

Riparian Evaluation of Oso Creek and Tributaries

Funding Entity: Texas Commission on Environmental Quality

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

Preface:

This report is the deliverable for Task 2.2 in support of Implementation Plan (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).

Technical Approach

- 2.1 NRA will identify 1-3 riparian evaluation project areas to establish on-going evaluation, status to be reported in the PRs identified in Task 1.1.
- 2.2 NRA will complete riparian evaluation worksheets, maps, and report outlining identified hindrances, opportunities and/or constraints by August 31, 2016.

Deliverables:

- 2.1 NRA will report on activities in the PRs identified in Task 1.1.
- 2.2 NRA will develop a final report documenting the results of the riparian evaluation.

Introduction:

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 southeast-erly 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 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. Since 2002, water quality testing has found that concentrations of bacteria are elevated in Oso Creek, which may pose a risk to people who swim or wade in it. Swimming and wading are called "contact recreation" in the state's standards for water quality; the term refers to all recreation in which people come in direct contact with the water. In response to these conditions, the TCEQ has developed a total maximum daily load for Oso Creek. The TMDL established 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) with measures that reduce pollution.

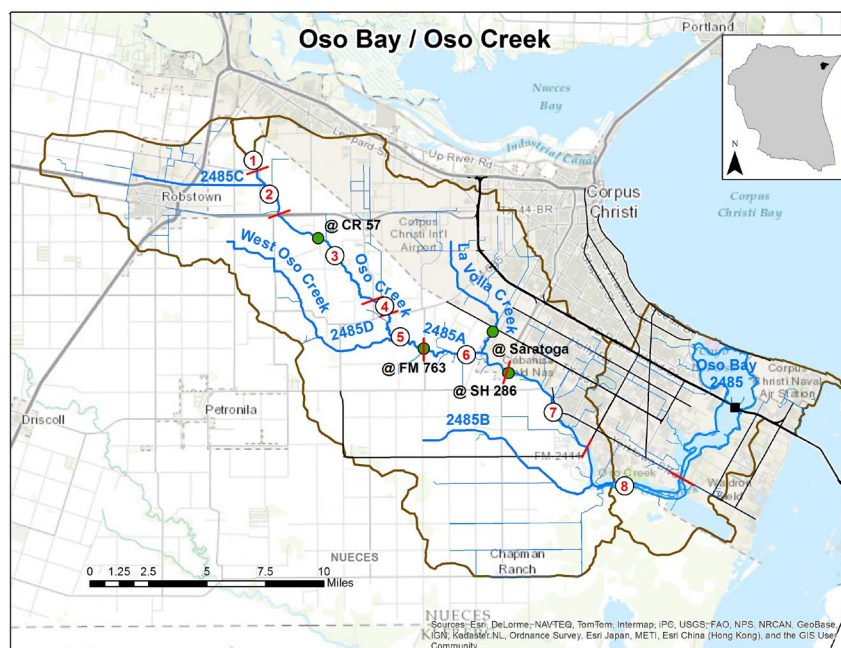
Riparian Connection:

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 and that 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.

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 and State Highway (SH) 286 and La Volla Creek down stream 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, 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 "[our Remarkable Riparian Field Guide](#)", Third edition, April 2016.

A Wetland Indicator status (WI) 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 (SR) 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 a SR of ten is equal to the stability of anchored rock. A SR of six to seven is considered the minimum necessary for adequate bank stability.

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:

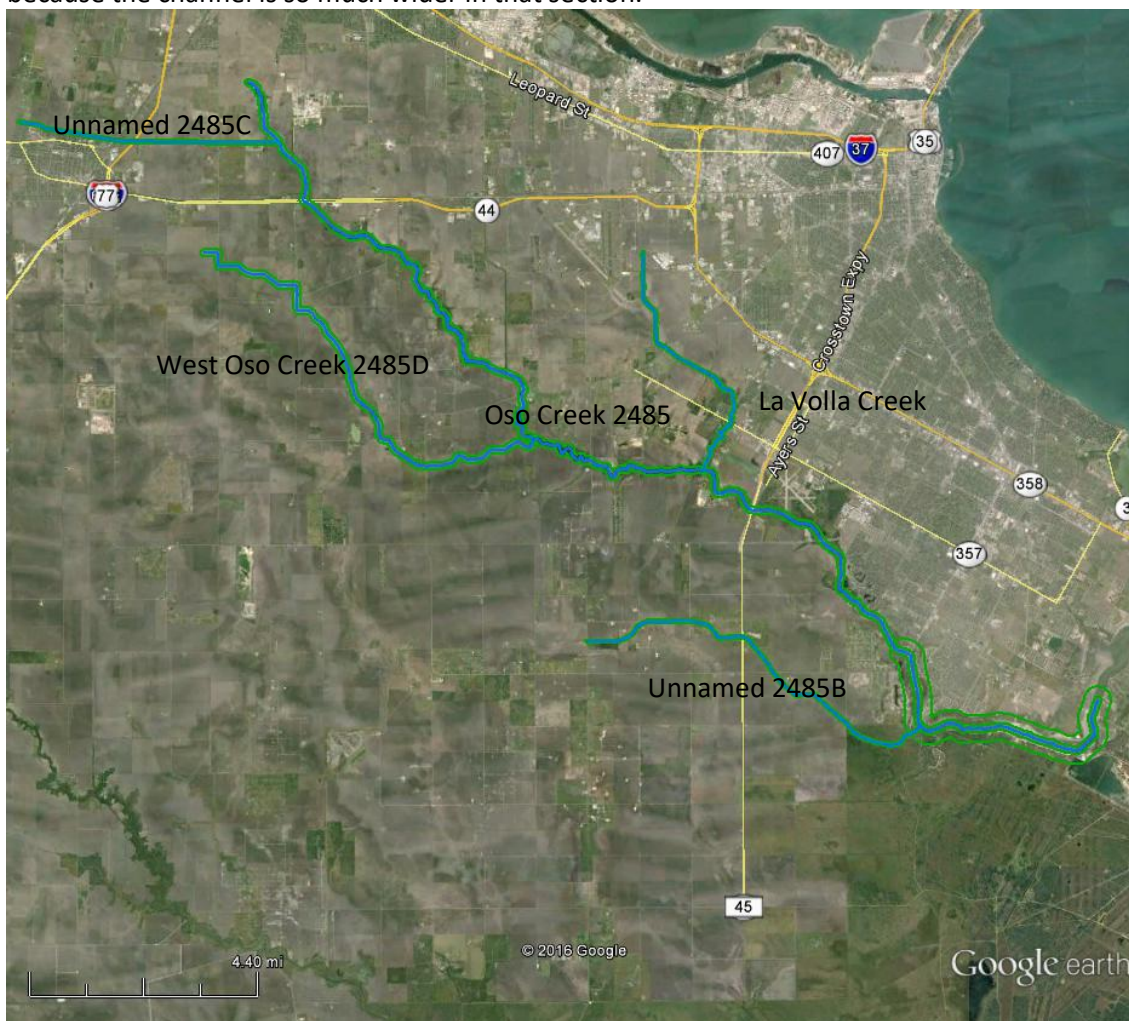
- Farming, mowing, or spraying weeds or brush too close to the bank
- Logging and related timber harvest activities adjacent to the creek
- Manicured or altered residential or park landscapes next to the creek
- Prolonged grazing concentrations in creek areas
- Excessive populations of deer, exotic hoof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

- 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 in blue within green lines. The buffer appears wider along the tidal section of the creek because the channel is so much wider in that section.

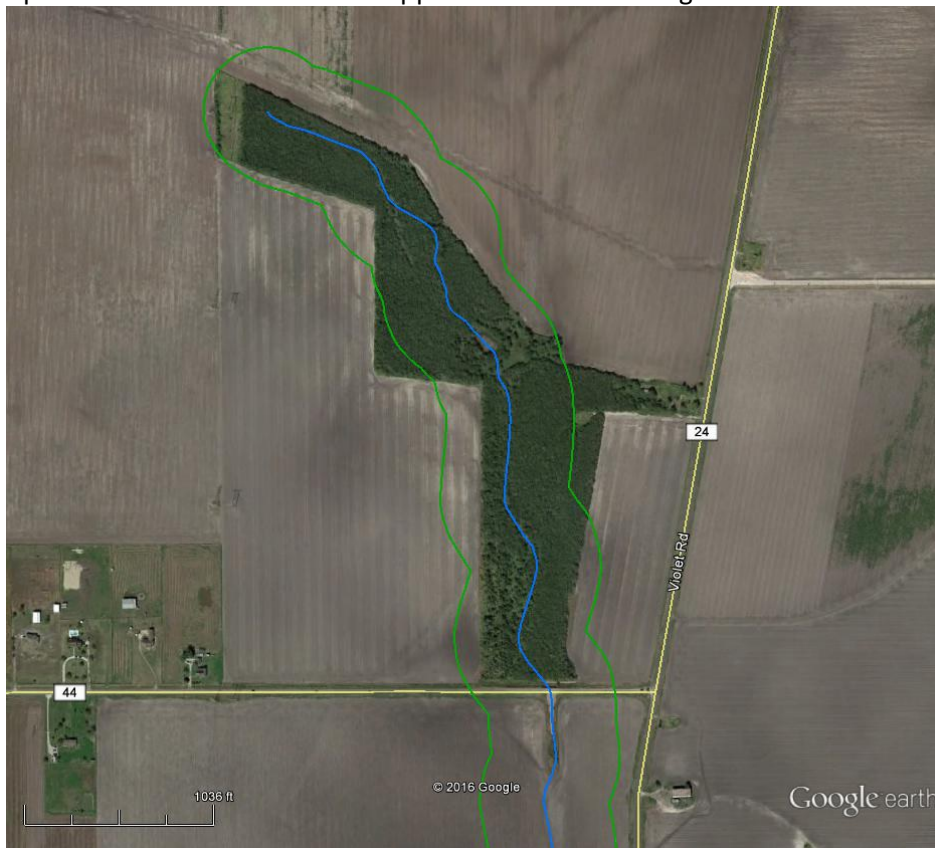


Oso Creek Segment 1

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 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 actual channel length in this section could be twice that distance because it is narrow and meandering which is difficult to account for using the Google earth measurement tool.

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 Indicator WI status 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 a pair of 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

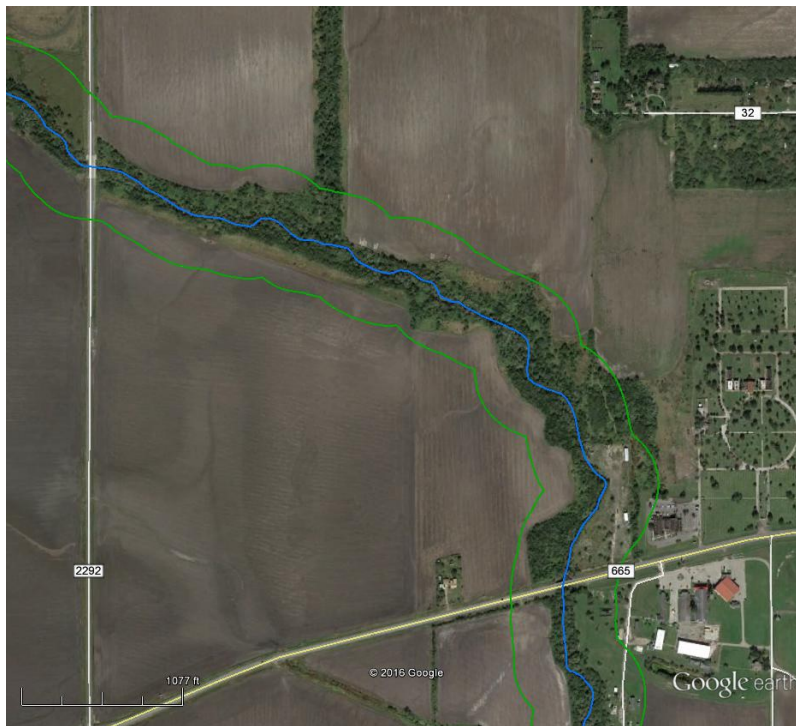


Oso Creek Segment 4

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



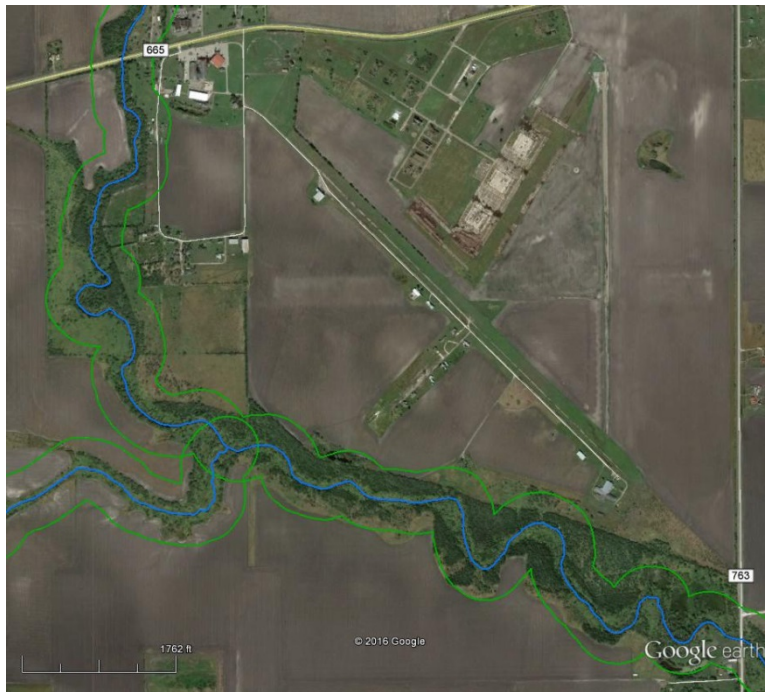
Oso Creek Segment 5

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 nicely 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

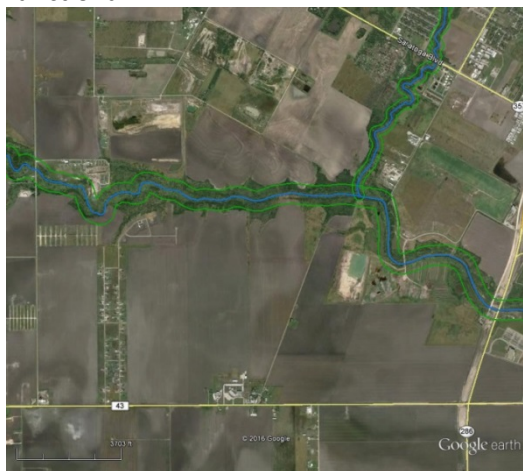
Approximate length 3.9 miles

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 Waste Water Treatment Plant 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

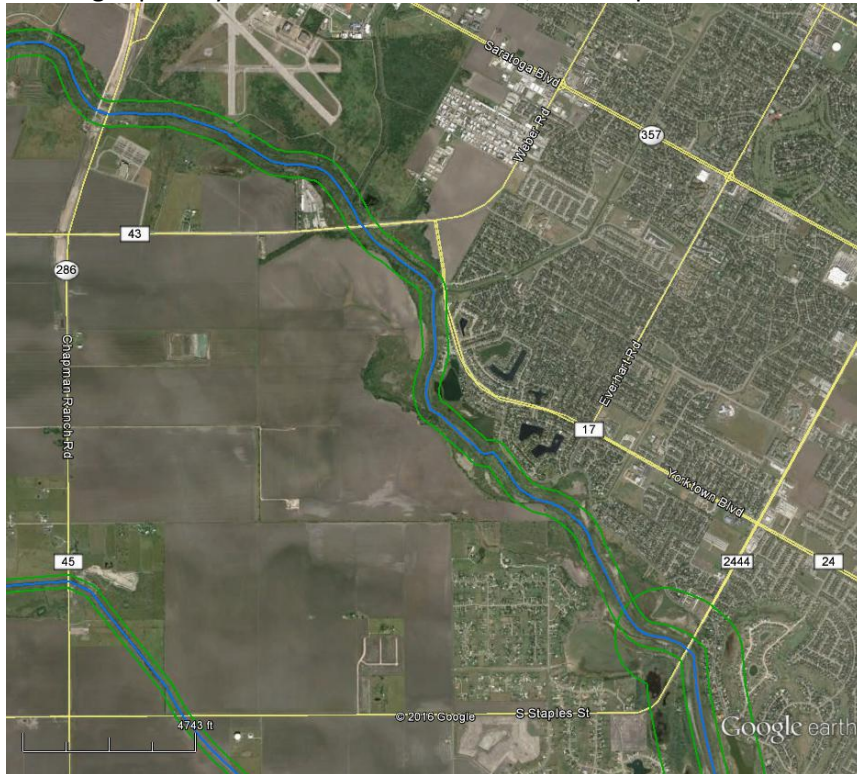


Oso Creek Segment 7

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.

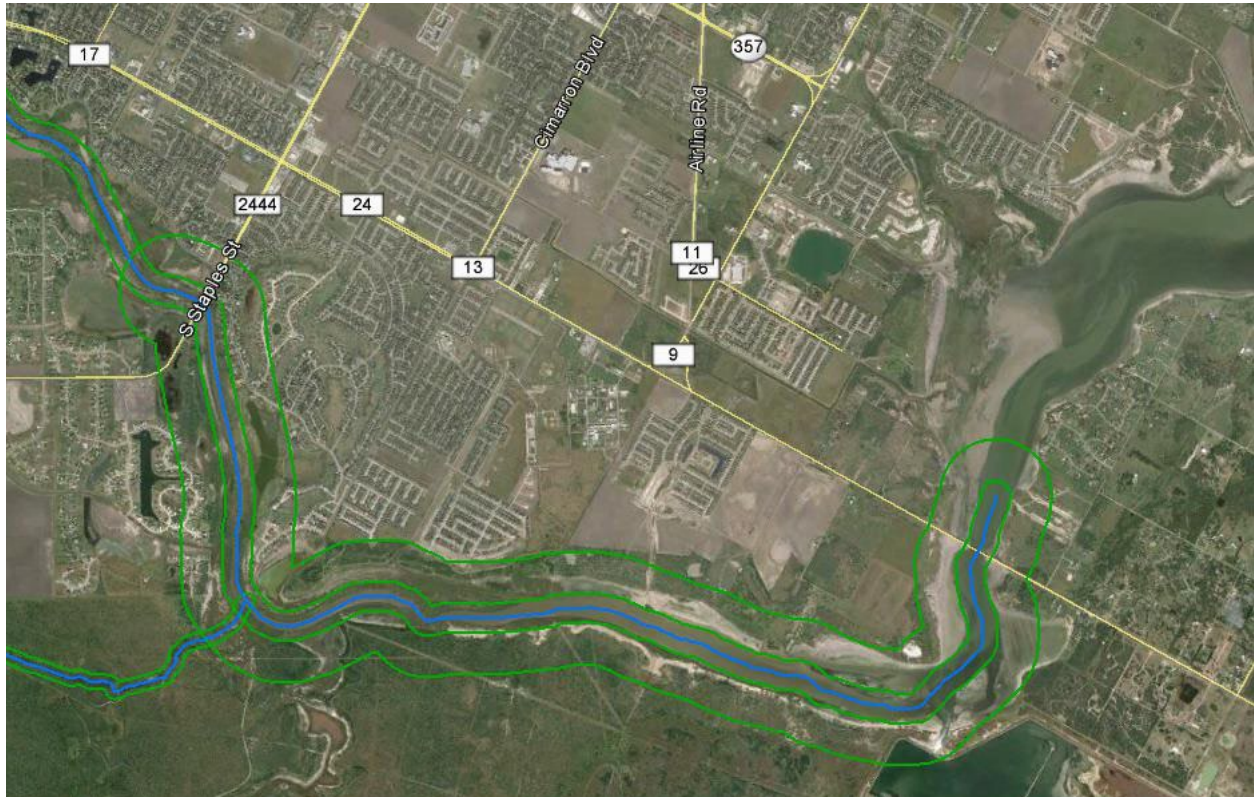


Oso Creek Segment 8

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 left 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



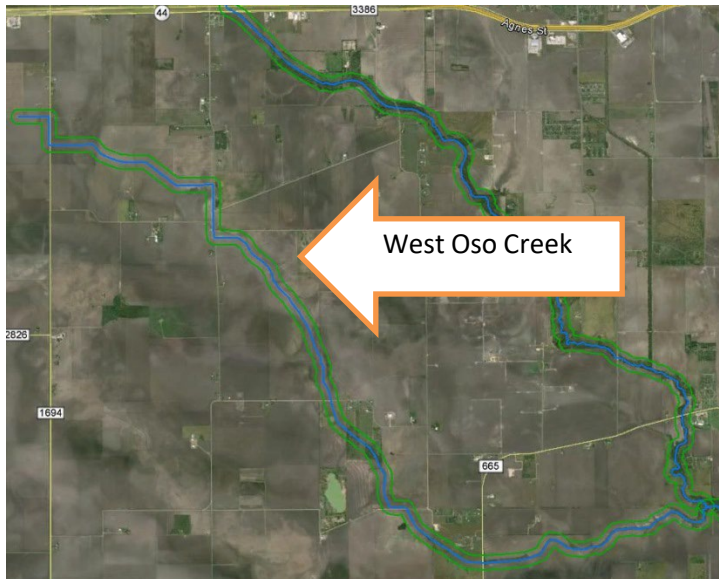
West Oso Creek 2485(D)

Approximate length 8 miles

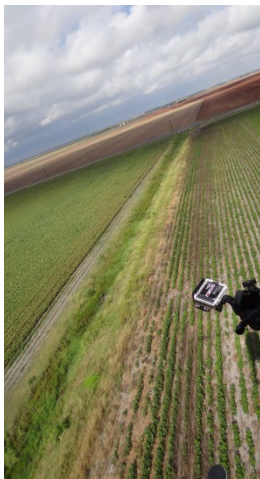
Approximate area of riparian potential 582 acres

West Oso Creek is a classified tributary to Oso Creek, running approximately 8 miles from FM 1694, near 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.

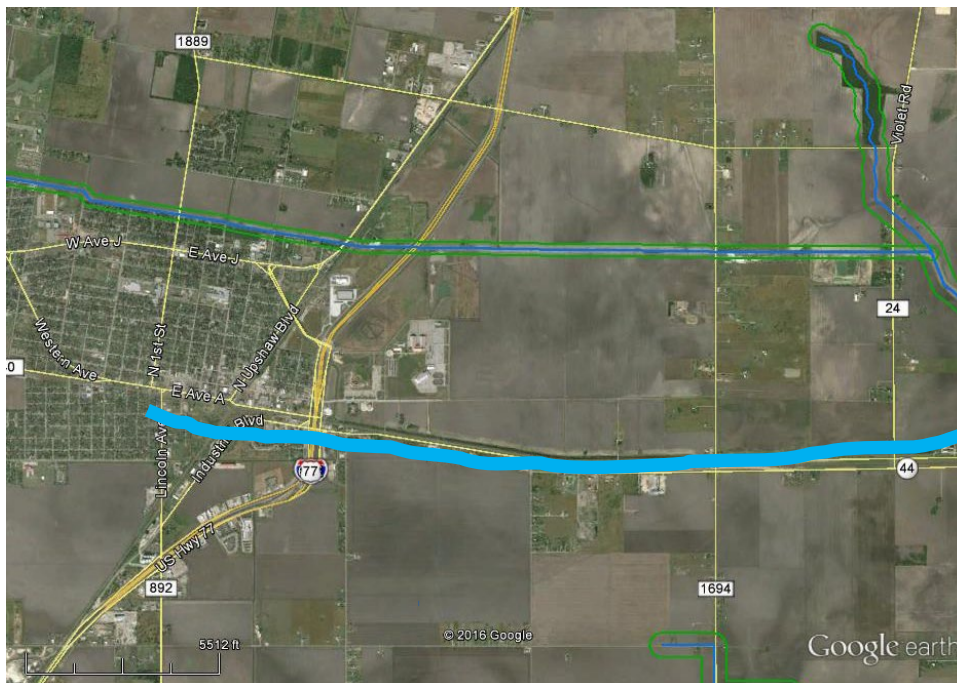


Unnamed tributary to Oso Creek 2485(C)

Approximate length 6 miles

Approximate area of riparian potential 218 acres

This unnamed drain carries the City of Robstown's Waste Water Treatment Plant (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

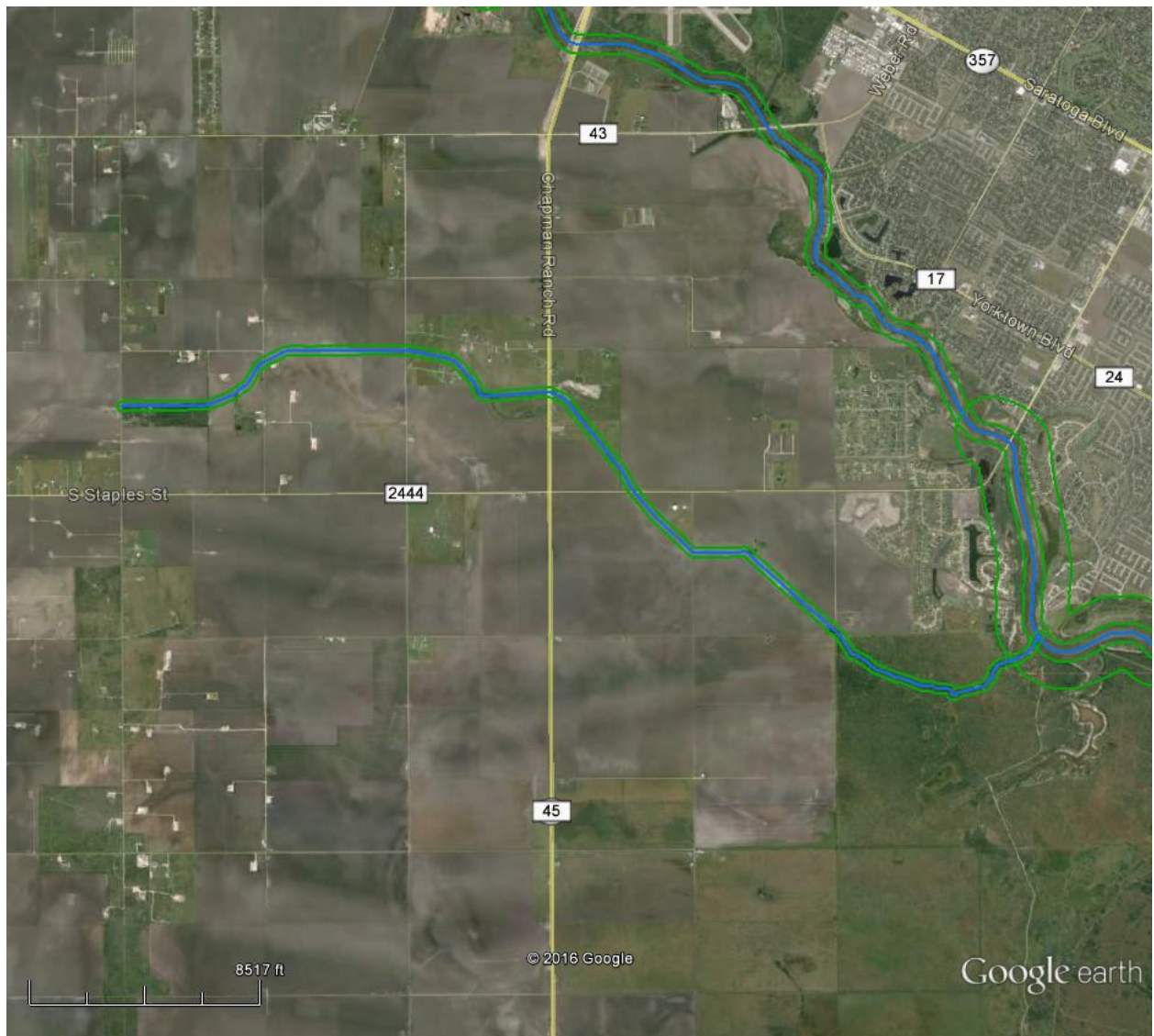


Unnamed tributary to Oso Creek 2485(B)

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



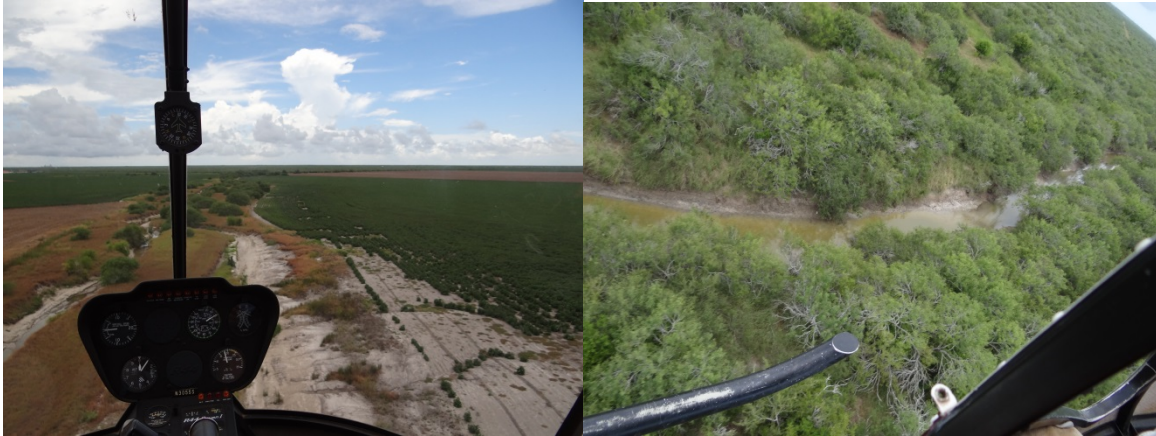
Another example of non-functional, ditch-like, riparian area



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.

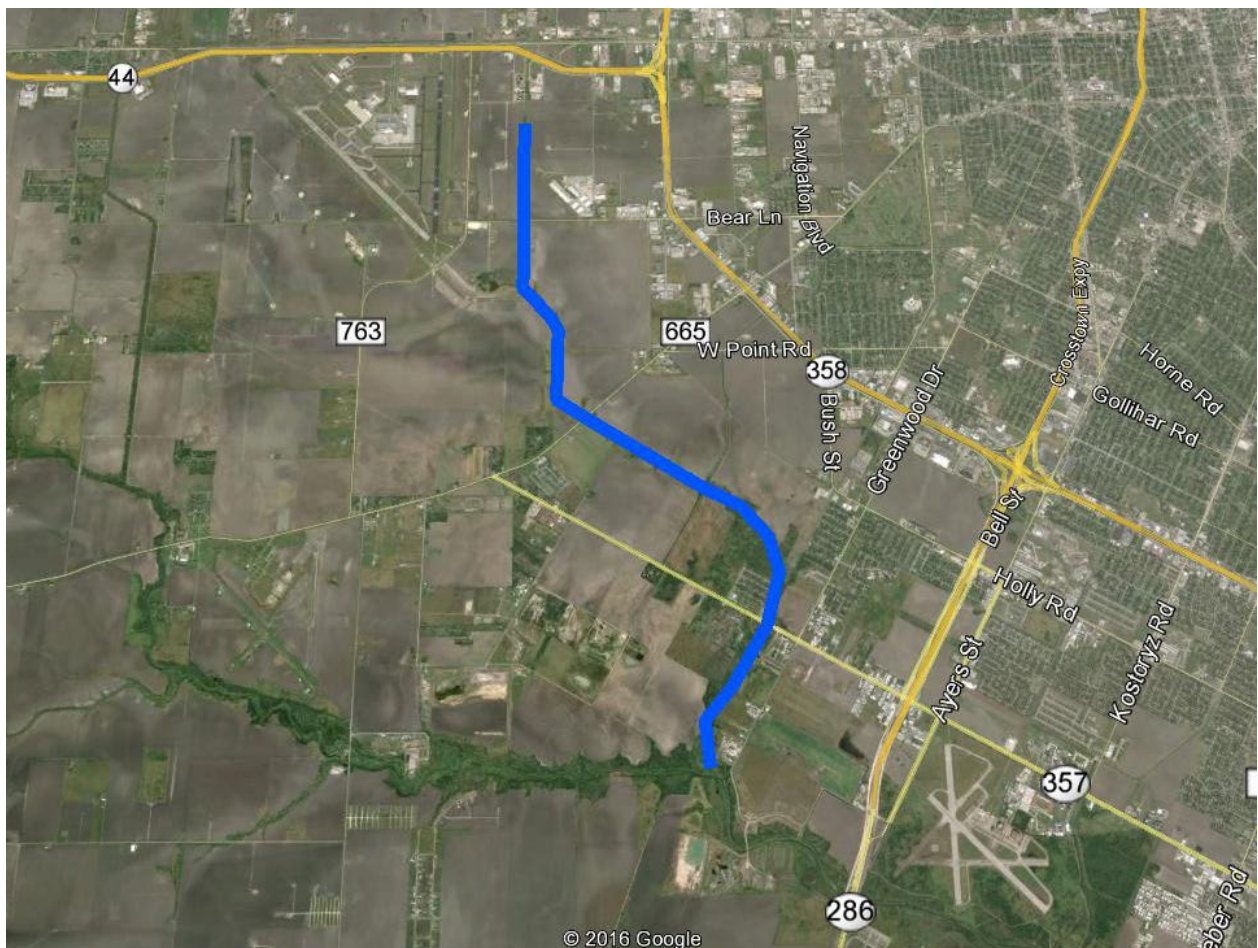


La Volla Creek

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 Waste Water Treatment Plant (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.



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 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