Riparian Evaluation of Oso Creek and Tributaries

Funding Entity: Texas Commission on Environmental Quality (TCEQ)
Contractor and Performing Party: Nueces River Authority (NRA)
Umbrella Contract No: 582-16-60058
Work Order No: 02 (PCR 62561)
Report Date: August 31, 2016

Introduction:

Since 2002, water quality testing has found that concentrations of bacteria are elevated in Oso Creek, which may pose a risk for contact recreation. In response to these conditions, TCEQ is currently developing a total maximum daily load (TMDL) for Oso Creek. The TMDL will establish the amount (or load) of a pollutant that a body of water can receive and still support its beneficial uses. The allowable load is then allocated among categories of sources within the watershed. Stakeholders are now developing a plan to implement the TMDL (I-Plan) which includes measures to reduce pollution.

This report is a deliverable for Task 2 of the FY 2016 Work Order to support I-Plan activities for the Oso Creek watershed as described below:

Task 2: Support of I-Plan Activities

NRA will conduct the riparian evaluation for the Oso Creek watershed. This assessment will include an evaluation of current riparian conditions, identification of opportunities for improvement, and establishment of visual assessment sites (partnering with Coastal Bend Regional Stream Team).

2.1 NRA will identify 1-3 riparian evaluation project areas to establish on-going evaluation.

2.2 NRA will complete riparian evaluation worksheets, maps, and report outlining identified hindrances, opportunities and/or constraints by August 31, 2016.

Watershed Description:

The Oso Creek watershed is wholly contained within Nueces County in the Nueces-Rio Grande Coastal Basin. The creek is about 28 miles long. It flows southeasterly from near the western edge of Corpus Christi over flat to rolling terrain, emptying into Oso Bay. Oso Creek's flow is dominated by permitted municipal wastewater discharges. Corpus Christi is the only major metropolitan area within the watershed's boundaries. Robstown is about 3 miles northeast of the creek's origin. Classified stream segments within the watershed include Oso Creek (2485A), West Oso Creek (2485D) and two unnamed tributaries (2485B and 2485C). Economic activities in the area include oil and gas refining and production, agriculture, manufacturing, and tourism.

Riparian Connection:

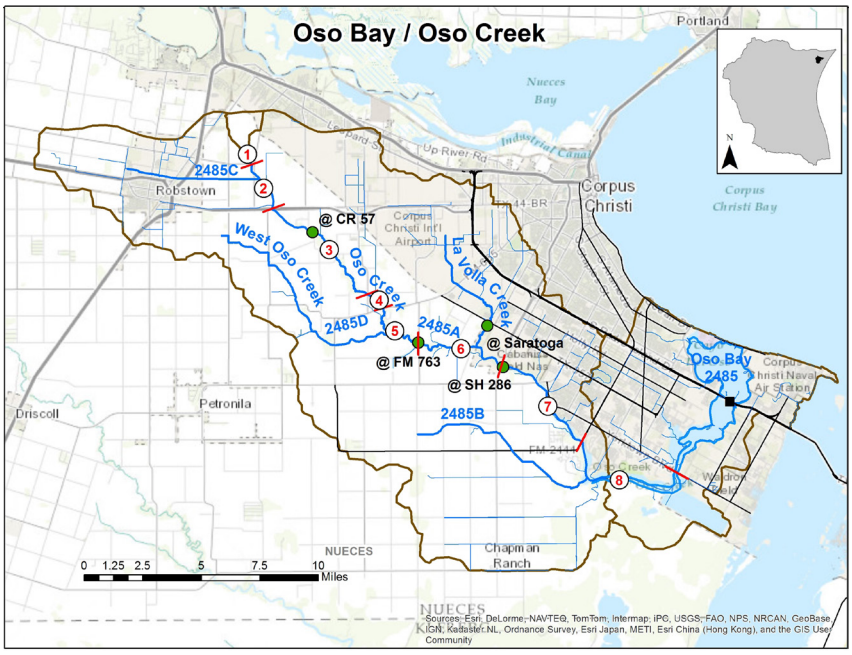
A riparian area is the part of the landscape that borders a creek or river. When a riparian area is healthy and functioning properly it filters and slows run-off and floodwaters, and allows for sediment trapping and groundwater infiltration. The water quality benefits of a healthy riparian area are well documented. In one recent study *"Putting a Price on Riparian Corridors as Water Treatment Facilities"*, 2009, Ann L. Riley, documents a direct and financial relationship between riparian function and water quality. The

study finds that healthy functional riparian areas have been shown to improve water quality by removing nutrients, improving dissolved oxygen, storing sediments, regulating temperatures, and buffering flood energies. They have been shown effective in reducing pathogens such as coliform and cryptosporidium. It also notes that the loss of riparian function equates to a loss in water quality treatment capability and can contribute directly to a decline in water quality.

Study Approach:

Riparian conditions along Oso Creek (2485A), West Oso Creek (2485D) and two unnamed tributaries (2485B and 2485C) were evaluated by helicopter on July 19, 2016. For the purpose of describing riparian functional conditions and identifying opportunities for improved function, Oso Creek (2485A) was divided into 8 segments. An approximate length is presented for each segment, along with an estimated size for a functional riparian area. A functional riparian area was estimated based on an average width from the channel; 300 feet on each side for Oso Creek and West Oso Creek, and 150 feet on each side for the two unnamed tributaries. In some segments of Oso Creek, functional riparian areas wider than 300 feet were observed. The wider and more continuous a functional riparian area is, the better it has been shown to be for water quality.

Four sites were identified for on-the-ground evaluation and possible ongoing evaluation by the Texas Stream Team volunteer monitoring program. The Texas Stream Team is an interdisciplinary student organization for water quality monitoring and promoting environmental stewardship with a chapter organized on the campus of Texas A&M University - Corpus Christi. The four possible ongoing evaluation sites are located at the following public road crossing: County Road (CR) 57, at Farm-to-Market (FM) 763, at State Highway (SH) 286, and La Volla Creek down steam of the bridge at Saratoga Blvd.



Rating Riparian Function:

Functional conditions were evaluated using the Riparian Bull's-Eye Evaluation Tool found in "Your Remarkable Riparian Field Guide" Third edition, published by Nueces River Authority, April 2016. The tool uses ten riparian indicators to guide observation and can help lead to the identification of activities that may be hindering the natural riparian recovery process. A copy of the evaluation tool and information on riparian functional conditions is included as an attachment to this report. An evaluation form was completed for each of the on-the-ground sites and the tool was used to guide the over-all visual evaluation of whole segments during the aerial survey. Indicators of riparian function considered in the Bull's-Eye Evaluation include:

- Active Floodplain
- Energy Dissipation
- New Plant Colonization
- Stabilizing Vegetation
- Riparian Age Diversity
- Diversity of Riparian Vegetation
- Plant Vigor
- Water Storage
- Bank or Channel Erosion
- Sediment Deposition

These indicators rely on the use of **wetland indicator** (WI) **status** and **stability rating** (SR) for specific riparian plants. The WI and SR for common riparian plants are found in "Your Remarkable Riparian Field Guide", Third edition, published by Nueces River Authority, April 2016.

A wetland status is assigned to plants according to the degree of soil moisture needed and tolerated by the plant. This rating is based U.S. Fish and Wildlife Service's Wetland Plant List compiled in 1988, with numerous revisions.

There are five categories:
OBL – *Obligate Wetland Plants*; almost always found in very wet locations
FACW – *Facultative Wetland Plants*; usually found in wet locations
FAC – *Facultative Wetland Plants*; found equally in wet and non-wet locations
FACU – *Facultative Upland Plants*; usually found in non-wet locations
UPL – *Obligate Upland Plants*; almost always found in non-wet locations

A stability rating is assigned to riparian plants according to the plant's observed ability to withstand the erosive forces of water in most of Texas. These stability estimates are based on information published the USDA TR47: Monitoring Vegetation Resources in Riparian Areas, A. Winward, 2000, and have been adjusted by Steve Nelle based on his observations from across Texas. The rating scale is one to ten. A SR of one is equal to bare ground, while an SR of ten is equal to the stability of anchored rock. An SR of six to seven is considered the minimum necessary for adequate bank stability.

Riparian Recovery:

Riparian areas have been found to naturally recover their functional condition unless that recovery is hindered by one or more activities or conditions. Common hindrances to riparian recovery include:

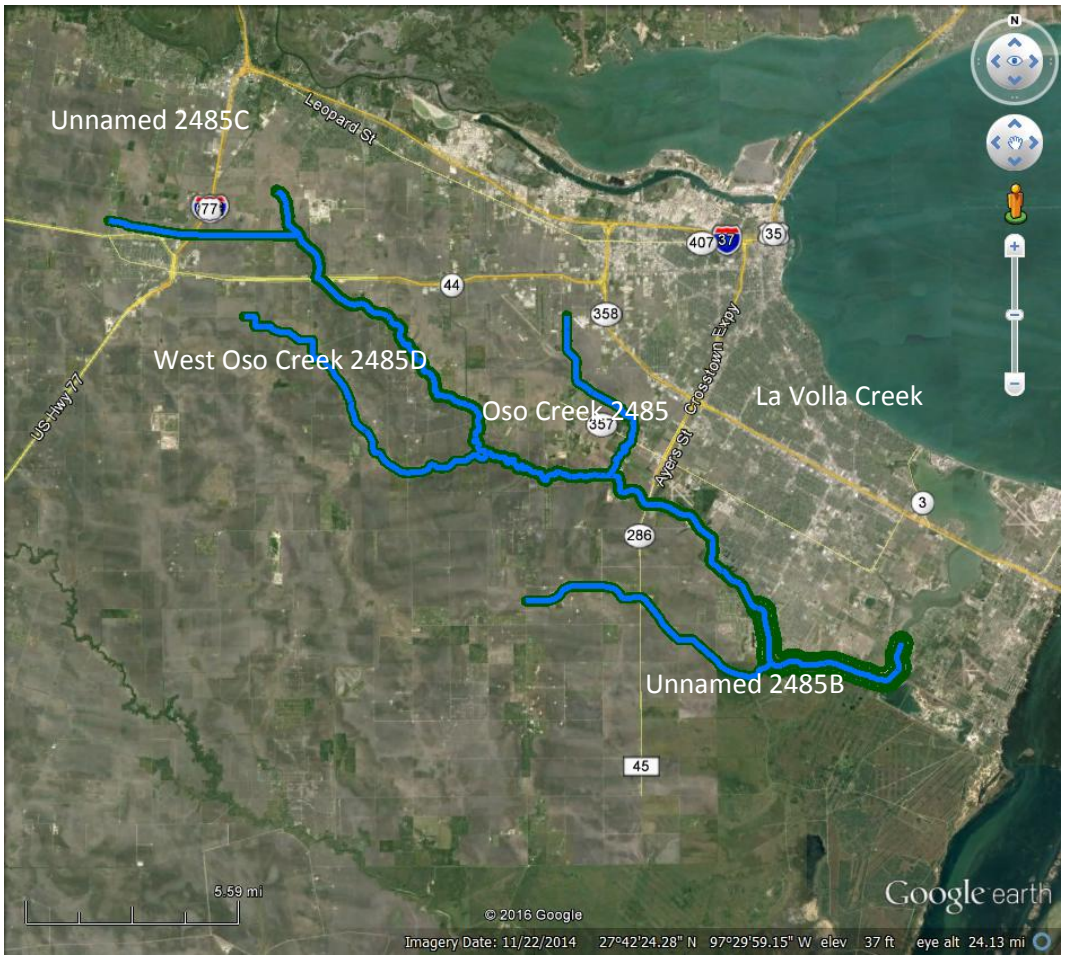
- Farming, mowing, or spraying weeds or brush too close to the bank
- Logging and related timber harvest activities adjacent to the creek
- Manicured or altered residential or park landscapes next to the creek
- Prolonged grazing concentrations in creek areas
- Excessive populations of deer, exotic hoof stock, or feral hogs in creek areas

- Removal of large dead wood and downed trees
- Artificial manipulation of banks, channels, or sediment
- Physical alteration of floodplain
- Excessive vehicle traffic in creek area
- Excessive recreational activity or foot traffic in creek area
- Excessive alluvial pumping or other withdrawals
- Excessive growth of invasive species that inhibit natives
- Low water dams and large reservoirs
- Poorly designed road crossings and bridges

Visual Evaluation of Riparian Function:

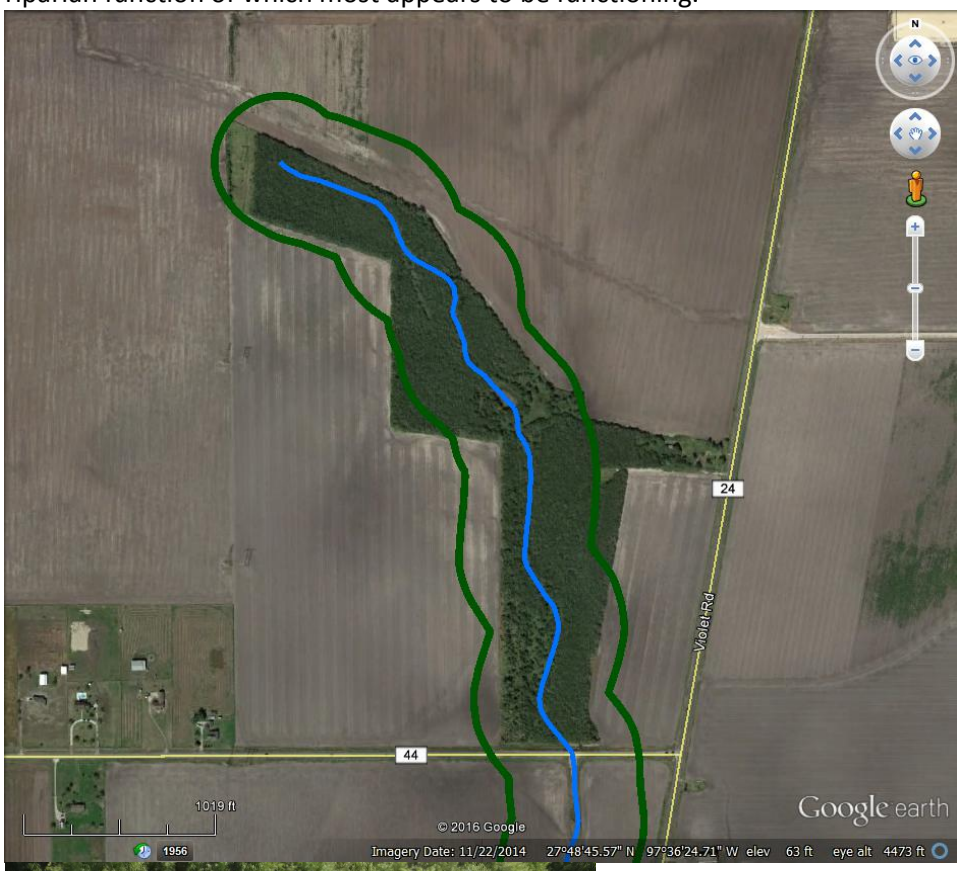
By establishing a theoretical buffer of 300 feet on each side of Oso Creek for a length of 28.6 miles, a potential riparian area is estimated to include about 2,076 acres. By establishing a buffer of 150 feet on each side of the primary and classified tributaries for a total length of about 24.8 miles, a potential riparian area is estimated to include about 1,193 acres.

The map below shows Oso Creek and its primary and classified tributaries with their riparian buffers highlighted. The buffer appears wider along the tidal section of the creek because the channel is so much wider in that section.



Oso Creek Segment 1
Approximate length ½ mile
Approximate area of riparian potential 36 acres

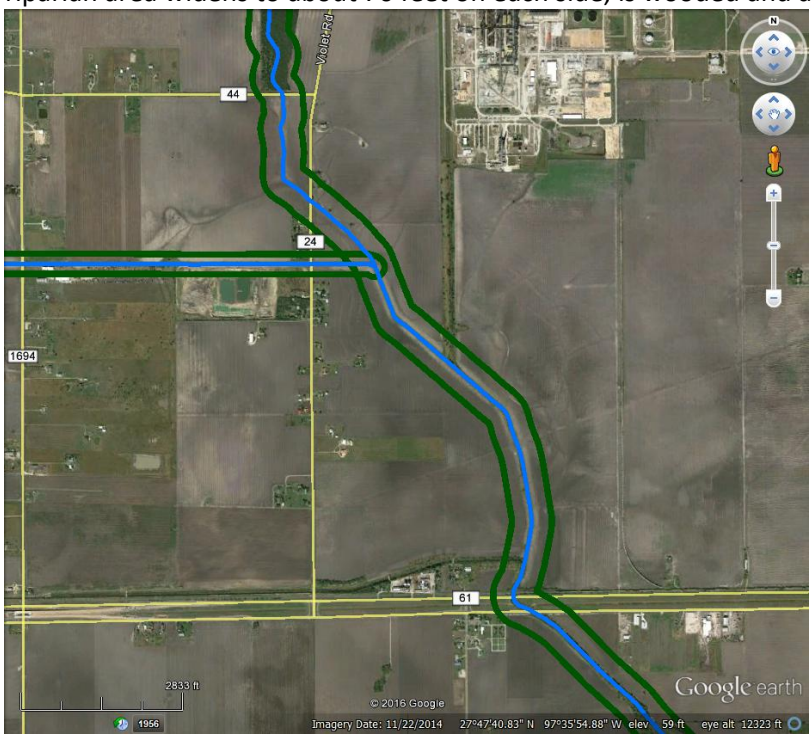
This short segment forms what appears to be the beginning of Oso Creek. It is a heavily wooded water saturated area, located at 27°49.030 N and 97°36.663 W, extending about ½ mile in length to CR 44. Most of the riparian area appears highly functional, with one large pool of water and many smaller ones visible through the canopy. A 300 foot buffer on each side amounts to about 36 acres of potential riparian function of which most appears to be functioning.



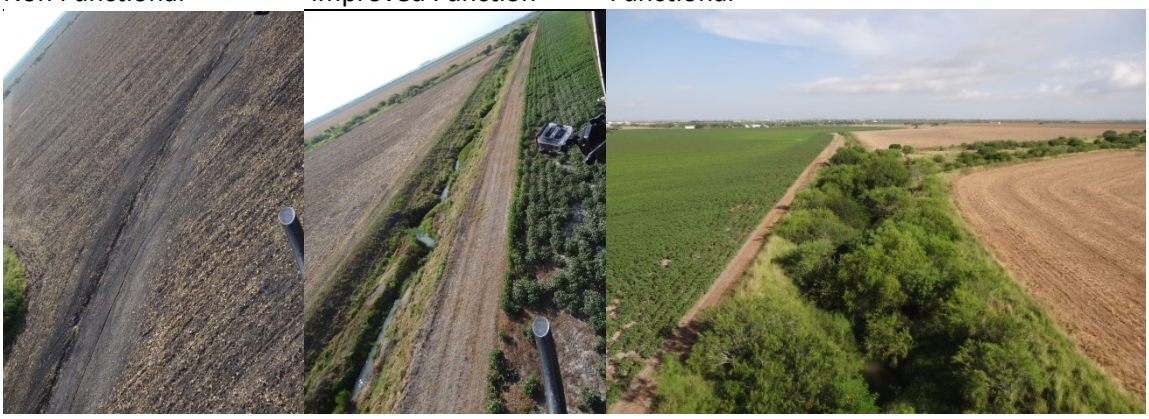
Saturated soils and standing water

Oso Creek Segment 2
Approximate length 2 miles
Approximate area of riparian potential 145 acres

This segment runs from CR 44 across Violet Road (CR 24) to SH 44 (Agnes St.)/CR 61 and it is about 2 miles in length containing about 145 potential riparian acres. The riparian area is non-functional in the first 0.67 miles where the creek is disturbed. Below this point, a classified tributary (2485C), which carries the Robstown Wastewater Treatment Plant (WWTP) effluent, enters from the west contributing a strong flow of clear water. A small band of vegetation, averaging about 30 feet in width, can be seen on each side of the creek. Another drain enters from the north at 1.08 miles and the riparian area widens, gaining function. At 1.85 miles, a larger well vegetated drain joins from the west and the riparian area widens to about 70 feet on each side, is wooded and appears functional.



Non Functional Improved Function Functional



Oso Creek Segment 3
Approximate length 5.4 miles
Approximate area of riparian potential 393 acres

This segment of Oso Creek runs from SH 44 (Agnes St.) across CR 57 (and CR 55A) to FM 2292, measuring approximately 5.4 miles in length. The channel in a portion of this section is narrow and very crooked making the length difficult to measure on satellite imagery.

The riparian area is marginally functional for the first 0.44 miles, where the vegetated banks average about 40 feet on each side and the channel appears overly straight. From 0.44 miles to 5.4 miles, with another 0.5 mile exception, the creek is highly sinuous and the riparian area is wide, heavily wooded, and highly functional. In places, the riparian area is vegetated with plant groups that are indicative of riparian water storage (plants with wetland statuses of FACW and OBL). In places, this vegetation is present over 300 feet from the channel. The 0.5 mile exception is an area where woody vegetation has been cleared and replaced with improved pasture (non-riparian) grasses and off-channel ponds have been developed. Toward the bottom of this segment, the channel appears to be down-cut or slightly incised and gullies have formed reaching into adjacent crop land.

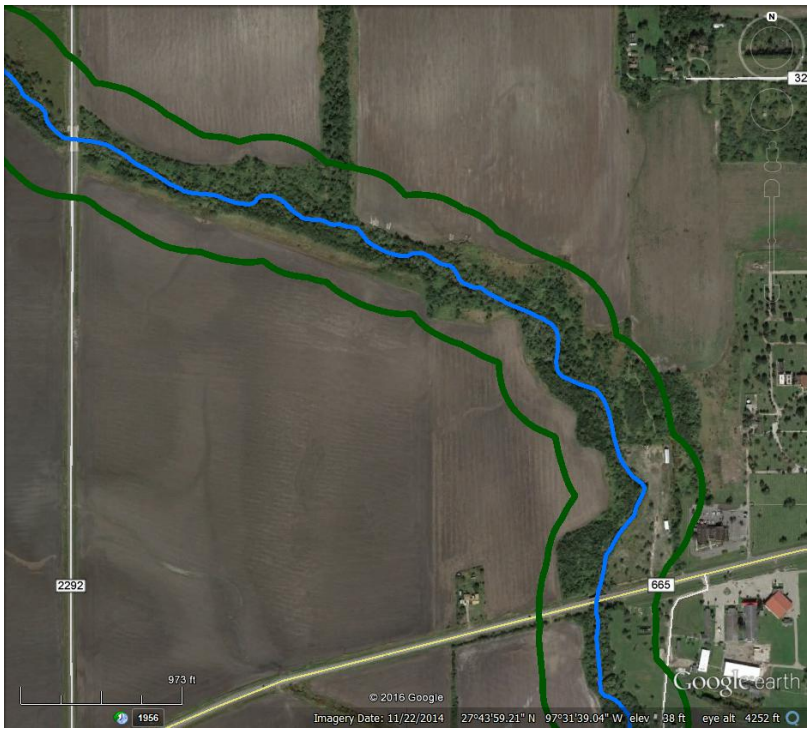
Functional riparian area

Bank clearing

Channel incision

Oso Creek Segment 4
Approximate length 1 mile
Approximate area of riparian potential 73 acres

This segment of the creek runs from FM 2292 to FM 665 (Old Brownsville Road) and is about 1 mile in length. In this segment, the creek's channel appears to become consistently incised. The band of riparian vegetation is about 100-150 feet wide on each side of the creek and includes mostly upland woody species and non-riparian grasses. Several active gullies are visible across the adjacent farm lands and enter the creek in this section. Some are old and covered with upland grasses and some are actively degrading and barren. Within the first quarter mile of the segment, a well vegetated, but unnaturally straight, drain enters from the north and was delivering a small steady flow of water. The channel of this drain also appears to be incised and capable of delivering large volumes of higher energy runoff. This segment is marginally functional but tending toward the non-functional condition.



Numerous gullies enter the channel

Major drain enters from North

A vehicle is partially buried in a gully

Oso Creek Segment 5
Approximate length 2.75 miles
Approximate area of riparian potential 200 acres

This segment of Oso Creek is between FM 665 (Old Brownsville Road) and FM 763 and is about 2.75 miles in length. It includes the confluence with West Oso Creek (2485D) which enters from the southwest. Two smaller drains also enter from the southwest, one at the top of the segment and another near the bottom at FM 763. On the day of this survey these drains carried steady flow, but little to no obligate (OBL) or facultative wetland (FACW) vegetation associated with water storage was observed that would indicate a permanence of moisture.

Except near its beginning, at FM 665, this segment is sinuous and bordered by a wide, heavily wooded, riparian area. The vegetated area is, on average, 200-300 feet wide on each side of the creek, but the channel appears cut-down and the creek does not appear to regularly access the wider floodplain. The channel is braided in a few spots and at least one oxbow can be seen in this segment. This segment can be considered marginally functional, but tending toward the non-functional condition.

Wooded sinuous channel

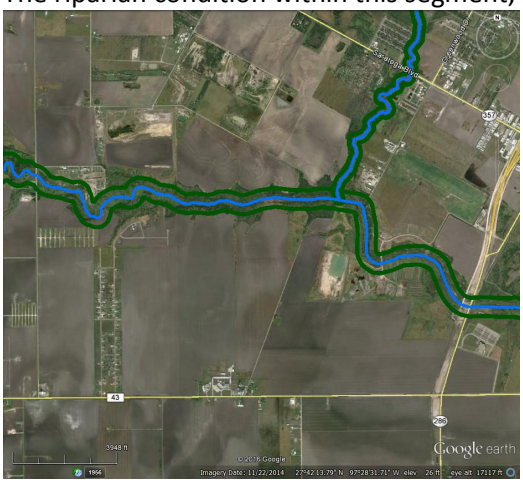
Gully entering the channel

Wide wooded riparian area

Oso Creek Segment 6
Approximate length 3.9 miles
Approximate area of riparian potential 284 acres

This segment of Oso Creek, from FM 763 to SH 286 (Crosstown Expressway), is about 3.9 miles in length. In this segment, the creek leaves mostly rural lands and enters a mostly urban area. The band of vegetation bordering the creek becomes more irregular; sometimes wide on one side and absent on another. The prevalent vegetation, while better than bare ground, is mostly not of the type indicative of functioning riparian areas. The highly invasive *Arundo donax* (Giant cane) is present in this segment. Even where a broad band of vegetation exists, the riparian area does not appear very functional. The creek channel may have been dredged or artificially deepened in the past. Deep gullies can be seen entering the creek from adjacent lands.

A small drain that begins in a pit, or pond, enters from the north near the beginning of the segment. Further downstream, La Volla Creek, a larger but unclassified tributary, joins Oso Creek from the northeast. This tributary drains an urban residential area, a large pet/horse rescue ranch, and carries the Greenwood WWTP effluent. In the area near its confluence with Oso Creek, the banks of La Volla Creek are heavily wooded and the water is very clear and deep. Large fish were seen from the air. A large scale streambank clearing project was underway on La Volla Creek above Saratoga Blvd. which could influence the riparian conditions at the confluence. A possible algal bloom was observed in Oso Creek within this segment, where water color and clarity change to bright green and appeared turbid. The riparian condition within this segment, as a whole, appears to be marginally functional.



Gulf cordgrass, a strong riparian native

Arundo donax, an invasive plant

Animal rescue facility on bank of La Volla Creek

Clear water, large fish, and large volume of litter

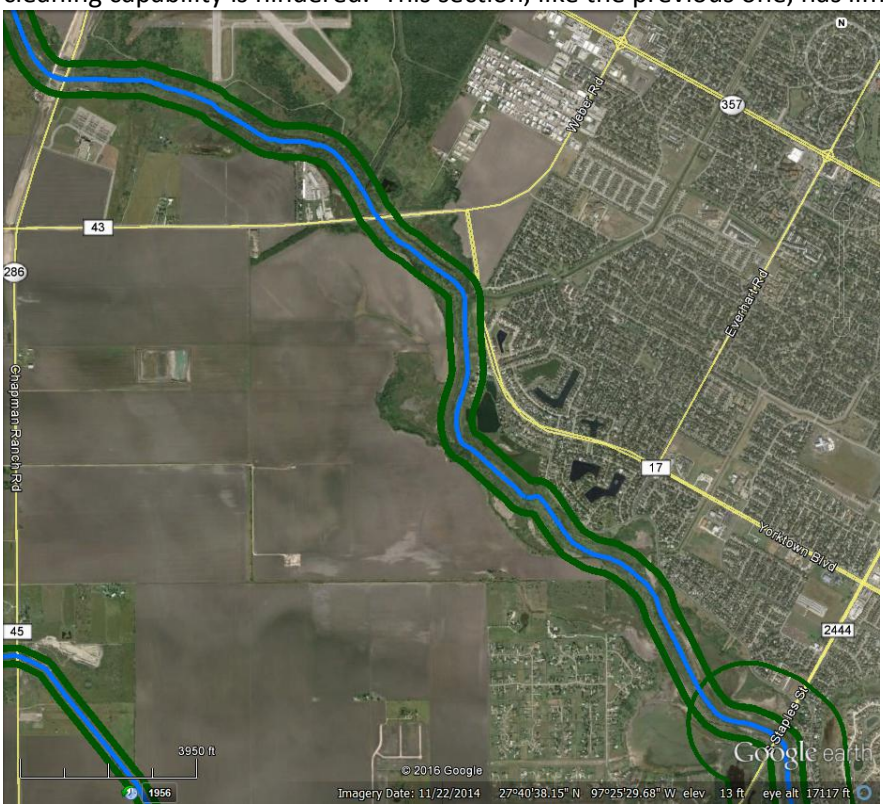
Bank clearing project on La Volla Creek

Deep gullies entering the creek from adjacent lands

Possible algae bloom in Oso Creek

Oso Creek Segment 7
Approximate length 5 miles
Approximate area of riparian potential 364 acres

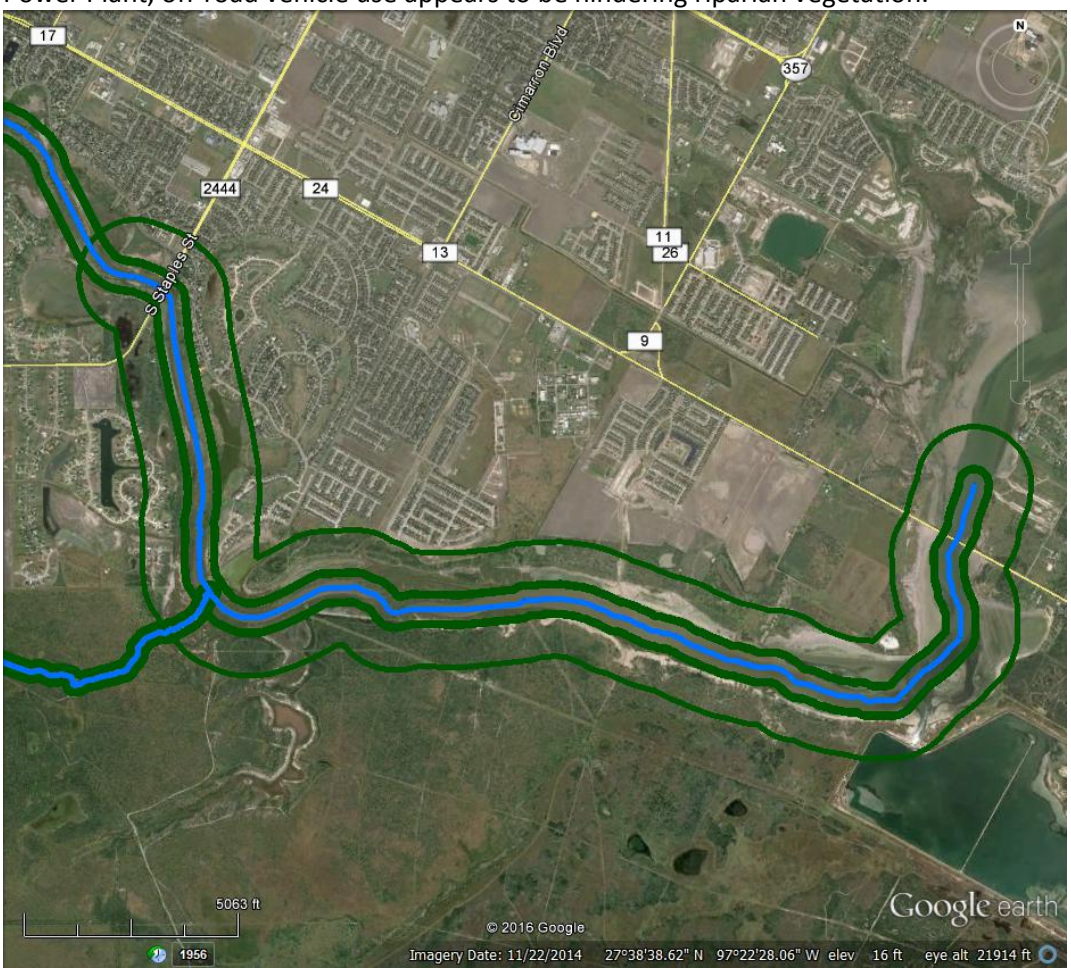
This segment of Oso Creek, from SH 286 (Crosstown Expressway) to FM 2444 (Staples Street), appears to be channelized with limited riparian function. Two urban drains enter the creek in this segment. Both were flowing on the day of this survey. Fresh water of this magnitude is a sign of opportunity, but without floodplain access and a wide, well vegetated floodplain, riparian recovery and riparian water cleaning capability is hindered. This section, like the previous one, has limited riparian function.



Example of urban riparian opportunity for enhanced function.

Oso Creek Segment 8
Approximate length 8 miles
Approximate area of riparian potential 582 acres

This section, from FM 2444 to Oso Bay, is about 8 miles long. After the first mile of urban development along its banks, looking downstream, Oso Creek is bordered on its right bank by undeveloped lands and on its right bank by the King Ranch. Through most of this segment, the creek is virtually untouched and functional. At the lower end of this reach, near the crossing of Yorktown Blvd., below the Barney Davis Power Plant, off-road vehicle use appears to be hindering riparian vegetation.



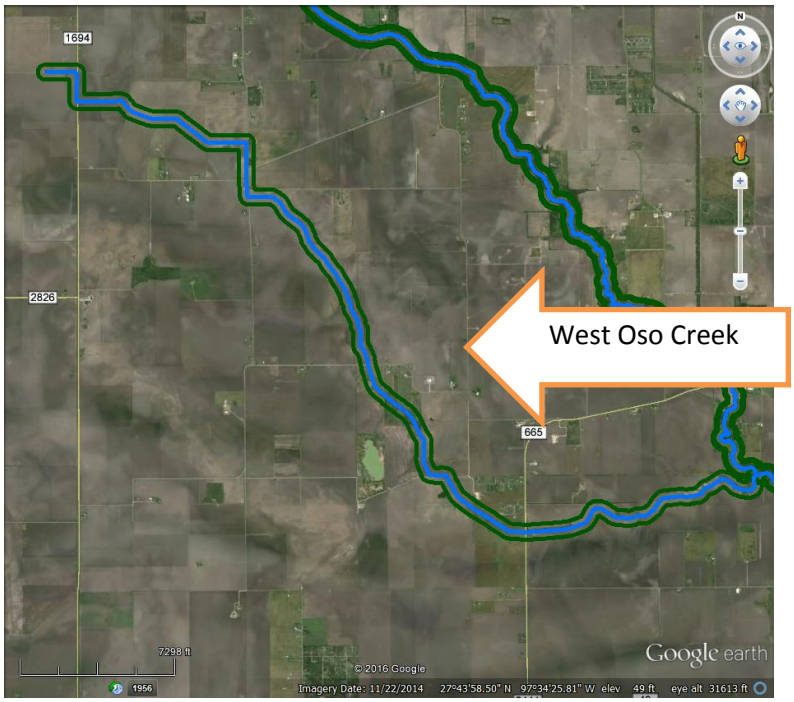
Undisturbed banks and highly functional riparian areas

Off-road vehicle use

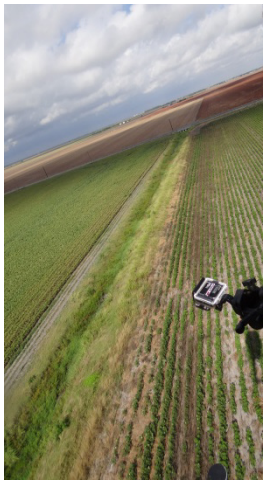
West Oso Creek 2485D
Approximate length 8 miles
Approximate area of riparian potential 582 acres

West Oso Creek is a classified tributary to Oso Creek, running approximately 8 miles from FM 1694, near the City of Robstown, to its confluence with Oso Creek downstream of FM 665. Outlined in green is a theoretical riparian area of approximately 150 feet wide on each side of the creek channel.

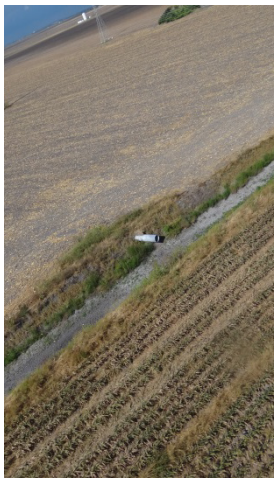
West Oso Creek's current riparian condition is functional in some areas where vegetation has been allowed to grow and non-functional in other areas where it is disturbed. Overall, it is estimated that about 15% of the creek is bordered by marginally functional riparian areas of varying width and about 85% is in non-functional condition.



Near its origin
at FM 1694



Field drains
to West Oso Creek



Thin band
of riparian vegetation

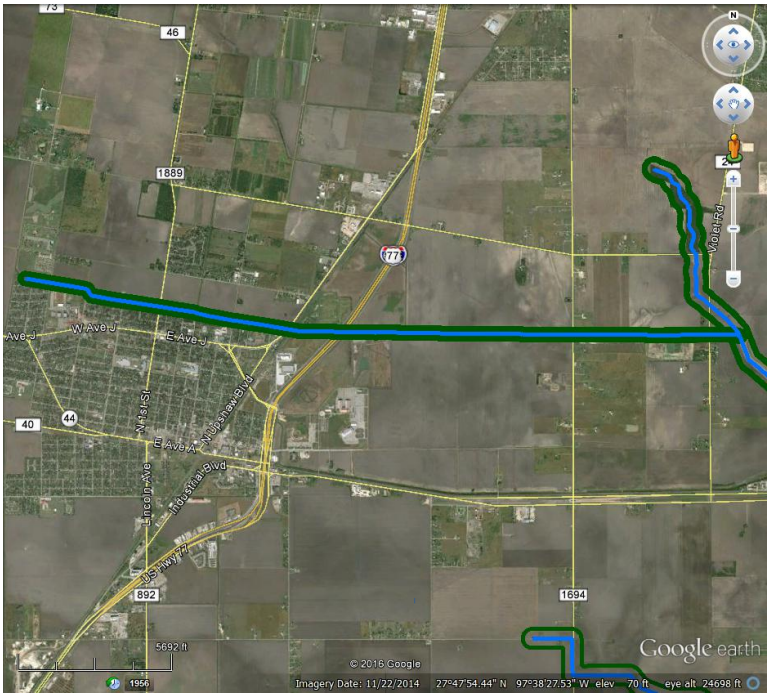
No riparian
vegetation

Example of a functional riparian area along West Oso Creek.
The undisturbed riparian area is about 100 feet wide on each side.

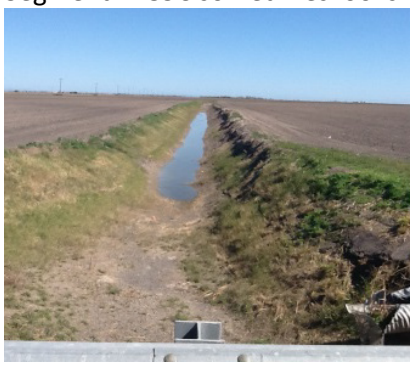
Example of non-functional riparian areas along West Oso Creek.

Unnamed tributary to Oso Creek 2485C
Approximate length 6 miles
Approximate area of riparian potential 218 acres

This unnamed drain carries the City of Robstown's WWTP effluent and storm water runoff from the north side of the town to the Oso Creek. This drain is classified as a tributary. As noted on watershed maps, it runs approximately 6 miles from CR 73, northwest of town, to its confluence with the Oso Creek east of CR 24. In some areas the stream looks like a drainage ditch, and in others it more closely resembles a creek, with functional riparian areas interspersed. Ditch cleaning/dredging was observed on the tributary. Also, a newly constructed "wetland", pictured below on the bottom row, is associated with the tributary. No wetland vegetation or aquatic life was observed in this series of ponds. The 2485C drain is outline in green on the map below to indicate a potential riparian area of 150 feet wide on each side. Another, more water rich, drain parallels this tributary and is associated with Oso Creek. It is shown as the wide blue line on the map below and was also photographed.



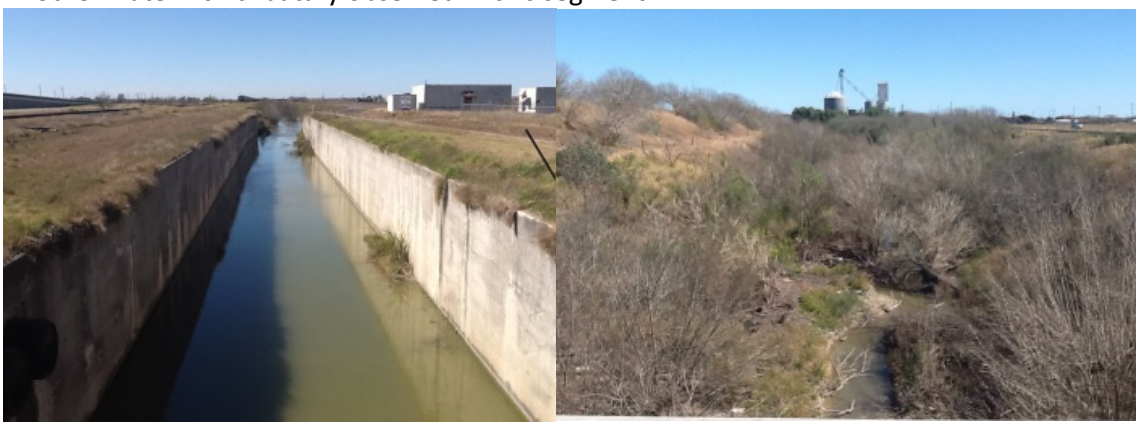
Segment 2485C sometimes looks like a ditch and sometimes a creek



Ditch cleaning project on 2485C

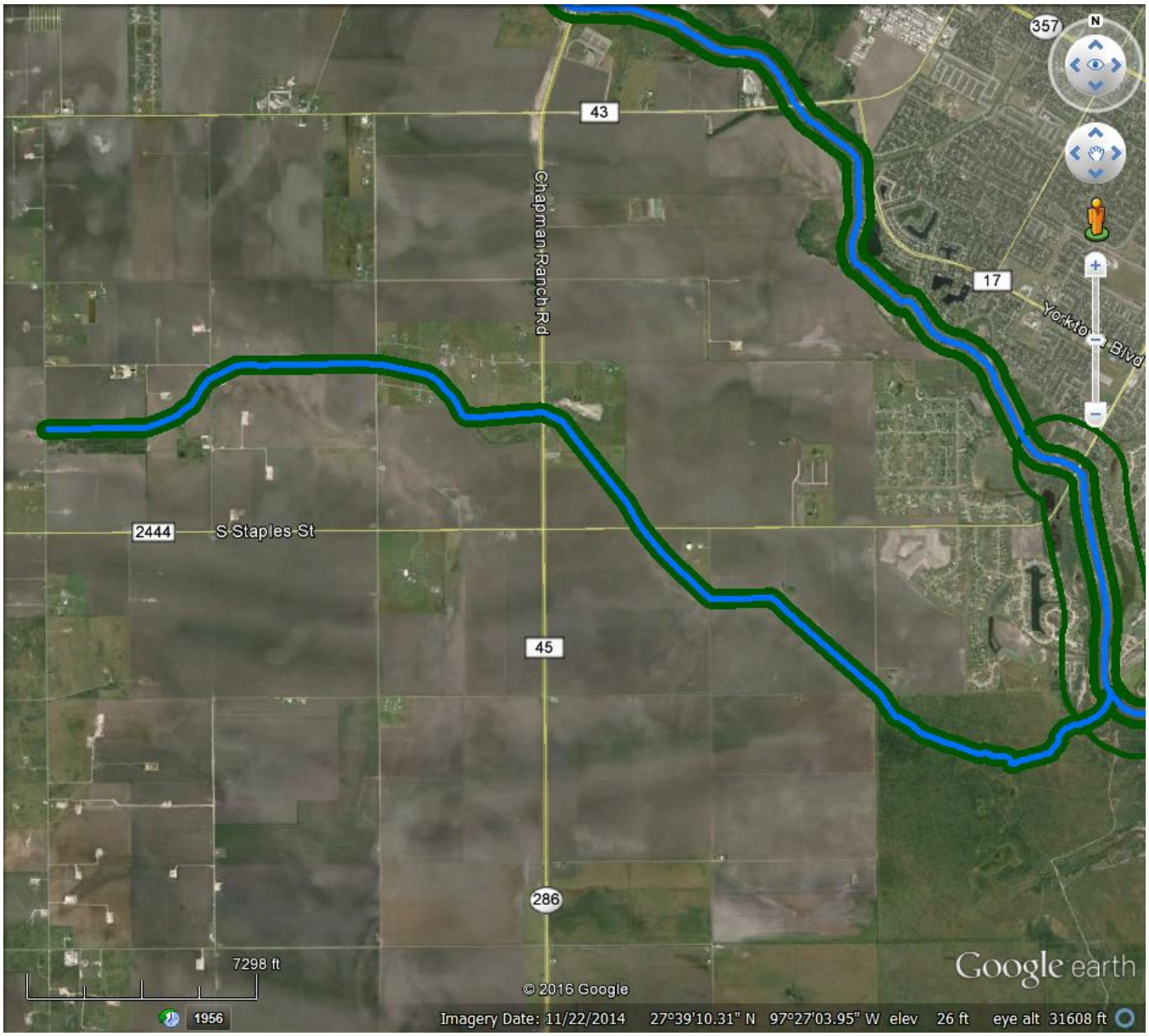
Nueces County Wetland

Another water rich tributary observed in this segment



Unnamed tributary to Oso Creek 2485B
Approximate length 5.4 miles
Approximate area of riparian potential 196 acres

Another classified, but unnamed, tributary drains the western portion of the Oso Creek watershed. It runs mostly through farmland and developing suburban areas. It enters the King Ranch about 1.6 miles before emptying into Oso Creek. The tributary, as noted on watershed maps, runs approximately 5.4 miles from CR 47 to its confluence with the Oso Creek just downstream from the Oso Parkway neighborhoods. Much of this tributary is ditch-like without visible riparian function. A small area of marginal function can be seen near the head of the stream. Then, in stark contrast, the area within the King Ranch is bordered by functional riparian areas and the landscape is dotted with wetlands.



Example of non-functional, ditch-like, riparian area

Another example of non-functional, ditch-like, riparian area

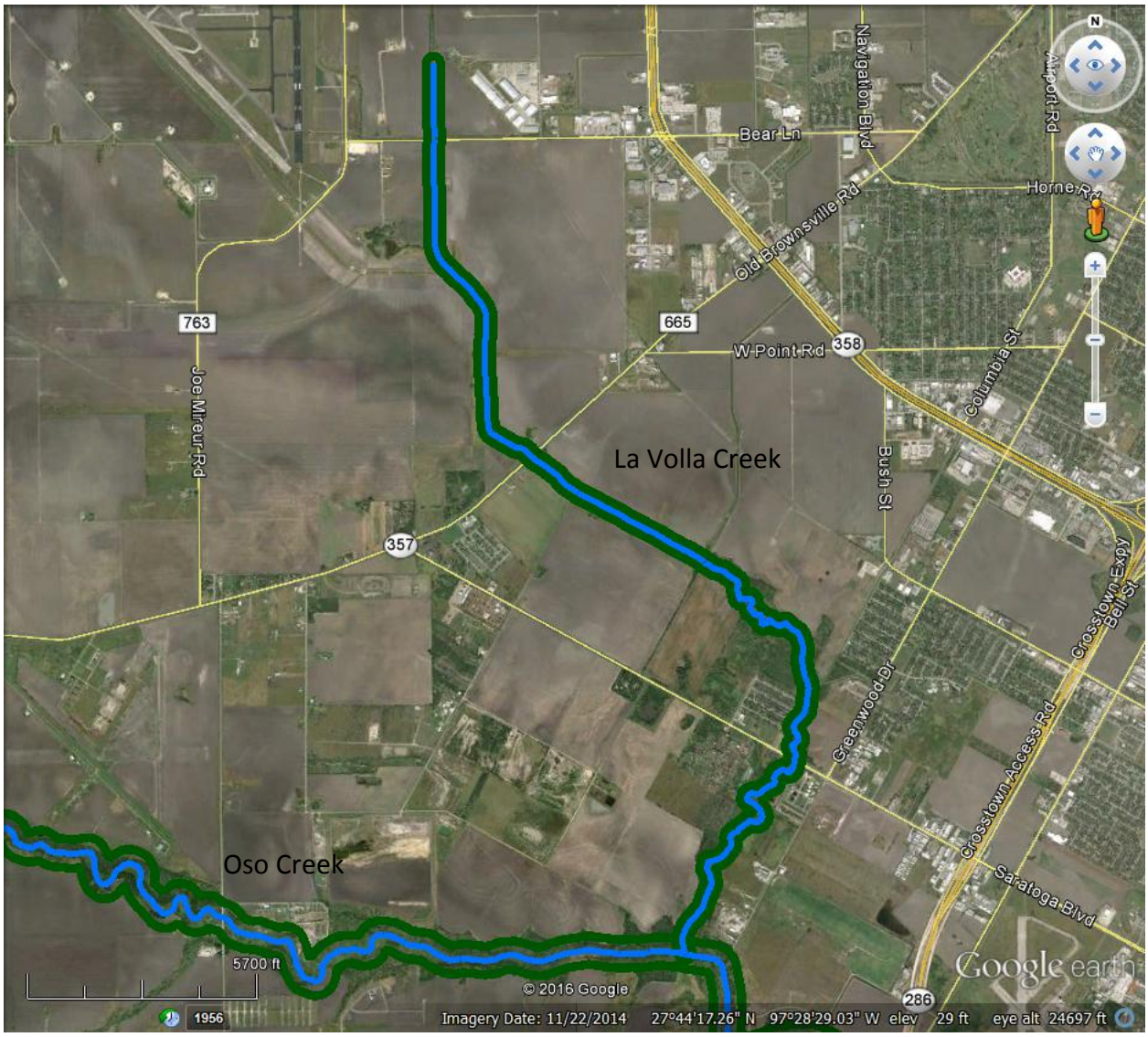
Example of small area of vegetated riparian area near the head of the tributary

As the tributary enters the King Ranch, the riparian area becomes very functional. The image on the left shows the visual contrast approaching the ranch fence line.

In the King Ranch the landscape becomes dotted with wet spots and undisturbed vegetation, providing a visual benchmark of riparian/wetland function.

La Volla Creek
Approximate length 5.4 miles
Approximate area of riparian potential 196 acres

This is an unclassified stream that drains into Oso Creek from the north. It runs about 5.4 miles from near SH 44, through farm, suburban, and urban lands and serves as the discharge for the Greenwood WWTP. Water in the creek near the discharge point is clear and many large fish, along with a large quantity of Styrofoam litter, were observed. Only the lower sections of this drain, below SH 357 (Saratoga Blvd.), were evaluated on this aerial survey. In this area, the creek is bordered by wooded, fairly functional, riparian areas averaging about 100 feet on each side of the stream. A subsequent ground observation revealed extensive bank clearing upstream of the SH 357 crossing that may influence future riparian function along the lower sections of the creek. An on-the-ground bull's eye evaluation was completed for the location looking downstream from this crossing.



La Volla Creek near the Greenwood wastewater discharge. Water is very clear at this location.

La Volla Creek channel clearing project at FM 357 (Saratoga Blvd.).

Summary:

One of the most cost effective ways to protect and improve water quality is to protect and improve riparian function along creeks and drains. Riparian function along the Oso Creek and its tributaries varies greatly. Some areas of high function were identified, mostly along the upper reaches of the main creek, but also in isolated spots along some of the creek's tributaries. The majority of stream miles and potential riparian acres are marginal (at-risk) or non-functional. Riparian areas generally recover their function when the activity that is hindering that recovery is halted.

Hindrances to riparian recovery identified along Oso Creek and its tributaries include:

- farming or mowing too close to the creek bank
- artificial manipulation of banks, channels, or stream sediment
- physical alteration of floodplain
- manicured or altered residential or park landscapes next to the creek
- excessive vehicle traffic in creek area

Based on the mapped potential riparian buffer, 300 feet wide on each side of Oso Creek and 150 feet wide on each side of the primary and classified tributaries, the total potential riparian area within Oso Creek watershed is estimated to include about 3,269 acres. The existing high functioning riparian areas could amount to about 15% -20% of this acreage. This would indicate that 75%-80%, or roughly about 2,500 acres, hold opportunity for enhanced riparian function. Many storm water ditches exist within both the rural and urban portions of the watershed and some of these also hold opportunity for enhanced function for water quality benefit.

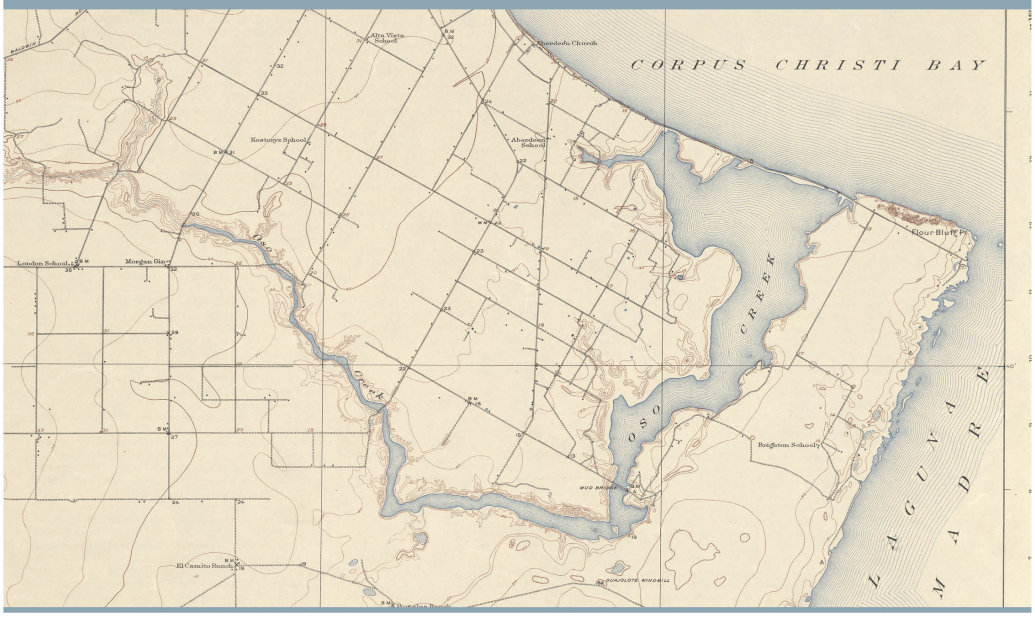
Outreach:

Improving riparian conditions along a creek requires the cultivation of common understanding about riparian function and an awareness of activities that hinder riparian recovery. Riparian function is not well understood. Key riparian concepts are often misunderstood, leading to management strategies that do not necessarily favor riparian function or water quality.

An additional task (Task 3) under this contract specified the delivery of public education and outreach for landowners and decision makers. Two riparian workshops were held within the Oso Creek watershed as part of this contract. A mailing list of riparian landowners was developed and fliers announcing the workshops were mailed to each one and widely distributed within the community. One workshop was focused on urban decision makers and was well attended by City of Corpus Christi staff. Flood prevention and the management of urban storm water runoff were featured discussion topics. Examples of urban riparian recovery within the City of Austin were presented. The second workshop focused on rural decision makers and was well attended by riparian landowners with agricultural operations in the upper reaches of the Oso Creek watershed. This workshop discussed how activities like mowing, grazing and farming can be managed in a way to allow for riparian recovery and enhanced riparian function. Pesticide applicator CEU's were offered to participants by Texas A&M Agrilife Extension. Below is the flier announcing the workshops. It was also designed in a postcard format. The deliverable products under Task 3 of this contract were submitted to TCEQ under separate cover.

Oso Creek

RIPARIAN WORKSHOPS



For Urban Interests:

August 25, 2016

Featured Speaker:
Mateo Scoggins, City of Austin, Watershed Department

- **Urban riparian experiences**
- **What works on urban creeks?**

Del Mar College,
Center for Economic Development
3209 S. Staples, Room 106
Corpus Christi

For Rural Interests:

August 30, 2016

Featured Speaker:
Steve Nelle, noted Riparian Expert

- **Storing and cleaning water on the land**
- **How degraded creeks can fix themselves?**
- **What country creeks can do for cities**

Texas A & M AgriLife Research
and Extension Center
10345 Highway 44
Between Robstown and Corpus Christi

Participants are eligible for two (2) General continuing education units (CEUs) for Texas Department of Agriculture pesticide license holders

Workshops run from
9 a.m. – 3 p.m.

Morning presentation -
Afternoon field trip

Register now!

Bring your lunch money

$10 suggested donation

Register to be counted for lunch
slewey@nueces-ra.org

830-278-6810

Nueces River Authority is a small government agency with no regulatory or taxing authority. It has become known for its riparian education programs. For more riparian information visit remarkableriparian.org

Nueces River AUTHORITY

Possible Next Steps:

1) This report, including the completed site evaluation forms, will be distributed to the Oso Creek Stakeholder - Workgroup for Science and Technology for their consideration along with other studies and assessments that have been completed within the Oso Creek watershed.

2) The completed site evaluation forms have been provided to the leader of the Texas Stream Team volunteer monitoring program at Texas A&M University - Corpus Christi for that group's use as a baseline for subsequent evaluations. Evaluations were performed at the following public road crossing: County Road (CR) 57, at Farm-to-Market (FM) 763, at State Highway (SH) 286, and La Volla Creek downstream of the bridge at Saratoga Blvd.

3) Providing funding becomes available, additional riparian workshops can help to raise awareness and cultivate common understanding about how riparian areas work and what types of activities can hinder their recovery.

4) A plastic relief model of the watershed would be a very valuable outreach/education tool. These types of models have proven successful to illustrate watershed geography and how water moves through a landscape. A model for the Oso Creek watershed might be produced for $18-20,000.

5) A program that incentivizes riparian landowners and decision-makers to:
   a) Remove hindrances, allowing poor functioning areas to improve, and
   b) Protect high functioning areas from degradation.

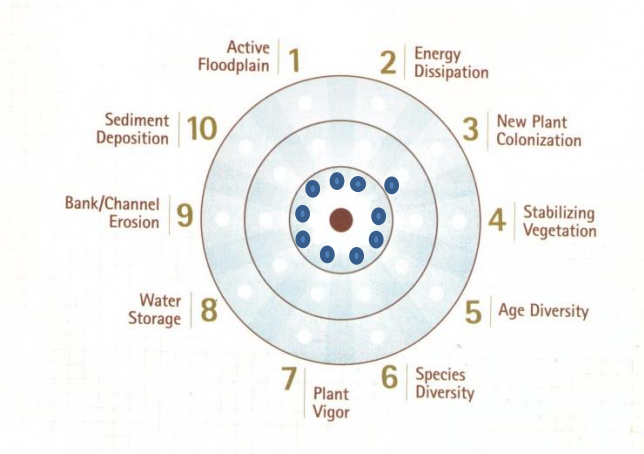
On-the-Ground Riparian Evaluations:

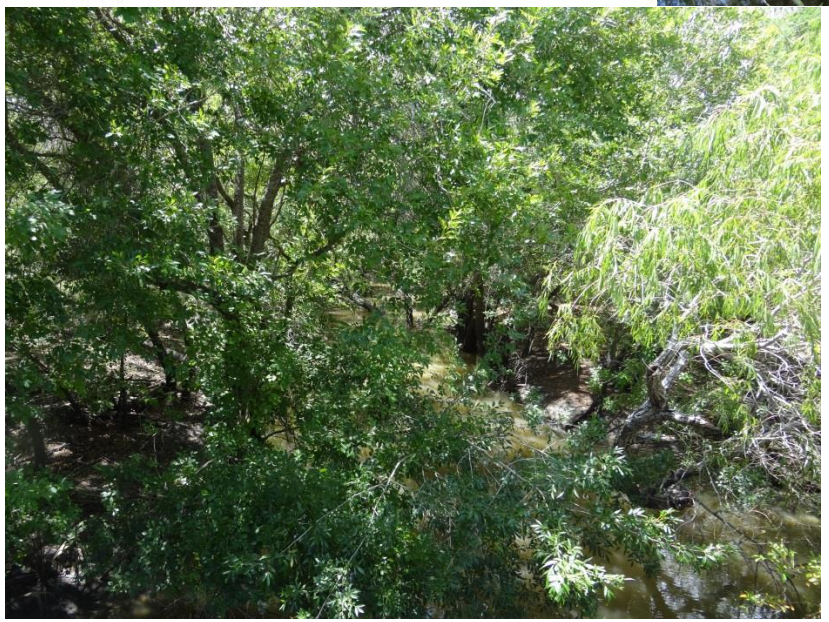
Riparian Evaluation
Site: Oso Creek at CR 57
Date: July 19, 2016
By: Sky Lewey

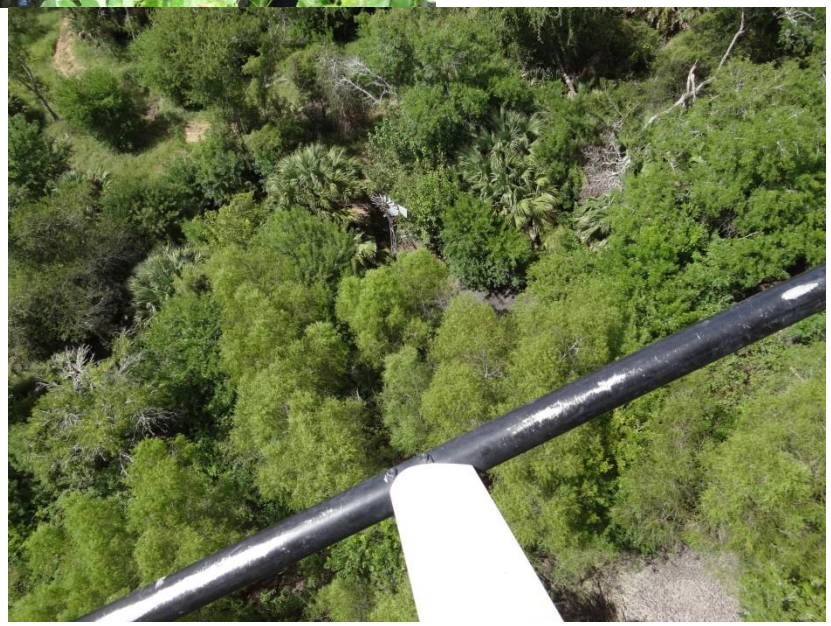
Riparian Indicators			Notes:
1. Active Floodplain *Look for recently deposited debris or silt. Is it clear that flood flows are able to rise above the channel, spread out on a floodplain, and slow down?*	**High Functional Condition**	**Floodplain clearly defined** allowing for floodwater to overflow channel, spread out and slow down.	**Floodplain is wide, measured on Google Earth™ at 630 feet across at the CR 57 crossing**
2. Energy Dissipation in Channel, on Banks or in Floodplain *Is there presence of trees, logs, boulders or dense vegetation to slow water down?*	**High Functional Condition**	**Abundance** of energy dissipaters present in the channel, on the banks, and in the floodplain.	**Floodplain is covered in energy dissipating vegetation plus an abundance of large wood.**
3. New Plant Colonization Do you see fresh sediments, deposited during flooding, being colonized by new plants?	**At-Risk Condition**	**Only some** new plant colonization on fresh sediment.	**Some new plants were observed colonizing fresh sediments but not much fresh sediment was observed. Most sediment is older and already stabilized.**
4. Stabilizing Vegetation *Is the bank covered with riparian plants and their roots? Do these plants have a stability rating (SR) greater than 6-7*? Refer to RR plant field guide for SR.	**High Functional Condition**	**Banks covered** with stabilizing vegetation.	**Banks are completely covered with many great stabilizing plants and the bank is heavily fortified with dense roots.** **Dwarf palmetto SR 7** **Black willow SR7** **Mexican ash SR 6** **Ratama SR 6** **Spiny aster SR 8**
5. Reproduction of Riparian Plants; Various Ages. *In addition to older plants, are there young and middle-aged riparian plants?*	**High Functional Condition**	**In addition to older riparian plants,** young and middle-aged plants are abundant.	**Young, middle-aged and mature riparian plants are present, including some that are palatable to grazing and browsing animals.**
6. Diversity of Riparian Plants *Using the RR field guide, can you identify different species of native riparian plants?*	**High Functional Condition**	**More than** 5 different species of native riparian trees, shrubs, grasses and sedges.	**More than 5 native riparian species are present.**
7. **Plant Vigor** *Are plants healthy, or do you see signs of grazing, trampling, mowing, browsing, cutting, shredding or bulldozing? Consult your field guide for information about a particular plant's palatability for grazing and browsing. Palatable plants can be sentinels of impaired vigor.*	**High Functional Condition**	**Healthy, vigorous riparian plants,** woodies showing little or no sign of heavy browsing or hedging. Grasses and sedges show little or no sign of heavy grazing, mowing, trampling or other impairments.	**Plants are healthy and vigorous.**
8. Water Storage *Using your field guide, can you locate key Wetland Obligate and Facultative Wetland plants?*	**High Functional Condition**	**Several** wetland plants present.	**Dwarf palmetto FACW** **Black willow FACW** **Ratama FACW** **Spiny aster FACW** **Flat sedge OBL**

9. Bank/Channel Erosion *Do you find signs of bank or channel erosion? Is it in predictable locations, such as on meander bends where point bars are being formed with the eroded material downstream? Does the channel look down-cut or incised like a drainage ditch? If so, it may also lack an active floodplain.*	**High Functional Condition**	**Light bank erosion** on meander bends being compensated by deposition on point bars below. Channel appears to be of size and depth to manage sediment.	**No erosion is visible from this site.**
10. Sediment Deposition *Are there signs of sediment deposition on point bars? Is it balanced with erosion, or is sediment piling up mid-channel, creating an overly wide and shallow appearance?*	**High Functional Condition**	**Normal and balanced** sediment deposition.	**Sediment appears to be in balance.**

Riparian Evaluation
Site: Oso Creek at CR 57





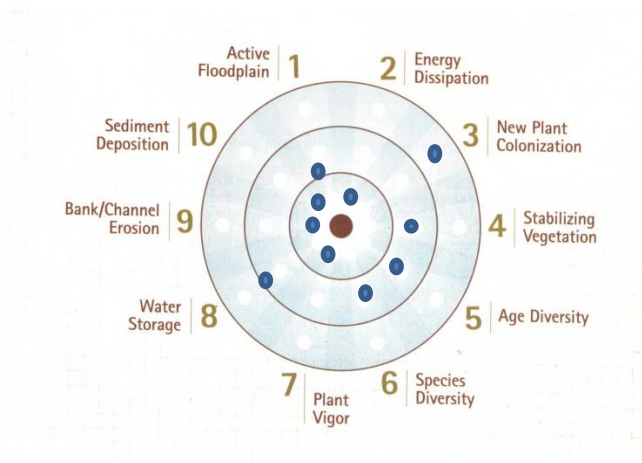


Riparian Evaluation
Site: Oso Creek at FM 763 (TCEQ site #13029 and USGS gaging station #08211520)
Date: July 19, 2016
By: Sky Lewey

Riparian Indicators			Notes:
1. Active Floodplain *Look for recently deposited debris or silt. Is it clear that flood flows are able to rise above the channel, spread out on a floodplain, and slow down?*	**Functional** tending toward At-Risk Condition	**Floodplain appears to be little too far above channel** limiting its effectiveness.	**Floodplain is functioning but is not very wide, measured on Google^{tm} earth at under 100 feet across at the FM 763 bridge. USGS hydrograph indicates flood waters over 20 ft. on three occasions over past 12 months.**
2. Energy Dissipation in Channel, on Banks or in Floodplain *Is there presence of trees, logs, boulders or dense vegetation to slow water down?*	**High Functional Condition**	**Abundance** of energy dissipaters present in the channel, on the banks and in the floodplain.	**Floodplain is covered in energy dissipating vegetation plus an abundance of large wood.**
3. New Plant Colonization Do you see fresh sediments, deposited during flooding, being colonized by new plants?	**Poor, Dysfunctional Condition**	**Not much colonization;** sediment deposits and point bars are bare.	**A small amount of new sediment was observed below the bridge but no colonization is visible. The reach up and downstream was not examined.**
4. Stabilizing Vegetation *Is the bank covered with riparian plants and their roots? Do these plants have a stability rating (SR) greater than 6-7*? Refer to RR plant field guide for SR.	**At-Risk Condition**	**Banks covered** with stabilizing vegetation.	**Banks are well covered with woody and herbaceous vegetation, not all of it is riparian. Sufficient stabilizing plants are present and the bank appears to be fortified with roots. The upper terraces are covered with Guinea grass which is not riparian but is providing some cover and function at this site.** **Hackberry SR 5/6** **Mexican ash SR 6** **Ratama SR 6** **Spiny aster SR 8**
5. Reproduction of Riparian Plants; Various Ages. *In addition to older plants, are there young and middle-aged riparian plants?*	**At-Risk Condition**	**Few to no old-mature** riparian trees are present.	**Most of the woody vegetation present appears to be of similar age class; young to middle-aged plants. This causes one to question, what happened to the older trees?**
6. Diversity of Riparian Plants *Using the RR field guide, can you identify different species of native riparian plants?*	**At-Risk Condition**	**Modest diversity** 3-4 species of native riparian trees, shrubs, grasses and sedges.	**Only a few native riparian woody species can be seen from the bridge.**
7. **Plant Vigor** *Are plants healthy, or do you see signs of grazing, trampling, mowing, browsing, cutting, shredding or bulldozing? Consult your field guide for information about a particular plant's palatability for grazing and browsing. Palatable plants can be sentinels of impaired vigor.*	**High Functional Condition**	**Healthy, vigorous riparian plants,** woodies showing little or no sign of heavy browsing or hedging. Grasses and sedges show little or no sign of heavy grazing, mowing, trampling, or other impairments.	**Plants are healthy and vigorous.**

Riparian Evaluation
Site: Oso Creek at FM 763 (TCEQ site #13029 and USGS gaging station #08211520)

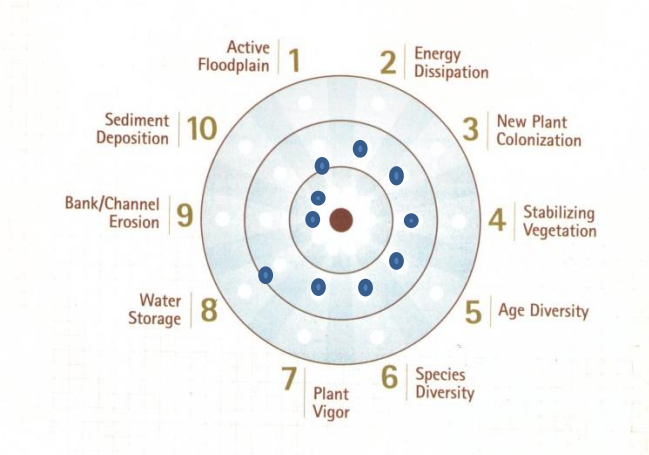
8. Water Storage *Using your field guide, can you locate key Wetland Obligate and Facultative Wetland plants?*	**At-Risk Condition** *tending toward nonfunctional*	**Only a few** Obl and FacW plant species present	**The riparian vegetation present is mostly indicative of a dry site. Spiny aster, a FACW plant is found in stands along the bank away from the water's edge indicating some water storage.** **Spiny aster FACW** **Mexican ash FAC** **Hackberry FAC**
9. Bank/Channel Erosion *Do you find signs of bank or channel erosion? Is it in predictable locations, such as on meander bends where point bars are being formed with the eroded material downstream? Does the channel look down-cut or incised like a drainage ditch? If so, it may also lack an active floodplain.*	**High Functional Condition**	**Light bank erosion** on meander bends being compensated by deposition on point bars below. Channel appears to be of size and depth to manage sediment.	**Some active erosion is visible directly within the right or way of the bridge but not visible looking up stream and down from that location. It is clear that the channel carries some high energy water and may be slightly incised, but no active or excessive erosion.**
10. Sediment Deposition *Are there signs of sediment deposition on point bars? Is it balanced with erosion, or is sediment piling up mid-channel, creating an overly wide and shallow appearance?*	**High Functional Condition**	**Normal and balanced** sediment deposition.	**Sediment appears to be in balance.**



Riparian Evaluation
Site: Oso Creek at State Hwy 286 (TCEQ site #13028)
Date: July 19, 2016
By: Sky Lewey

Riparian Indicators			Notes:
1. Active Floodplain *Look for recently deposited debris or silt. Is it clear that flood flows are able to rise above the channel, spread out on a floodplain, and slow down?*	**Functional** *tending toward At-Risk Condition*	**Floodplain appears to be little too far above channel** or channel is too deep; limited floodplain effectiveness.	**Floodplain is functioning and is wide, measured on Google[tm] earth at about 300 feet across near the Hwy 286 bridge. Still something does not seem right about the floodplain access. Either the floodplain land is built up or the channel has been deepened.**
2. Energy Dissipation in Channel, on Banks or in Floodplain *Is there presence of trees, logs, boulders or dense vegetation to slow water down?*	**At-Risk Condition**	**Only some** energy dissipating features present.	**Floodplain is covered with vegetation but not necessarily in energy dissipating vegetation. Trees and woody debris are sparse and much of the herbaceous vegetation in not riparian.**
3. New Plant Colonization Do you see fresh sediments, deposited during flooding, being colonized by new plants?	**At-Risk Condition**	**Only some** new plant colonization on fresh sediment.	**New sediment entering from banks is being colonized and colonizers are marching into the channel trapping and holding freshly delivered sediment. Flood deposited sediments are not readily apparent.**
4. Stabilizing Vegetation *Is the bank covered with riparian plants and their roots? Do these plants have a stability rating (SR) greater than 6-7*? Refer to RR plant field guide for SR.	**At-Risk Condition**	**Some gaps present** and/or some vegetation lack sufficient stability rating.	**Banks are well covered with vegetation but it is mostly not riparian. Some stabilizing plants are present but their coverage is sparse.** **Hackberry SR 5/6** **Mexican ash SR 6** **Ratama SR 6** **Spiny aster SR 8**
5. Reproduction of Riparian Plants; Various Ages. *In addition to older plants, are there young and middle-aged riparian plants?*	**At-Risk Condition**	**Few to no old-mature** riparian trees are present.	**Most of the woody vegetation present appears to be of similar age class; young to middle-aged plants. This is causes one to question, what happened to the older trees?**
6. Diversity of Riparian Plants *Using the RR field guide, can you identify different species of native riparian plants?*	**At-Risk Condition**	**Modest diversity** 3-4 species of native riparian trees, shrubs, grasses and sedges	**Only a few native riparian species were observed.**
7. **Plant Vigor** *Are plants healthy, or do you see signs of grazing, trampling, mowing, browsing, cutting, shredding or bulldozing? Consult your field guide for information about a particular plant's palatability for grazing and browsing. Palatable plants can be sentinels of impaired vigor.*	**At-Risk Condition**	**Low vigor,** woody plants show signs of heavy browsing, hedging or browse line may be present. Grasses and sedges show signs of heavy use, grazing, mowing, and trampling only in places.	**Some Riparian plants are being mowed and others are disturbed by construction activities. Undisturbed plants are healthy and vigorous.**

8. Water Storage *Using your field guide, can you locate key Wetland Obligate and Facultative Wetland plants?*	**At-Risk Condition** tending to nonfunctional	**Only a few** OBL and FACW plant species present.	**The riparian vegetation present is mostly indicative of a dry site. Spiny aster, a FACW plant is found in stands along the bank away from the water's edge indicating some water storage.** **Spiny aster FACW** **Morning glory FAC**
9. Bank/Channel Erosion *Do you find signs of bank or channel erosion? Is it in predictable locations, such as on meander bends where point bars are being formed with the eroded material downstream? Does the channel look down-cut or incised like a drainage ditch? If so, it may also lack an active floodplain.*	**High Functional Condition**	**Light bank erosion** on meander bends being compensated by deposition on point bars below. Channel appears to be of size and depth to manage sediment.	**No active erosion from floodwaters is visible. Some erosion from construction site runoff was observed at this site.**
10. Sediment Deposition *Are there signs of sediment deposition on point bars? Is it balanced with erosion, or is sediment piling up mid-channel, creating an overly wide and shallow appearance?*	**High Functional Condition**	**Normal and balanced** sediment deposition.	**Sediment appears to be in balance.**

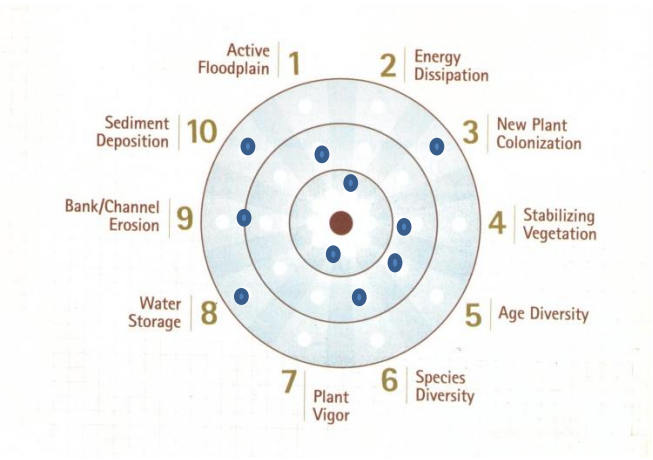


Runoff from bridge construction area observed entering Oso Creek

Riparian Evaluation
Site: La Volla Creek at Saratoga Blvd. (State Hwy 357)
Date: August 25, 2016
By: Sky Lewey

Riparian Indicators			**Notes:**
1. Active Floodplain *Look for recently deposited debris or silt. Is it clear that flood flows are able to rise above the channel, spread out on a floodplain, and slow down?*	**At-Risk Condition**	**Floodplain too far above channel** to be very effective.	**Floodplain is not very wide, measured on Google ™ earth at 93 feet across at the Saratoga Blvd. bridge.**
2. Energy Dissipation in Channel, on Banks or in Floodplain *Is there presence of trees, logs, boulders or dense vegetation to slow water down?*	**High Functional Condition**	**Abundance** of energy dissipaters present in the channel, on the banks, and in the floodplain.	**Floodplain is covered in energy dissipating vegetation plus an abundance of large wood.**
3. New Plant Colonization Do you see fresh sediments, deposited during flooding, being colonized by new plants?	**Poor, Dysfunctional Condition**	**Not much colonization;** sediment deposits and point bars are bare.	**A small amount of new sediment was observed below the bridge but no colonization is visible. The reach downstream was not examined.**
4. Stabilizing Vegetation *Is the bank covered with riparian plants and their roots? Do these plants have a stability rating (SR) greater than 6-7*? Refer to RR plant field guide for SR.	**At-Risk Condition**	**Some gaps present** and/or some vegetation lacks sufficient stability rating.	**Banks are covered with vegetation, not all of it is riparian. Still some moderately stabilizing plants are present and the bank appears to be fortified with roots and are covered with Guinea grass which is not riparian but is providing some cover and function at this site.** **Hackberry SR 5/6** **Mexican ash SR 6** **Ratama SR 6**
5. Reproduction of Riparian Plants; Various Ages. *In addition to older plants, are there young and middle-aged riparian plants?*	**At-Risk Condition**	**Few to no old-mature** riparian trees are present.	**Most of the woody vegetation present appears to be of the same age class; young to middle-aged plants. This could indicate an early stage of riparian recovery is underway, perhaps an historic activity removed woody vegetation and these plants represent a regrowth.**
6. Diversity of Riparian Plants *Using the RR field guide, can you identify different species of native riparian plants?*	**At-Risk Condition**	**Modest diversity** 3-4 species of native riparian trees, shrubs, grasses and sedges.	**Only a few native riparian woody species can be seen from the bridge.**
7. **Plant Vigor** *Are plants healthy, or do you see signs of grazing, trampling, mowing, browsing, cutting, shredding or bulldozing? Consult your field guide for information about a particular plant's palatability for grazing and browsing. Palatable plants can be sentinels of impaired vigor.*	**High Functional Condition**	**Healthy, vigorous riparian plants,** woodies showing little or no sign of heavy browsing or hedging. Grasses and sedges show little or no sign of heavy grazing, mowing, trampling or other impairments.	**Plants are healthy and vigorous.**

8. Water Storage *Using your field guide, can you locate key Wetland Obligate and Facultative Wetland plants?*	**Poor, Dysfunctional Condition**	**No OBL or FACW** species are present, indicating a lack of water being stored in the riparian area.	**The riparian vegetation present is mostly indicative of a dry site. Sedge was seen at the water's edge but no water loving plants are seen any distance away from the channel.** **Hackberry FAC** **Mexican ash FAC** **Ratama FACW** **Flat sedge OBL (at the water's edge)**
9. Bank/Channel Erosion *Do you find signs of bank or channel erosion? Is it in predictable locations, such as on meander bends where point bars are being formed with the eroded material downstream? Does the channel look down-cut or incised like a drainage ditch? If so, it may also lack an active floodplain.*	**Functional** ***but tending toward At-Risk Condition***	**Light bank erosion** on meander bends being compensated by deposition on point bars below. Channel appears to be of size and depth to manage sediment.	**There is erosion visible and beginning on left bank. It is clear that the channel carries a lot of high energy water and may be slightly incised, but erosion beyond downstream meander bends is not visible from the bridge.**
10. Sediment Deposition *Are there signs of sediment deposition on point bars? Is it balanced with erosion, or is sediment piling up mid-channel, creating an overly wide and shallow appearance?*	**High Functional Condition**	**Normal and balanced** sediment deposition.	**Sediment appears to be in balance.**



Addition note:
A large scale stream bank and channel clearing project was observed upstream of evaluation site. Subsequent evaluations of this site may identify downstream riparian impacts. A photo point of the disturbed riparian site was established. Its recovery may be visually documented by taking subsequent photos over time.