *Water Matters: Water for New Mexico Rivers*. Albuquerque, New Mexico: Utton Transboundary Resources Center.
- Brown, J. K. (1974). *Handbook for Inventorying Downed Woody Material*, USDA Forest Service General Technical report INT-16. *Handbook for Inventorying Downed Woody Material*. Ogden, Utah: USDA Forest Service Intermountain Forest and Range Experiment Station.
- Bureau of Land Management. (2006). *Grazing Management Processes and Strategies for Riparian-Wetland Areas, TR 1737-20*.
- Claunch-Pinto Soil and Water Conservation District on behalf of the Greater Rio Grande Watershed Alliance. (2015). *Request for Proposals for Greater Rio Grande Watershed Alliance Riparian Restoration Projects*. Mountainair, NM: Claunch-Pinto Soil and Water Conservation District.
- Committee on Riparian Zone Functioning and Strategies for Management, et al. (2002). *Riparian Areas: Functions and Strategies for Management*. Washington, D.C.: National Academy Press.
- Lightfoot, D. &. (2012). *Greater Rio Grande Watershed Alliance Riparian Restoration Effectiveness Monitoring Plan*. Albuquerque, NM: SWCA Environmental Consultants.
- Lightfoot, David & Stropki, C. (2012). *Field Manual for Greater Rio Grande Watershed Alliance Riparian Restoration Effectiveness Monitoring*. Albuquerque, NM: SWCA Environmental Consultants.
- Lizarazo, I., & Elsner, P. (2009). Fuzzy segmentation for object-based image classification. *International Journal of Remote Sensing*, 30.
- Muldavin, E. B. (2011). *New Mexico Rapid Assessment Method: Montaine Riverine Wetlands*. Version 1.1. Final report to the New Mexico Environment Department, Surface Water Quality Bureau. 90 pp. and appendices.
- New Mexico Department of Game and Fish Conservation Services Division. (2012). *Bridge and Road Construction/Reconstruction Guidelines for Wetland and Riparian Areas*.
- U.S. Climate Data. (2017). *Climate New Mexico*. Retrieved from U.S. Climate Data: <http://www.usclimatedata.com/climate/new-mexico/united-states/3201>
- USDA NRCS. (2016, 8 10). *Web soil Survey*. Retrieved from <https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- USDA NRCS n.d. (n.d.). *Ecological Site Description Clayey Bottomland R035XA119NM*.
- USDA USFS. (1996, September). *Ecology, Diversity, and Sustainability of the Middle Rio Grande Basin*, RM-GTR-268. (D. M. Finch, & J. A. Tainter, Eds.) Fort Collins, Colorado.

Appendix I - Photopoint Table

Name	Latitude	Longitude
16.13_1_NESW	35.1111	-107.8690
16.13_2_NESW	35.1205	-107.8750
16.13_PC_NESW	35.1128	-107.8710

16.13_1_NESW	1/18/2022 11:10am	100-0399	35.1111 0154	- 107.8694 233	N	4-wing saltbush @14' @356deg	Saltcedar @570' @0/360deg	-	Olympus red	CB, RM, AM	Bareground, field of 4-wing saltbush
		100-0400			E	Bareground PC @21' @180deg	Fence @563' @90deg	-	Olympus red	CB, RM, AM	Bareground, 4-wing saltbush, field and fence
		100-0401			S	4-wing saltbush @27' @180deg	Fence @203' @180deg	-	Olympus red	CB, RM, AM	Bareground from PC - 27', some 4-wing saltbush then fence, then 4-wing saltbush
		100-0402			W	Bareground PC @50' @270deg	4-wing saltbush @313' @270deg	-	Olympus red	CB, RM, AM	Bareground, 4-wing saltbush, one salt cedar sapling
16.13_PCNESW	1/18/2022 11:39am	100-0405	35.1128 3048	- 107.8707 7265	N	4-wing saltbush @15' @0/360deg	Saltcedar @570' @0/360deg	-	Olympus red	CB, RM, AM	Mulching, scattered, some bareground, 4-wing saltbush from N->S
		100-0406			E	4-wing saltbush @8' @90deg	4-wing saltbush @520' @90deg	-	Olympus red	CB, RM, AM	Facing W main road, mountain hill and buildings
		100-0407			S	4-wing saltbush @4' @180deg	4-wing saltbush @256' @180deg	-	Olympus red	CB, RM, AM	
		100-0410			W	4-wing saltbush @21' @270deg	Fence @1126' @270deg	-	Olympus red	CB, RM, AM	Mulching and fencing, west is road and houses, tumbleweed

Appendix II - Photos



2016:
16.13_1_N.
View facing

2021:
16.13_1_N



2016:
16.13_1_E.
View facing
east.



2021: 16.13_1_E



2016: 16.13_1_S.
View facing
south.

2021:
16.13_1_S



16.13:
16.13_1_W.
View facing
west.



2021:
16.13_1_W



2015:
16.13_2_N
W. View
facing
north-
west.

2021:
16.13_2_N



2015:
16.13_2_E.
View
facing east



2021: 16.13_2_E

2015:
16.13_2_SE.
View facing
south-east.



2021:
16.13_2_SE

2015:
16.13_2_SW.
View facing
south-west.



2021:
16.13_2_SW

Appendix III – Current monitoring methods available

Low-intensity methods

- Where: happens on all sites with GRGWA projects
- Method name: NMRAM (New Mexico Rapid Assessment Method v 2.1)
- Time required: 3 hours – half day/ site
- Repeat: done once pre-treatment and in 4-5 year intervals post-treatment
- Basics: mapping vegetation communities (by vertical and horizontal structure), recording dominant vegetation in each strata (trees, shrubs, herbaceous), assessing fuel load, noting soil surface condition and native/exotic ratio at all vegetation levels, photo points
- Any on-site impacts or materials: none

High-intensity methods

- Where: happens on select sites, in addition to low-intensity monitoring

Submethod name 1: BBIRD or BEMP vegetation plots (depends on treatment area size)

- Time required: approx. 2 hours/site
- Repeat: both pre-treatment and in 4-5 yr intervals post-treatment
- Basics: larger plots and transects documenting vegetation, photo points
- On-site impacts or materials: rebar and cap

Submethod name 2: Brown's transects

- Time required: 1-1.5 hours/site
- Repeat: both pre-treatment and in 4-5 yr intervals post-treatment
- Basics: transects to calculate fuel loading and fire behavior, photo points
- On-site impacts or materials: rebar and cap

Submethod name 3: BEMP-adapted Groundwater Well Monitoring

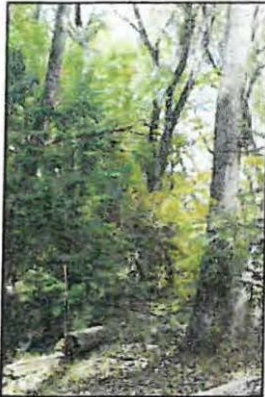
- Time required:
 - Initial installation: 1-2 hours/ well (ideally 2+ wells/site)
 - Repeat: maintenance as needed, should be minimal
 - Data offloading: 10-20 minutes/well
 - Repeat: at least annually (this is when we anticipate datalogger will be full and batteries will need to be changed)
- Basics: install a well with a sensor which records groundwater level and temperature once an hour year round; this will reflect changes due to seasonal variation, vegetation growth, irrigation, etc.
- On-site impacts or materials: shallow monitoring well (consists of capped PVC pipe extending into the ground about 3 feet below the water table and above ground approx. 2 feet (can be painted earth tones); well contains a datalogger (pressure transducer) suspended on a cable into the water); well should be protected from cattle grazing (so may require rebar around pvc visible above ground)

Appendix IV - Modified Hink and Ohmart categories, from NMRAM

The following is pages 39-41 in Muldavin et al.'s 2014 NMRAM for Montane Riverine Wetlands v 2.0 Manual (draft, not yet published)

Vegetation Vertical Structure Type Definitions for NMRAM

Multiple-Story Communities (Woodlands/Forests)



Type 1 – High Structure Forest with a well-developed understory.

Tall mature to intermediate-aged trees (>5 m [>15 feet]) with canopy covering >25% of the area of the community (polygon) and understory layer (0-5 m [0-15 feet]) covering >25% of the area of the community (polygon). Substantial foliage is in all height layers. (This type incorporates Hink and Ohmart structure types 1 and 3.) Photograph on Gila River by Y. Chauvin, 2012.



Type 2 –Low Structure Forest with little or no understory.

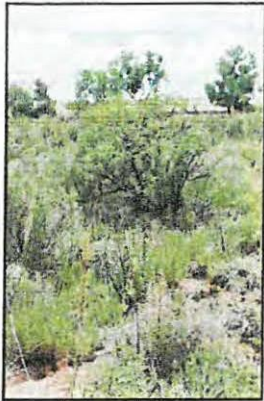
Tall mature to intermediate-aged trees (>5 m [>15 feet]) with canopy covering >25% of the area of the community (polygon) and understory layer (1-5 m [3-15 feet]) covering <25% of the area of the community (polygon). Majority of foliage is over 5 m (15 feet) above the ground. (This type incorporates Hink and Ohmart structure types 2 and 4.) Photograph on Diamond Creek by Y. Chauvin, 2012.

Single-story Communities (Shrublands, Herbaceous and Bare Ground)



Type 5 –Tall Shrub Stands.

Young tree and shrub layer only (15-5 m [4.5-15 feet]) covering >25% of the area of the community (polygon). Stands dominated by tall shrubs and young trees, may include herbaceous vegetation underneath the woody vegetation. Photograph on San Francisco River by Y. Chauvin, 2012.



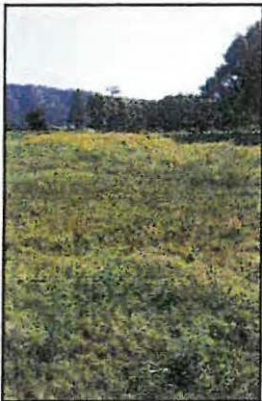
Type 6S- Short Shrub Stands.

Short stature shrubs or very young shrubs and trees (up to 1.5 m [up to 4.5 feet]) covering >10% of the area of the community (polygon). Stands dominated by short woody vegetation, may include herbaceous vegetation underneath the woody vegetation. Photograph on Lower Pecos River by E. Lindahl, 2008.



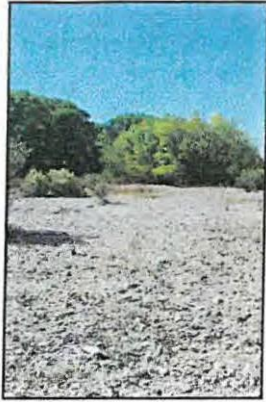
Type 6W- Herbaceous Wetland.

Herbaceous wetland vegetation covering >10% of the area of the community (polygon). Stands dominated by obligate wetland herbaceous species. Woody species absent, or <10% cover. Photograph of *Carex nebrascensis* meadow on upper Rio Santa Barbara by Y. Chauvin, 2009.



Type 6H- Herbaceous.

Herbaceous vegetation covering >10% of the area of the community (polygon). Stands dominated by herbaceous vegetation of any type except obligate wetland species. Woody species absent or <10% cover. Photograph on Diamond Creek by Y. Chauvin, 2012.



Type 7–Sparse Vegetation/Bare Ground.

Bare ground, may include sparse woody or herbaceous vegetation, but total vegetation cover <10%. May be natural in origin (cobble bars) or anthropogenic in origin (graded or plowed earth) Photograph on Lower Gila River by Y. Chauvin,2012.