Exelon.
Generation

NP-08-0020
November 13, 2008

10 CFR 52.75

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Exelon Nuclear Texas Holdings, LLC
Victoria County Station, Units 1 and 2
Submittal of Additional Environmental Data in Support of Combined License Application
NRC Docket Nos. 52-031 and 52-032

References:
1. Exelon Nuclear Texas Holdings, LLC letter to USNRC, "Application for Combined Licenses for Victoria County Station, Units 1 and 2," dated September 2, 2008
2. Exelon Nuclear Texas Holdings, LLC letter to USNRC, "Submittal of Additional Geological Data and Environmental Monitoring Status Update in Support of Combined License Application," dated October 16, 2008

In Reference 1, Exelon Nuclear Texas Holdings, LLC (Exelon) submitted an application for a combined license (COL) for Victoria County Station (VCS), Units 1 and 2. That submittal consisted of eleven parts, as described in the referenced letter, and a separate part containing Safeguards Information provided under separate cover.

In addition to the contents of the application, Exelon is providing the enclosed supplemental information in support of the review of the VCS Units 1 and 2 COL application (COLA). As previously discussed in Reference 2, the following information is enclosed:

Enclosure 1, "Summary of Seasonal Wildlife Surveys at the Victoria County Station Site, Victoria County, Texas, 2007 – 2008," which includes the results of an early fall 2008 terrestrial ecology survey;

Enclosure 2, "Groundwater Level Measurements (FSAR Table 2.4.12-205 and ER Table 2.3.1-23)," which includes groundwater level monitoring data collected from July 2008 through October 2008; and

Enclosure 3, "Surveys of Aquatic Biota for the Victoria County Station Site, Fall Interim Report, January – September 2008," which includes aquatic ecology data collected monthly in offsite water bodies from July 2008 through September 2008.

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The fall onsite aquatic ecological sampling event was conducted in October 2008. The results of that survey will be provided in an upcoming monthly groundwater level data update, as noted in Reference 2.

Exelon is also submitting a letter from the US Fish and Wildlife Service (USFWS), dated October 3, 2008 (Enclosure 4). The USFWS letter was provided in response to Exelon's April 30, 2008 letter (NP-08-0003) requesting information regarding non-marine species that could be affected by the proposed project. Exelon's letter was included in Appendix A of the VCS COLA Environmental Report.

The content of this submittal has been previously discussed with the NRC. In accordance with those discussions and the referenced letters, additional groundwater level monitoring data and aquatic ecology survey data will be provided to the NRC in future submittals.

If any additional information is needed, please contact David J. Distel at (610) 765-5517 or Joshua Trembley at (610) 765-5345.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 13th day of November, 2008.

Respectfully,

Kenneth A. Ainger
Director – New Plant Licensing

Enclosures:
1. Summary of Seasonal Wildlife Surveys at the Victoria County Station Site, Victoria County, Texas, 2007 - 2008
2. Groundwater Level Measurements (FSAR Table 2.4.12-205 and ER Table 2.3.1-23)
3. Surveys of Aquatic Biota for the Victoria County Station Site, Fall Interim Report, January – September 2008
4. US Fish and Wildlife Service letter dated October 3, 2008

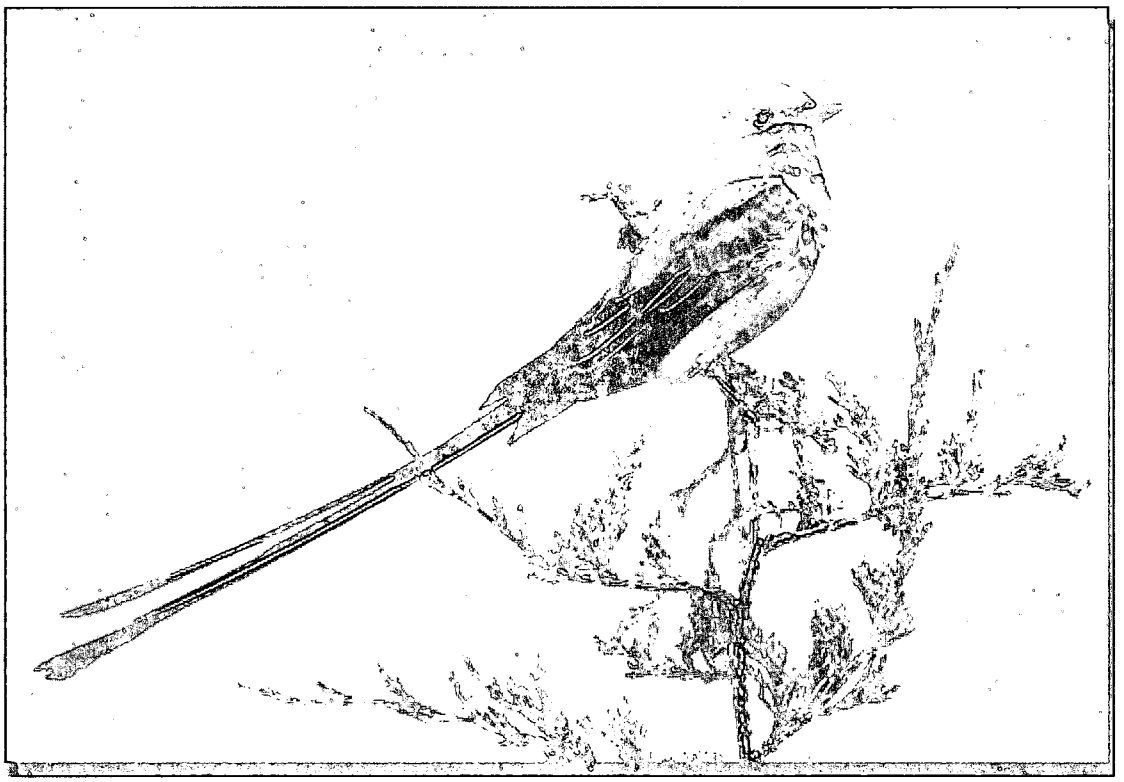
cc: USNRC, Project Manager, VCS, Division of New Reactor Licensing (w/enclosures – one copy)
USNRC Region IV, Regional Administrator (w/enclosures – one copy)

Enclosure 1

Summary of Seasonal Wildlife Surveys at the Victoria County Station Site
Victoria County, Texas

2007 - 2008

SUMMARY OF SEASONAL WILDLIFE SURVEYS AT THE VICTORIA COUNTY STATION SITE, VICTORIA COUNTY, TEXAS, 2007-2008



(Scissor-tailed Flycatcher)

11 November 2008

INTRODUCTION

This report summarizes five seasonal surveys of terrestrial wildlife observed on the Victoria County Station (VCS) site from October of 2007 through October of 2008. Terrestrial wildlife observed during this period included mammals, reptiles, and birds. Mammals, reptiles, and amphibians were also surveyed during species-specific surveys during the spring/summer months, their peak period of activity. The results of the species-specific studies are reported in BioWest 2008 and summarized in the VCS Combined License Application Environmental Report.

Wildlife use of the VCS site is influenced by a multitude of factors, but three of the most important factors include the types of available habitats, climatic (rainfall) impacts on habitat, and (for birds) seasonal presence due to migratory status. Many wildlife species, especially mammals and reptiles, do not migrate, but apparent differences among seasons for these animals are often due to changes in activity patterns (if they are less active, they are less likely to be observed).

VCS Habitats

The VCS site is located on a slightly elevated plain adjacent to the Guadalupe River basin in southern Victoria County, Texas. The terrain is relatively flat on the western side of the site, becoming more hilly toward the eastern side of the site. The northeastern site boundary slopes sharply downward to the Guadalupe River basin, specifically Black Bayou and Linn Lake (Figure 1). The site consists primarily of rangeland (generally bluestem grasslands) with scattered oak mottes and encroaching thickets of invasive/nuisance shrubs, predominantly huisache. A relatively low number of mottes are sufficiently large to appear in Figure 1, but many smaller mottes occur on the VCS landscape. This rangeland receives varying levels of use by livestock, as approximately 1100 cattle and 150 horses are rotated among fenced parcels for grazing. Some portions of this rangeland have not been grazed in 3–4 years, and thus they can appear as tall "old field vegetation." This rangeland is interspersed with ephemeral/intermittent streams and low-lying depression wet areas. The largest ephemeral stream is Dry Kuy Creek, which originates in the northwest corner of the site and exits the south-central site boundary. Several other un-named ephemeral/intermittent streams occur on the site as tributaries of Dry Kuy Creek, Linn Lake, Black Bayou, and Kuy Creek. The slope from the rangeland down to the Guadalupe River basin is typified by live oak forests transitioning into bottomland forest along the open water sites and the Guadalupe River. Linn Lake and Black Bayou are the open water sites with forested wetland edges along the eastern boundary of the VCS site. All depressional wetlands and water bodies on the VCS site, including those adjacent to Linn Lake and Black Bayou, are subject to major fluctuations in water levels due to climatic factors.

Climate/Rainfall Effects

The hydrologic status of wetlands, streams, and water bodies throughout and adjacent to the VCS site during the period of study was largely determined by local rainfall amounts/patterns. For example, the March survey occurred shortly after heavy rains impacted Victoria County and the site and all of the depression wetlands had standing water and the ephemeral/intermittent streams had flowing water (Table 1). The region then experienced a sustained dry period from May through October of 2008, which included the last two seasonal surveys. All on-site streams were therefore subject to considerable water level/flow fluctuations (Table 1). As a result, none of the ephemeral/intermittent streams on the VCS site contained any water during the last two surveys. All depression wetlands were dry during the latter surveys, the only exception being depressions managed to hold water for livestock (using supplemental pumps). Linn Lake was largely dry during the latter two surveys. Similarly, the riverine bottomlands in the southeastern corner of the site were typically very dry during those surveys, with only a few persistent, isolated pools of water.

Avian Migration

Potential avian species found on the VCS site consist of "year-round" species and wintering/migratory birds. Of the 629 species of birds documented for Texas, 333 species (53%) are considered neoarctic-neotropical migrants, essentially those birds that breed in the temperate latitudes but leave to winter in the more tropical latitudes to the south (Shackleford *et al.* 2005). Avian migration is triggered by external factors such as day length and temperature, but is also influenced by weather patterns, flowering of plants, and the availability of food. The timing of migration is relatively fixed for some species (e.g., swallows, swifts), but is flexible for most others, being dependent on environmental conditions. Migratory birds often follow specific, well-defined routes over long distances. The Texas coastal region is situated at the conjunction of two migration routes, the Central and Mississippi flyways, resulting in large numbers of a wide diversity of species migrating through the region in the fall and spring months (Shackleford *et al.* 2005). Some migrants fly to Texas and "winter" in this region whereas others fly though the region en route to/from more tropical wintering areas.

METHODS

Tetra Tech conducted five (5) wildlife surveys on the proposed Victoria County Station site: 23-24 October 2007, 11-13 March 2008, 28-29 May 2008, 15-16 July 2008, and 7-8 October 2008. The October and March surveys included fall and spring avian migrants, respectively.

Each survey consisted of approximately 20 hours of observations over a two or three day period by two biologists. All habitat types present on the site were visited during each survey: bluestem grasslands, oak mottes, oak forest, bottomland forests, as well as ephemeral streams and wetlands, stock watering ponds, and Linn Lake (shoreline

surveys only). Time spent in each habitat was roughly proportional to habitat abundance within the site (e.g., biologists spent considerably more time surveying the grasslands than the oak mottes).

The surveys consisted of a combination of vehicular and pedestrian surveys (Figure 1), although frequent stops were made during the vehicular component to get out and identify and count wildlife by both direct observation, observation of signs (e.g., tracks), and sound (calls). Approximately 22 miles of routes were surveyed by vehicle during all five seasonal visits ("permanent"); portions of other routes ("occasional"; approximately 9 miles total) were surveyed if time allowed.

For birds, the relative abundance of individual species was estimated after each seasonal survey, with each recorded species classified as abundant (> 50 individuals observed), common (10 to 50 observed), or uncommon (< 10 observed), based on their frequency of occurrence. Additionally, avian species were documented by biologists involved in other surveys (e.g., small mammal and herpetological surveys) during the October 2007 through October 2008 period of study. These birds were recorded on the avian species list, but were not included in the seasonal survey estimates.

The observed bird species were also classified as to their expected occurrence in the region. They were classified as:

- year-round - indicates the species can be found year-round in this region, although winter and summer populations may involve different individual birds
- summer - these are birds in their breeding range
- winter - the normal winter distribution of the species
- migration - main migration routes, as well as areas of normal dispersal and post-breeding wandering

These classifications were made based on range maps in avian field guides (NGS 1987, Sibley 2000).

SUMMARY OF WILDLIFE SURVEYS

Avian Surveys

One hundred and six (106) avian species were observed on or near the VCS site during the twelve-month period of seasonal surveys (Table 2). Of these, 25 species (24%) were not documented during the seasonal surveys, but rather during other surveys (e.g., small mammal trapping). Sixteen (16) of the 25 species were water birds/shorebirds observed during extensive herpetological/small mammal surveys in or adjacent to site wetlands.

The remaining 81 avian species were observed during one or more of the five seasonal surveys. For discussion purposes, these species were classified into avian "groups" including wading birds, shorebirds, other water birds, game birds, birds of prey/soaring

birds, and passerines and other birds. Occurrence of federal or state-listed species is mentioned within each avian group.

Wading Birds

Twelve species of wading birds were observed during the five surveys (Table 2). Of these, four species were observed during every survey: great egret (*Ardea alba*), great blue heron (*Ardea herodias*), little blue heron (*Egretta caerulea*), and white ibis (*Eudocimus albus*). No wading bird species were classified as "abundant" during these surveys, although several were classified as "common."

Climatic impacts on site wetlands influenced wading bird use of the site and locations within the sites. Drying conditions during the May and July surveys tended to concentrate wading birds in the shrinking wetlands, resulting in 9 species observed during each of those surveys and increased presence of tactile-foraging species (stork, spoonbill, and ibis species) in July. The sustained dry conditions of the October 2008 survey (all ephemeral wetlands dry, Linn Lake essentially dry) resulted in only five wading bird species and these were observed in generally low numbers.

The wood stork (*Mycteria americana*) is a state-listed (threatened) species that was observed during the latter two surveys of the VCS site. This species is federally listed as endangered in five southeastern states (AL, FL, GA, SC, NC), but is not federally listed in Texas. This large piscivorous bird is a tactile forager, requiring shallow waters to effectively catch prey. Wood storks are not known to breed on a regular basis in Texas and most sightings in the state are presumed to be birds dispersing from Mexican breeding populations to forage in drying Gulf Coast wetlands. A single stork was observed in a drying bottomland pool in the southeastern corner of the VCS site (near the Guadalupe River) in July and 30 storks were observed flying over a dry Linn Lake in October 2008.

White-faced ibis (*Plegadis chihi*) is a state-listed (threatened) species that is very similar in appearance to non-listed glossy ibis (*Plegadis falcinellus*). Although we presumed the birds we observed were glossy ibises, some sightings were made at distances that precluded accurate identification and thus it is possible that some white-faced ibis were present on the site.

Shorebirds

Only four species of shorebirds were observed during the seasonal surveys (Table 2). The most common bird in this group was the killdeer (*Charadrius vociferus*), which was present in low numbers during most of the surveys. The American avocet (*Recurvirostra americana*) is a year-round species more common to tidal mud flats and the remaining two species are migrants.

The low shorebird numbers and species diversity were likely due to overall lack of shore line habitat (VCS is dominated by grasslands) and the timing of the drawdown of the

few site water bodies due to rainfall. Extensive drying/ drawdown of site wetlands and Linn Lake occurred between the March and July surveys (9 additional species of shorebirds were observed during non-avian surveys [see Table 2], which occurred in April and May). Shorebirds frequently forage on aquatic invertebrates along the drying edge of water bodies and the primary water body, Linn Lake, was relatively dry during both the July and October 2008 surveys.

Other Water Birds

This group consists of waterfowl, diving birds, and marsh birds. Eight species were observed during the five seasonal surveys (Table 2). Of these, white pelicans (*Pelecanus erythrorhynchos*) were the most common, typically seen on Linn Lake when water levels were higher. Two of the diving birds, anhingas (*Anhinga anhinga*) and cormorants (*Phalacrocorax* spp.), were relatively common in the first two surveys but were absent during the latter drier surveys. Waterfowl species were relatively sparse and tended to shift from depression wetlands to the more persistent stock watering ponds in the drier months.

Game Birds

Two of the five game species, bobwhite quail (*Colinus virginianus*) and mourning dove (*Zenaida macroura*), were present and occasionally abundant throughout all five seasonal surveys (Table 2). Although common ground doves (*Columbina passerine*) and wild turkeys (*Meleagris gallopavo*) were not observed during all surveys, these species probably occur year-round on the site in very low numbers. The sandhill crane (*Grus canadensis*) is a seasonally abundant migratory species that winters in the region. These cranes were abundant during the March surveys, when they were observed foraging in the recently-burned parcels of the rangeland on the VCS site prior to their northward spring migration.

Birds of Prey/Soaring Birds

Most of the ten species in this group likely reside on the VCS site or in the region, only the merlin (*Falco columbarius*) and northern harrier (*Circus cyaneus*) are migratory species (Table 2). Turkey vultures (*Cathartes aura*) were common to abundant throughout the year and were seen roosting in large numbers (>300) on the dried-out Linn Lake "mud flats" in October 2008. The remaining species were seen in low numbers throughout the year.

The white-tailed hawk (*Buteo albicaudatus*) is a state-listed (threatened) species that forages in the rangeland habitats common to the VCS site. This species was seen in low numbers (≤ 5) throughout the year, but no evidence of nesting on the VCS site has been found.

Single bald eagles (*Haliaeetus leucocephalus*), another state-listed (threatened) species that was recently de-listed as a federally-endangered species, were observed on three

occasions during the year (once in October, 2007 and twice in October of 2008). All sightings were in the eastern portion of the site, near Linn Lake. Multiple bald eagle nest sites are documented in the Guadalupe River basin (Dr. Brent Ortego, TPWD, pers. comm.), but none occur on the VCS site or Linn Lake.

Passerines and Other Birds

Fifty-one passerine/other bird species have been seen on the VCS site, of which 42 were observed during the seasonal surveys. Thirty-one of the 42 (74%) are classified as year-round or summer (breeding season) species and the remaining 26% (11 species) are classified as winter or migratory species. Several species were seasonally abundant: northern cardinal (*Cardinalis cardinalis*), mockingbird (*Mimus polyglottos*), eastern meadowlark (*Sturnella magna*), scissor-tailed flycatcher (*Tyrannus forficatus*), barn swallow (*Hirundo rustica*), and cliff swallow (*Petrochelidon pyrrhonata*); although all are classified as year-round or summer species.

None of the avian species within this group are federally or state listed.

Mammal and Reptile Surveys

Eleven different mammal species or their sign were observed during the seasonal surveys (Table 3). All 11 of these species, as well as 5 rodent species captured during live-trapping activities, were reported during mammal surveys (BioWest 2008). Three species (white-tail deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), and feral pigs (*Sus scrofa*)) or their sign were observed during all five surveys. There are an estimated 1,000 deer on the VCS site, based on hunter reports and census efforts (Kirke Fuerbacher, McCann Ranch biologist, pers. comm.). Tracks of coyotes and/or dogs, which are identical, were observed during two surveys.

Twenty-two (22) total species of amphibians and reptiles were reported in the combined herpetological surveys (BioWest 2008) which included minnow trapping and other active aquatic sampling methods. However, only three species of reptiles were observed during the 2007-2008 seasonal wildlife surveys (Table 3).

CONCLUSIONS

Five seasonal wildlife surveys of the VCS site in Victoria County, Texas, were conducted from October 2007 though October 2008. Eighty-one avian species were documented during these surveys. Species occurrence on the site was impacted by the habitats available (primarily grasslands) and climatic conditions which impacted those habitats. Sustained dry conditions in the latter portion of the year eliminated shallow wetland habitats available to the birds and literally removed Linn Lake as an aquatic open-water habitat. Seasonal differences in bird occurrence, which were expected, were impacted by annual migration patterns of the various species. Approximately one-

fourth of all avian species observed on or near the VCS site were wintering or migratory species.

Eleven mammal and three reptile species also were observed during the seasonal surveys. All of these species also were documented during the specific mammal and herpetological surveys, which, as expected, found other, more secretive species. Also, as with the avifauna, sustained dry conditions reduced habitat (wetlands) availability for some species and likely impacted the numbers of mammal and reptile species observed during seasonal surveys.

Wildlife species observed during the seasonal surveys were typical for the region and the timing of the surveys.

References

BioWest, Inc. 2008. Herpetological and small mammal survey: Exelon Victoria County Site. Prepared by BioWest, Inc., Rosenberg, TX, for Tetra Tech NUS, Inc.

Fuerbacher, K. 2008. Conversation with Larry Bryan, Tetra Tech NUS, during March 2008 seasonal survey.

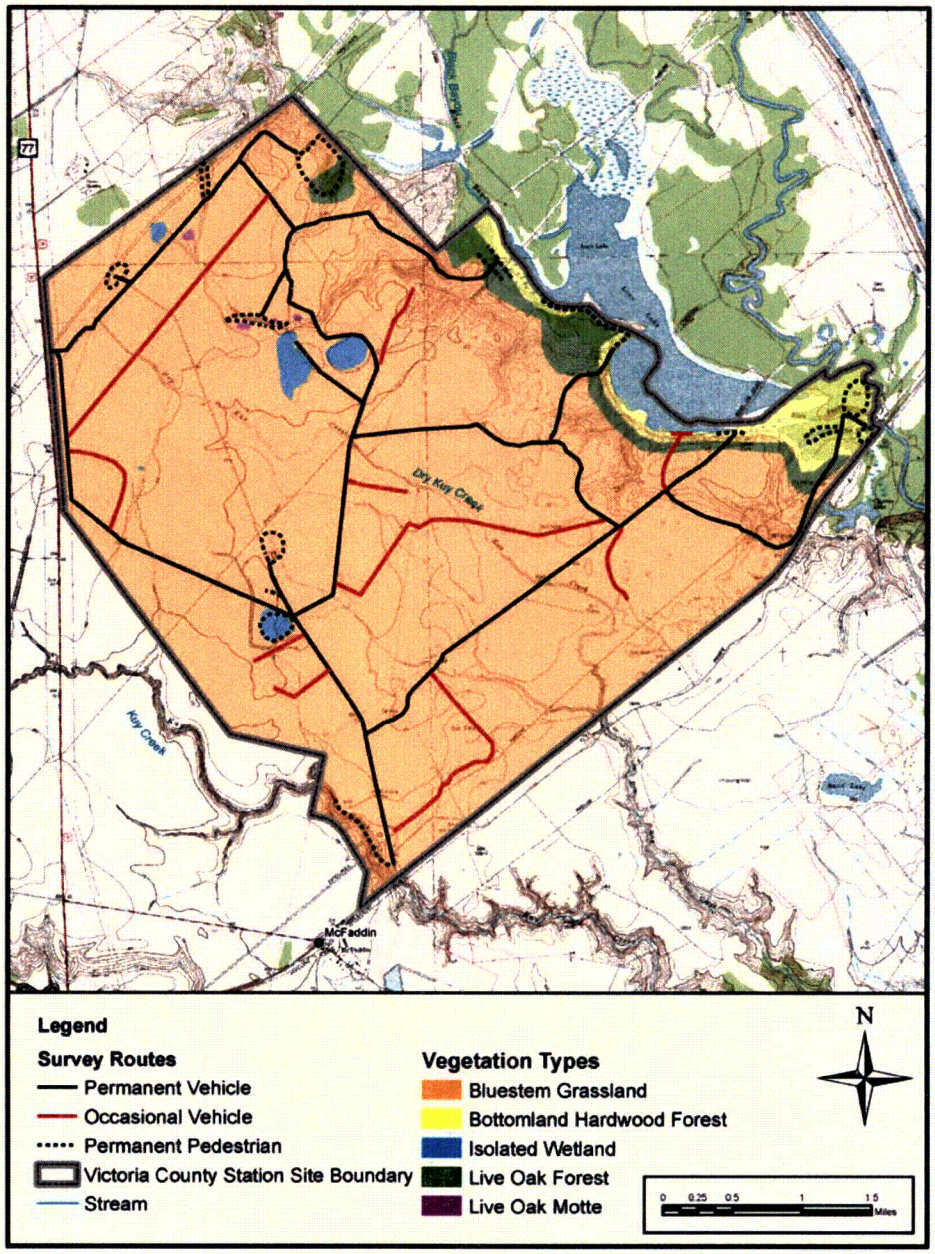
NGS (National Geographic Society) 1987. Field Guide to the Birds of North America, 3rd Edition. NGS, Washington, D.C.

Ortego, B. 2008. Texas Parks and Wildlife Department, Email to Larry Bryan, TetraTech NUS.

Shackelford, C.E., E.R. Rozenburg, W.C. Hunter, and M.W. Lockwood. 2005. Migration and the Migratory Birds of Texas, 4th Edition. Texas PWD, PWD BK W7000-511 (11/05). Booklet, 34 pp.

Sibley, D.A. 2000. The Sibley Guide to Birds. National Audubon Society/Alfred A. Knopf Publishers, New York.

Figure 1. Wildlife survey routes on the VCS site: 2007-2008.



Terrestrial Survey Routes

Table 1. Presence and flow of water in Kuy Creek and Dry Kuy Creek on the Victoria County Station site during 2007-2008 seasonal surveys.

	Kuy Creek	Dry Kuy Ck (north rd)	Dry Kuy Ck (mid-site rd)	Dry Kuy Ck (south rd)
October 23-24, 2007	continuous low flow	isolated pools no flow	isolated pools no flow	isolated pools no flow
March 11-13, 2008	continuous high flow	continuous moderate flow	continuous moderate flow	continuous moderate flow
May 28-29, 2008	isolated pools no flow	isolated pools no flow	isolated pools no flow	isolated pools no flow
July 15-16, 2008	isolated pools no flow	dry no flow	dry no flow	dry no flow
October 7-8, 2008	dry no flow	dry no flow	dry no flow	dry no flow

Table 2. Avian Species Observed During Wildlife Surveys of the Proposed Victoria County Station Site[1] in Victoria County, Texas: 2007-2008.

Avian Group	Occurrence Status[4]	Species	Survey Period[2]/Abundance[3] OCT. 2007	MAR. 2008	MAY 2008	JULY 2008	OCT. 2008
Wading Birds	S	Roseate spoonbill (*Ajaia ajaja*)	Uncom	Uncom	Uncom	Com	-
	Y	Great egret (*Ardea alba*)	Com	Com	Uncom	Com	Uncom
	Y	Great blue heron (*Ardea herodias*)	Com	Com	Uncom	Uncom	Uncom
	W	American bittern (*Botaurus lentiginosus*)*	-	-	-	-	-
	Y	Cattle egret (*Bubulcus ibis*)	-	-	Com	Uncom	-
	Y	Green heron (*Butorides virescens*)*	-	-	-	-	-
	Y	Little blue heron (*Egretta caerulea*)	Uncom	Uncom	Uncom	Uncom	Uncom
	Y	Snowy egret (*Egretta thula*)	Uncom	-	Uncom	-	-
	Y	Tricolored heron (*Egretta tricolor*)	Uncom	-	Uncom	-	-
	Y	White ibis (*Eudocimus albus*)	Com	Com	Com	Com	Uncom
	Y	Least bittern (*Ixobrychus exilis*)*	-	-	-	-	-
	M	Wood stork (*Mycteria americana*)	-	-	-	Uncom	Com
	Y	Yellow-crowned night-heron (*Nyctanassa violacea*)	-	Uncom	Uncom	-	-
	Y	Black-crowned night-heron (*Nycticorax nyctocorax*)	-	-	-	Uncom	-
	Y	Whitefaced or glossy ibis (*Plegadis chihi or falcinellus*)	-	Com	-	Uncom	-
Shorebirds	W	Spotted sandpiper (*Actits macularia*)*	-	-	-	-	-
	W	Western sandpiper (*Calidris mauri*)*	-	-	-	-	-
	W	Least sandpiper (*Calidris pusillus*)*	-	-	-	-	-
	W	Mountain plover (*Charadrius montanus*)	-	Uncom	-	-	-
	Y	Killdeer (*Charadrius vociferus*)	Com	Com	Uncom	-	Com
	Y	Black-necked stilts (*Himantopus mexicanus*)*	-	-	-	-	-
	W	Short-billed dowitcher (*Limnodromus griseus*)*	-	-	-	-	-
	W	Long-billed dowitcher (*Limnodromus scolopaceus*)*	-	-	-	-	-

Table 2. Avian Species Observed During Wildlife Surveys of the Proposed Victoria County Station Site[1] in Victoria County, Texas: 2007-2008 (continued)

Avian Group	Occurrence Status[4]	Species	Survey Period[2]/Abundance[3] OCT. 2007	MAR. 2008	MAY 2008	JULY 2008	OCT. 2008
Shorebirds - Cont'd	M	Stilt sandpiper (*Micropalma himantopus*)*	-	-	-	-	-
	Y	Amercian avocet (*Recurviristra americana*)	Uncom	-	-	-	-
	W	Lesser yellowlegs (*Tringa flavipes*)*	-	-	-	-	-
	W	Greater yellowlegs (*Tringa melanocleuca*)	-	Uncom	-	-	Uncom
	W	Solitary sandpiper (*Tringa solitaria*)*	-	-	-	-	-
Other Waterbirds	Y	Wood duck (*Aix sponsa*)*	-	-	-	-	-
	W	Northern shoveler (*Anas clypeata*)	-	Uncom	-	-	-
	Y	Blue-winged teal (*Anas discors*)	-	-	-	-	Uncom
	Y	Mottled duck (*Anas fulvigula*)*	-	-	-	-	-
	Y	Anhinga (*Anhinga anhinga*)	Com	Com	-	-	-
	W	Yellow rail (*Coturnicops novaboracensis*)*	-	-	-	-	-
	Y	Black-bellied whistling duck (*Dendrocygna autumnalis*)	-	-	Uncom	Uncom	-
	S	Fulvous whistling duck (*Dendrocygna bicolor*)	Uncom	-	-	-	-
	Y	White pelican (*Pelecanus erythrorhynchos*)	Com	Com	Uncom	-	-
	Y	American coot (*Fulicia americana*)	-	Uncom	-	-	-
	W	Sora (*Porzana carolina*)*	-	-	-	-	-
	Y	Cormorant (*Phalacrocorax spp.*)	Uncom	Uncom	-	-	-
Game Birds	Y	Northern bobwhite quail (*Colinus virginianus*)	Uncom	Uncom	Abun	Abun	Uncom
	Y	Common ground dove (*Columbina passerina*)	-	-	Uncom	Uncom	Uncom
	W	Sandhill crane (*Grus canadensis*)	Com	Abund	-	-	-
	Y	Wild turkey (*Meleagris gallopavo*)	Uncom	Uncom	Uncom	-	-
	Y	Mourning dove (*Zenaida macroura*)	Com	Com	Abun	Com	Abun

Table 2. Avian Species Observed During Wildlife Surveys of the Proposed Victoria County Station Site[1] in Victoria County, Texas: 2007-2008 (continued)

Avian Group	Occurrence Status[4]	Species	Survey Period[2]/Abundance[3] OCT. 2007	MAR. 2008	MAY 2008	JULY 2008	OCT. 2008
Birds of Prey/ Soaring Birds	Y	White-tailed hawk (*Buteo albicaudatus*)	Uncom	Uncom	Uncom	Uncom	Uncom
	Y	Red-tailed hawk (*Buteo jamaicensis*)	Com	Com	Uncom	Uncom	Uncom
	Y	Red-shouldered hawk (*Buteo lineatus*)	-	Uncom	Uncom	Uncom	Uncom
	Y	Crested caracara (*Caracara plancus*)	Uncom	Com	Uncom	Uncom	Uncom
	Y	Turkey vulture (*Cathartes aura*)	Com	Com	Com	Abun	Abun
	W	Northern harrier (*Circus cyaneus*)	-	Uncom	-	-	-
	Y	Black vulture (*Coragyps atratus*)	Uncom	Uncom	Uncom	Uncom	Uncom
	W	Merlin (*Falco columbarius*)	Uncom	-	-	-	-
	Y	Kestrel (*Falco sparverius*)	Com	Com	-	-	Com
	Y	Bald eagle (*Haliaeetus leucocephalus*)	Uncom	-	-	-	Uncom
Passerines & Other Birds	Y	Red-winged blackbird (*Agelaius phoeniceus*)	-	Uncom	Com	Uncom	-
	S	Ruby-throated hummingbird (*Archilochus colubris*)	-	-	-	Uncom	-
	Y	Tufted titmouse (*Baeolophus bicolor*)	-	Uncom	Uncom	Uncom	Uncom
	Y	Great horned owl (*Bubo virginiana*)*	-	-	-	-	-
	Y	Northern cardinal (*Cardinalis cardinalis*)	Com	Com	Abun	Abun	Com
	S	Chimney swift (*Chaetura pelagica*)*	-	-	-	-	-
	Y	Lark sparrow (*Chondestes grammacus*)*	-	-	-	-	-
	S	Yellow-billed cuckoo (*Coccyzus americanus*)	-	-	Uncom	Uncom	-
	Y	Northern flicker (*Colaptes auratus*)	-	Uncom	-	-	-
	M	Eastern wood pewee (*Contopus virens*)	-	-	-	-	Uncom
	Y	American crow (*Corvus brachyrhynchos*)	-	Uncom	Uncom	Uncom	Com
	W	Yellow-rumped warbler (*Dendroica coronata*)	-	Uncom	-	-	-
	M	Yellow-throated warbler (*Dendroica dominica*)*	-	-	-	-	-
	W	Palm warbler (*Dendroica palmarum*)	-	-	-	-	Uncom
	Y	Pileated woodpecker (*Dryocopus pileatus*)	-	-	-	Uncom	-
	W	Gray catbird (*Dumetella carolinensis*)	-	-	-	-	Uncom

Table 2. Avian Species Observed During Wildlife Surveys of the Proposed Victoria County Station Site[1] in Victoria County, Texas: 2007-2008 (continued)

Avian Group	Occurrence Status[4]	Species	Survey Period[2]/Abundance[3] OCT. 2007	MAR. 2008	MAY 2008	JULY 2008	OCT. 2008
Passerines & Other Birds - Cont'd	S	Blue grosbeak (*Guiraca caerulea*)	-	-	-	Uncom	-
	S	Barn swallow (*Hirundo rustica*)	Com	-	-	-	Abun
	Y	Loggerhead shrike (*Lanius ludovicianus*)	Com	Com	-	Uncom	Com
	Y	Red-bellied woodpecker (*Melanerpes carolinus*)	-	Uncom	Uncom	Uncom	Uncom
	W	Song sparrow (*Melospiza melodia*)	-	Com	-	-	-
	Y	Mockingbird (*Mimus polyglottos*)	Com	Com	Abun	Com	Com
	S	Black-and-white warbler (*Mniotitla varia*)	-	-	-	Uncom	-
	Y	Brown-headed cowbird (*Molothrus ater*)	-	Uncom	Com	Uncom	-
	M	Great crested flycatcher (*Myiarchus crinitus*)	-	-	Uncom	-	-
	Y	Ladder-backed woodpecker (*Picoides scalaris*)	-	-	Uncom	-	Uncom
	S	Painted bunting (*Passerina ciris*)	-	-	Uncom	Uncom	-
	M	Indigo bunting (*Passerina cyanea*)*	-	-	-	-	-
	W	Savannah sparrow (*Passerculus sandwichensis*)	-	Com	-	-	Uncom
	S	Cliff swallow (*Petrochelidon pyrrhonata*)	-	-	Com	Abun	Com
	W	Vesper sparrow (*Pooecetes gramineus*)*	-	-	-	-	-
	Y	Carolina chickadee (*Poecile carolinensis*)	-	Uncom	Uncom	Uncom	Uncom
	Y	Blue-gray gnatcatcher (*Poliotila caerula*)	-	Uncom	-	-	Uncom
	M	Prothonotary warbler (*Prothonotaria citrea*)*	-	-	-	-	-
	Y	Great-tailed grackle (*Quiscalus mexicanus*)	-	-	-	Uncom	-
	Y	Common grackle (*Quiscalus quiscala*)	-	Uncom	-	-	-
	Y	Eastern phoebe (*Sayornis phoebe*)	-	Com	-	-	-
	Y	Eastern bluebird (*Siala sialis*)	-	Uncom	-	-	-
	W	Yellow-bellied sapsucker (*Sphyrapicus varius*)	-	-	-	-	Uncom
	Y	Dickcissel (*Spiza americana*)	-	-	Uncom	-	-
	W	Field sparrow (*Spizella pusilla*)	-	Uncom	-	-	-
	Y	Northern rough-winged swallow (*Stelgidopteryx serripennis*)	-	-	-	-	Uncom
	Y	Barred owl (*Strix varia*)	-	Uncom	Uncom	Uncom	Uncom

Table 2. Avian Species Observed During Wildlife Surveys of the Proposed Victoria County Station Site[1] in Victoria County, Texas: 2007-2008 (continued)

Avian Group	Occurrence Status[4]	Species	Survey Period[2]/Abundance[3] OCT. 2007	MAR. 2008	MAY 2008	JULY 2008	OCT. 2008
Passerines & Other Birds Cont'd	Y	Eastern meadowlark (*Sturnella magna*)	Com	Com	Uncom	Abun	Uncom
	W	Tree swallow (*Tachycineta bicolor*)	Com	Uncom	-	-	-
	Y	Bewick's wren (*Thryomanes bewickii*)	-	-	Uncom	-	-
	S	Scissor-tailed flycatcher (*Tyrannus forficatus*)	Uncom	-	Abun	Com	Com
	S	Eastern kingbird (*Tyrannus tyrannus*)*	-	-	-	-	-
	W	Orange-crowned warbler (*Vermivora celata*)	-	-	-	-	Uncom
	S	White-eyed vireo (*Vireo griseus*)	-	Com	Com	Com	-
	M	Red-eyed vireo (*Vireo olivaceus*)*	-	-	-	-	-

[1] The site surveys included the Victoria County Station Site, Black Bayou, and Linn Lake.
[2] Survey periods were October 23-24, 2007; March 11-13, 2008; May 28-29, 2008, July 15-16, 2008, and October 7-8, 2008.
[3] Relative abundance (within expected habitats) was classified as Abun = Abundant; Com = Common; and Uncom = Uncommon/Rare, based on number observed in typical habitats relative to time surveyed. "-" indicates birds were not observed during the specified survey and thus relative abundance was not determined.
[4] Occurrence Status: birds were classified as year-round (Y), summer (S), winter (W), or migration (M) - see description in Methods.
* These species were not seen during the five seasonal surveys but were seen during other site visits/surveys.

Table 3. Mammal and Reptile Species Observed During Wildlife Surveys of the Proposed Victoria County Station Site[1] in Victoria County, Texas: 2007-2008.

		Survey Period[2]/Presence[3]				
Group	**Species**	**OCT.**	**MAR.**	**MAY**	**JULY**	**OCT.**
Mammals	Coyote/dog (*Canis latrans/domesticus*)	P	-	-	-	P
	Armadillo (*Dasypus novemcinctus*)	-	P	P	-	-
	Oppossum (*Didelphis virginiana*)	-	P	-	-	-
	Attwater's pocket gopher (*Geomys attwateri*)	-	P	P	P	P
	Bobcat (*Lynx rufus*)	-	P	-	-	-
	White-tail deer (*Odocoileus virginianus*)	P	P	P	P	P
	Raccoon (*Procyon lotor*)	P	P	P	P	P
	Gray squirrel (*Sciurus carolinensis*)	-	P	P	P	P
	Fox squirrel (*Sciurus niger*)	-	P	P	-	-
	Feral pig (*Sus scrofa*)	P	P	P	P	P
	Rabbit (*Silvilagus floridanus* or *S. aquaticus*)	-	P	-	-	-
Reptiles	Alligator (*Alligator mississippiensis*)	-	-	-	P	-
	Eastern garter snake (*Thamnophis sirtalis sirtalis*)	P	-	P	-	-
	Broad-banded water snake (*Nerodia fasciata confluens*)	-	-	P	P	-

[1] The site surveys included the Victoria County Station Site, Black Bayou, and Linn Lake.
[2] Survey periods were October 23-24, 2007; March 11-13, 2008; May 28-29, 2008, July 15-16, 2008, and October 7-8, 2008.
[3] Presence: "P" = species observed; "-" = species not observed.

Enclosure 2

Groundwater Level Measurements
(FSAR Table 2.4.12-205 and ER Table 2.3.1-23)

FSAR Table 2.4.12-205
ER Table 2.3.1-23

EXELON VCS COL PROJECT
Victoria County, Texas
Groundwater Level Measurements

Well No.	Ref. Elev. (NAVD88)	Hydro-geologic Unit	October 25, 2007			November 17, 2007			December 18, 2007			January 30, 2008			February 18, 2008			March 31, 2008			April 26, 2008		
			Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)
OW-01L	73.74	Lower	12:28	42.39	31.35	9:37	42.39	31.35	16:33	42.51	31.23	9:16	42.77	30.97	10:20	42.94	30.80	10:51	42.99	30.75	14:12	42.41	31.33
OW-01U	73.65	Upper	12:33	41.46	32.19	9:34	41.45	32.20	16:30	41.56	32.09	9:14	41.97	31.68	10:19	42.19	31.46	10:50	42.18	31.47	14:11	41.91	31.74
OW-02L	76.53	Lower	12:16	51.36	25.17	9:26	51.21	25.32	16:20	51.12	25.41	9:30	51.21	25.32	10:48	51.31	25.22	10:29	51.32	25.21	12:54	50.81	25.72
OW-02U	76.74	Upper	12:19	51.49	25.25	9:29	51.35	25.39	16:22	51.19	25.55	9:28	51.25	25.49	10:46	51.35	25.39	10:28	51.29	25.45	12:56	51.46	25.28
OW-03L	76.67	Lower	12:02	55.63	21.04	9:15	55.73	20.94	16:13	55.88	20.79	9:39	56.17	20.50	10:55	56.31	20.36	10:20	56.47	20.20	12:46	56.69	19.98
OW-03U	77.05	Upper	12:06	55.96	21.09	9:18	55.04	22.01	16:16	DRY	NA	9:40	DRY	NA	10:53	DRY	NA	10:19	DRY	NA	12:48	DRY	NA
OW-04L	80.67	Lower	11:55	56.69	23.98	9:07	56.61	24.06	16:09	56.54	24.13	9:49	56.75	23.92	11:02	56.91	23.76	10:10	56.98	23.69	12:41	57.22	23.45
OW-04U	81.08	Upper	11:49	56.15	24.93	9:04	56.02	25.06	16:07	56.06	25.02	9:47	56.20	24.88	11:00	56.32	24.76	10:09	56.44	24.64	12:39	56.70	24.38
OW-05L	79.90	Deep	11:37	53.17	26.73	8:57	53.02	26.88	16:03	52.97	26.93	9:58	53.05	26.85	11:08	53.21	26.69	10:04	53.25	26.65	12:34	53.52	26.38
OW-05U	79.55	Upper	11:44	52.71	26.84	9:00	52.48	27.07	16:02	52.31	27.24	9:56	52.33	27.22	11:06	52.45	27.10	10:03	52.50	27.05	12:36	52.75	26.80
OW-06L	81.55	Lower	11:12	54.46	27.09	8:47	54.25	27.30	15:50	53.86	27.69	10:15	54.22	27.33	11:23	54.34	27.21	9:55	54.41	27.14	12:21	54.22	27.33
OW-06U	80.77	Upper	11:18	53.59	27.18	8:49	53.38	27.39	15:51	53.20	27.57	10:12	53.23	27.54	11:22	53.35	27.42	9:53	53.43	27.34	12:23	53.66	27.11
OW-07L	79.04	Deep	11:00	57.78	21.26	8:39	57.88	21.16	15:40	57.99	21.05	10:25	58.17	20.87	11:50	58.33	20.71	9:20	58.41	20.63	11:44	58.68	20.36
OW-07U	79.02	Upper	11:04	58.02	21.00	8:42	57.99	21.03	15:42	55.98	23.04	10:24	58.17	20.85	11:48	58.30	20.72	9:18	58.39	20.63	11:42	58.55	20.47
OW-08L	84.07	Deep	10:00	49.75	34.32	8:17	49.98	34.09	15:23	50.1	33.97	11:07	50.08	33.99	12:40	50.16	33.91	8:55	50.30	33.77	9:56	50.69	33.38
OW-08U	83.88	Lower	10:03	46.26	37.62	8:21	46.24	37.64	15:26	46.36	37.52	11:05	46.49	37.39	12:38	46.64	37.24	8:53	46.79	37.09	9:54	46.98	36.90
OW-09L	80.00	Deep	11:26	52.19	27.81	8:53	51.91	28.09	15:56	51.82	28.18	10:06	51.97	28.03	11:14	52.13	27.87	9:59	52.10	27.90	12:29	46.74	33.26
OW-09U	79.24	Upper	11:32	51.77	27.47	8:51	51.37	27.87	15:55	50.83	28.41	10:04	51.31	27.93	11:13	51.46	27.78	9:58	51.32	27.92	12:28	51.71	27.53
OW-10L	79.88	Lower	10:45	54.52	25.36	8:31	54.76	25.12	15:35	54.81	25.07	10:35	54.80	25.08	12:16	54.98	24.90	9:13	55.15	24.73	11:33	53.61	26.27
OW-10U	79.53	Upper	10:50	57.24	22.29	8:34	57.04	22.49	15:37	56.92	22.61	10:33	57.00	22.53	12:14	57.04	22.49	9:11	56.83	22.70	11:35	56.91	22.62
OW-2150L	82.45	Deep	-	-	-	-	-	-	-	-	-	13:46	48.01	34.44	13:27	47.90	34.55	8:15	47.87	34.58	10:40	48.11	34.34
OW-2150U	82.78	Upper	-	-	-	-	-	-	-	-	-	13:43	36.49	46.29	13:26	36.70	46.08	8:13	36.51	46.27	10:38	36.73	46.05
OW-2169L	81.72	Lower	-	-	-	-	-	-	-	-	-	13:52	44.58	37.14	14:42	44.76	36.96	8:24	44.91	36.81	10:44	45.15	36.57
OW-2169U	81.77	Upper	-	-	-	-	-	-	-	-	-	13:54	38.29	43.48	14:40	38.59	43.18	8:20	38.40	43.37	10:46	38.71	43.06
OW-2181L	81.32	Lower	-	-	-	-	-	-	-	-	-	14:00	44.87	36.45	14:04	44.74	36.58	8:29	44.78	36.54	10:51	44.86	36.46
OW-2181U	81.31	Upper	-	-	-	-	-	-	-	-	-	13:58	38.07	43.24	13:51	38.46	42.85	8:27	38.27	43.04	10:50	38.60	42.71
OW-2185L	81.36	Lower	-	-	-	-	-	-	-	-	-	14:17	45.54	35.82	14:16	45.72	35.64	8:37	45.88	35.48	11:02	46.13	35.23
OW-2185U	81.45	Upper	-	-	-	-	-	-	-	-	-	14:15	41.64	39.81	14:15	41.76	39.69	8:35	41.77	39.68	10:59	41.96	39.49
OW-2253L	82.66	Deep	-	-	-	-	-	-	-	-	-	13:11*	34.35	48.31	14:49*	34.82	47.84	7:43	49.52	33.14	10:29	49.82	32.84
OW-2253U	82.82	Upper	-	-	-	-	-	-	-	-	-	13:09*	49.23	33.59	14:48*	49.39	33.43	7:41	34.48	48.34	10:27	34.65	48.17
OW-2269L	82.55	Deep	-	-	-	-	-	-	-	-	-	13:21	48.87	33.68	15:03	48.99	33.56	7:50	49.12	33.43	10:16	49.42	33.13
OW-2269U	82.43	Lower	-	-	-	-	-	-	-	-	-	13:18	46.70	35.73	15:00	46.88	35.55	7:53	47.02	35.41	10:12	47.25	35.18
OW-2284L	82.74	Lower	-	-	-	-	-	-	-	-	-	13:28	47.40	35.34	15:09	47.58	35.16	8:03	47.73	35.01	10:06	47.96	34.78
OW-2284U	82.62	Upper	-	-	-	-	-	-	-	-	-	13:25	38.13	44.49	15:07	38.32	44.30	8:01	38.18	44.44	10:08	38.21	44.41
OW-2301L	83.19	Deep	-	-	-	-	-	-	-	-	-	-	-	-	7:39	44.84	38.35	7:16	44.97	38.22	9:19	45.23	37.96
OW-2301U	83.27	Upper	-	-	-	-	-	-	-	-	-	-	-	-	7:37	33.03	50.24	7:14	32.75	50.52	9:15	33.07	50.20
OW-2302L	81.95	Deep	-	-	-	-	-	-	-	-	-	-	-	-	7:54	44.94	37.01	7:27	45.02	36.93	9:37	45.27	36.68
OW-2302U	81.99	Lower	-	-	-	-	-	-	-	-	-	-	-	-	7:53	43.10	38.89	7:26	43.22	38.77	9:39	43.49	38.50
OW-2304L	69.73	Lower	-	-	-	-	-	-	-	-	-	-	-	-	8:33	42.26	27.47	11:01	42.31	27.42	16:04	42.41	27.32
OW-2304U	70.10	Upper	-	-	-	-	-	-	-	-	-	-	-	-	8:31	33.96	36.14	11:10	34.17	35.93	16:05	34.37	35.73
OW-2307L	78.56	Lower	-	-	-	-	-	-	-	-	-	10:47	51.54	27.02	12:31	51.75	26.81	9:05	51.92	26.64	11:26	52.35	26.21
OW-2307U	78.59	Upper	-	-	-	-	-	-	-	-	-	10:44	45.77	32.82	12:29	45.91	32.68	9:03	46.09	32.50	11:23	46.32	32.27
OW-2319L	76.05	Deep	-	-	-	-	-	-	-	-	-	9:00	42.37	33.68	8:13	41.54	34.51	11:01	42.31	33.74	14:22	37.44	38.61
OW-2319U	75.97	Lower	-	-	-	-	-	-	-	-	-	9:01	40.62	35.35	8:11	40.74	35.23	11:00	40.84	35.13	14:25	41.02	34.95
OW-2320L	73.19	Deep	-	-	-	-	-	-	-	-	-	8:10	43.02	30.17	10:28	43.14	30.05	10:35	43.24	29.95	13:54	43.51	29.68
OW-2320U	73.50	Lower	-	-	-	-	-	-	-	-	-	8:09	44.59	28.91	10:27	44.69	28.81	10:34	44.70	28.80	13:52	44.86	28.64
OW-2320U1	72.90	Upper	-	-	-	-	-	-	-	-	-	8:03	43.52	29.38	10:33	43.65	29.25	10:45	43.62	29.28	13:57	43.79	29.11
OW-2320U2	72.92	Upper	-	-	-	-	-	-	-	-	-	8:04	43.53	29.39	10:35	43.69	29.23	10:44	43.65	29.27	14:00	43.80	29.12
OW-2320U3	72.84	Upper	-	-	-	-	-	-	-	-	-	8:00	43.58	29.26	10:37	43.72	29.12	10:42	43.69	29.15	14:02	42.89	29.95
OW-2320U4	72.91	Upper	-	-	-	-	-	-	-	-	-	8:01	43.79	29.12	10:39	43.91	29.00	10:41	43.89	29.02	14:05	40.87	32.04
OW-2321L	73.54	Deep	-	-	-	-	-	-	-	-	-	-	-	-	9:58	51.68	21.86	12:17	51.79	21.75	13:31	52.02	21.52
OW-2321U	73.27	Lower	-	-	-	-	-	-	-	-	-	-	-	-	9:56	51.70	21.57	12:16	51.70	21.57	13:29	51.86	21.41
OW-2324L	26.27	Deep	-	-	-	-	-	-	-	-	-	-	-	-	12:03	11.79	14.48	9:29	11.99	14.28	11:52	12.13	14.14
OW-2324U	26.17	Lower	-	-	-	-	-	-	-	-	-	-	-	-	12:02	11.28	14.89	9:28	11.38	14.79	11:53	11.54	14.63
OW-2348L	52.70	Deep	-	-	-	-	-	-	-	-	-	-	-	-	9:31	39.53	13.17	11:55	39.73	12.97	15:04	39.31	13.39
OW-2348U	52.12	Lower	-	-	-	-	-	-	-	-	-	-	-	-	9:29	39.06	13.06	11:54	39.17	12.95	14:55	39.12	13.00
OW-2352L	64.60	Lower	-	-	-	-	-	-	-	-	-	-	-	-	9:03	45.17	19.43	11:39	45.09	19.51	15:30	45.19	19.41
OW-2352U	64.47	Upper	-	-	-	-	-	-	-	-	-	-	-	-	9:02	45.09	19.38	11:38	45.00	19.47	15:32	45.08	19.39
OW-2359L1	79.36	Deep	-	-	-	-	-	-	-	-	-	-	-	-	11:42	54.54	24.82	9:44	54.72	24.64	12:11	53.72	25.64
OW-2359L2	78.93	Deep	-	-	-	-	-	-	-	-	-	-	-	-	11:38	54.12	24.81	9:46	54.30	24.63	12:07	52.40	26.53
OW-2359L3	78.83	Deep	-	-	-	-	-	-	-	-	-	-	-	-	11:36	53.89	24.94	9:47	54.05	24.78	12:05	52.12	26.71
OW-2359U1	79.29	Upper	-	-	-	-	-	-	-	-	-	-	-	-	11:40	55.01	24.28	9:45	55.09	24.20	12:09	55.29	24.00

Notes:

Shaded areas indicate a typographical error corrected subsequent to submittal of FSAR Subsection 2.4.12 and ER Subsection 2.3.1 of the Exelon VCS COLA, Revision 0.

Shaded areas indicate an anomaly or suspect measurement reading.

* Wells OW-2253U/L were field mislabeled, sounding of the total depth of the wells on 3/31/08 indicated that the well numbers were reversed.

Abbreviations:

Deep = Deep aquifer
ftbtc = feet below top of casing
Lower = Lower Shallow aquifer
NAVD88 = North American Vertical Datum of 1988
Upper = Upper Shallow aquifer

FSAR Table 2.4.12-205
ER Table 2.3.1-23

EXELON VCS COL PROJECT
Victoria County, Texas
Groundwater Level Measurements

Well No.	Ref. Elev. (NAVD88)	Hydro-geologic Unit	May 23, 2008			June 17, 2008			July 15, 2008			August 11, 2008			September 24 - 25, 2008			October 22, 2008		
			Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)	Time	Depth to Water (ftbtc)	Elevation of Water (NAVD88)
OW-01L	73.74	Lower	12:31	43.32	30.42	11:24	43.57	30.17	11:14	43.67	30.07	14:25	43.85	29.89	11:15	44.14	29.60	13:08	44.26	29.48
OW-01U	73.65	Upper	12:28	42.52	31.13	11:20	42.72	30.93	11:11	42.86	30.79	14:23	42.99	30.66	11:18	43.33	30.32	13:07	43.40	30.25
OW-02L	76.53	Lower	11:37	51.66	24.87	10:26	51.87	24.66	10:11	52.00	24.53	13:30	52.16	24.37	11:05	52.49	24.04	12:22	52.64	23.89
OW-02U	76.74	Upper	11:30	51.58	25.16	10:24	51.80	24.94	10:13	51.94	24.80	13:32	52.05	24.69	11:07	52.40	24.34	12:21	52.48	24.26
OW-03L	76.67	Lower	11:19	56.69	19.98	10:17	57.11	19.56	10:05	57.42	19.25	13:21	57.76	18.91	10:57	58.26	18.41	12:15	58.52	18.15
OW-03U	77.05	Upper	11:23	DRY	NA	10:19	DRY	NA	10:07	DRY	NA	13:24	DRY	NA	10:59	DRY	NA	12:17	DRY	NA
OW-04L	80.67	Lower	11:10	57.22	23.45	10:06	57.57	23.10	9:55	57.78	22.89	13:12	58.01	22.66	10:50	58.43	22.24	12:08	58.63	22.04
OW-04U	81.08	Upper	11:12	56.70	24.38	10:08	57.03	24.05	9:58	57.22	23.86	13:15	57.47	23.61	10:53	57.83	23.25	12:10	58.02	23.06
OW-05L	79.90	Deep	11:04	53.52	26.38	10:06	53.93	25.97	9:43	54.11	25.79	13:07	54.31	25.59	10:42	54.64	25.26	12:05	54.79	25.11
OW-05U	79.55	Upper	11:02	52.75	26.80	10:03	53.06	26.49	9:45	53.21	26.34	13:04	53.36	26.19	10:39	53.71	25.84	12:04	53.83	25.72
OW-06L	81.55	Lower	10:48	54.82	26.73	9:55	55.02	26.53	9:25	55.19	26.36	12:52	55.38	26.17	10:27	55.71	25.84	11:52	55.85	25.70
OW-06U	80.77	Upper	10:45	53.66	27.11	9:53	54.02	26.75	9:23	54.20	26.57	12:54	54.36	26.41	10:29	54.71	26.06	11:54	54.84	25.93
OW-07L	79.04	Deep	10:17	58.88	20.16	9:17	59.14	19.90	8:59	59.41	19.63	12:07	59.75	19.29	9:40	59.97	19.07	11:31	60.21	18.83
OW-07U	79.02	Upper	10:14	58.66	20.36	9:13	58.81	20.21	8:57	59.00	20.02	12:04	59.21	19.81	9:37	59.58	19.44	11:33	59.78	19.24
OW-08L	84.07	Deep	9:00	51.02	33.05	8:46	51.39	32.68	8:08	51.56	32.51	10:07	52.03	32.04	9:02	52.16	31.91	11:08	52.33	31.74
OW-08U	83.88	Lower	8:55	47.25	36.63	8:43	47.60	36.28	8:10	47.79	36.09	10:05	48.17	35.71	9:05	48.38	35.50	11:09	48.54	35.34
OW-09L	80.00	Deep	10:55	52.58	27.42	9:59	52.75	27.25	9:30	52.91	27.09	13:00	53.11	26.89	10:35	53.41	26.59	11:58	53.51	26.49
OW-09U	79.24	Upper	10:52	51.77	27.47	9:57	51.93	27.31	9:33	52.07	27.17	12:58	52.02	27.22	10:33	52.53	26.71	11:56	52.59	26.65
OW-10L	79.88	Lower	9:36	56.00	23.88	9:05	56.54	23.34	8:48	56.84	23.04	11:54	57.34	22.54	9:28	57.35	22.53	11:27	57.56	22.32
OW-10U	79.53	Upper	9:32	56.90	22.63	9:07	56.95	22.58	8:50	57.01	22.52	11:58	57.09	22.44	9:25	57.29	22.24	11:26	57.29	22.24
OW-2150L	82.45	Deep	18:09	48.29	34.16	15:18	48.61	33.84	13:33	48.85	33.60	10:54	49.21	33.24	12:52	49.46	32.99	10:06	49.71	32.74
OW-2150U	82.78	Upper	18:07	36.93	45.85	15:16	37.17	45.61	13:30	37.43	45.35	10:52	37.66	45.12	12:54	38.00	44.78	10:04	38.12	44.66
OW-2169L	81.72	Lower	18:15	45.4	36.32	15:25	45.72	36.00	13:36	45.91	35.81	11:00	46.23	35.49	12:59	46.49	35.23	9:55	46.65	35.07
OW-2169U	81.77	Upper	18:17	38.82	42.95	15:29	39.19	42.58	13:38	39.38	42.39	11:01	39.62	42.15	13:01	39.99	41.78	9:57	40.08	41.69
OW-2181L	81.32	Lower	18:23	44.91	36.41	15:33	45.06	36.26	13:43	45.2	36.12	11:09	45.41	35.91	13:07	45.68	35.64	10:13	45.86	35.46
OW-2181U	81.31	Upper	18:21	38.67	42.64	15:30	39.05	42.26	13:41	39.23	42.08	11:07	39.48	41.83	13:05	39.85	41.46	10:12	39.91	41.40
OW-2185L	81.36	Lower	18:34	46.38	34.98	15:55	46.69	34.67	17:35	46.87	34.49	11:18	47.18	34.18	15:30	47.45	33.91	10:58	47.61	33.75
OW-2185U	81.45	Upper	18:30	42.19	39.26	15:57	42.54	38.91	17:37	42.73	38.72	11:16	43.01	38.44	15:34	43.32	38.13	10:57	43.47	37.98
OW-2253L	82.66	Deep	17:56	50.10	32.56	16:08	50.51	32.15	14:08	50.70	31.96	10:40	51.08	31.58	14:38	51.24	31.42	9:02	51.43	31.23
OW-2253U	82.82	Upper	17:58	35.68	47.14	16:10	36.14	46.68	14:10	36.59	46.23	10:43	37.01	45.81	14:41	37.61	45.21	9:03	37.95	44.87
OW-2269L	82.55	Deep	17:47	49.70	32.85	15:43	50.07	32.48	13:56	50.26	32.29	10:34	50.64	31.91	8:41	50.81	31.74	9:34	51.00	31.55
OW-2269U	82.43	Lower	17:50	47.55	34.88	15:40	47.84	34.59	13:54	48.03	34.40	10:33	48.37	34.06	8:46	48.62	33.81	9:38	48.78	33.65
OW-2284L	82.74	Lower	17:34	48.27	34.47	15:50	48.55	34.19	14:00	48.75	33.99	10:24	49.05	33.69	8:31	49.32	33.42	9:28	49.48	33.26
OW-2284U	82.62	Upper	17:38	38.62	44.00	15:52	38.94	43.68	14:02	39.26	43.36	10:29	39.55	43.07	8:27	39.98	42.64	9:25	40.22	42.40
OW-2301L	83.19	Deep	17:21	45.51	37.68	8:34	45.88	37.31	8:02	46.05	37.14	9:35	46.45	36.74	8:47	46.60	36.59	8:40	46.77	36.42
OW-2301U	83.27	Upper	17:18	33.27	50.00	8:31	33.60	49.67	7:59	33.74	49.53	9:39	33.89	49.38	8:52	34.08	49.19	8:37	34.11	49.16
OW-2302L	81.95	Deep	8:31	45.48	36.47	11:44	45.88	36.07	11:39	45.97	35.98	9:52	46.31	35.64	12:32	46.51	35.44	16:01	46.65	35.30
OW-2302U	81.99	Lower	8:37	43.70	38.29	11:46	44.12	37.87	11:42	44.23	37.76	9:54	44.57	37.42	12:34	44.79	37.20	16:03	44.96	37.03
OW-2304L	69.73	Lower	15:58	42.79	26.94	13:29	42.94	26.79	14:35	43.12	26.61	16:01	43.45	26.28	9:37	43.65	26.08	15:36	43.79	25.94
OW-2304U	70.10	Upper	16:00	34.57	35.53	13:31	34.84	35.26	14:37	35.16	34.94	15:59	35.5	34.60	9:41	36.00	34.10	15:34	36.30	33.80
OW-2307L	78.56	Lower	9:25	52.53	26.03	8:55	53.46	25.10	8:17	53.89	24.67	11:45	54.46	24.10	9:19	54.50	24.06	11:21	54.83	23.73
OW-2307U	78.59	Upper	9:20	46.45	32.14	8:57	46.59	32.00	8:15	46.73	31.86	11:43	46.92	31.67	9:15	47.21	31.38	11:20	47.37	31.22
OW-2319L	76.05	Deep	12:42	42.71	33.34	12:02	43.19	32.86	11:20	43.17	32.88	14:35	43.47	32.58	12:13	43.71	32.34	15:49	43.82	32.23
OW-2319U	75.97	Lower	12:49	41.23	34.74	12:04	41.63	34.34	11:23	41.67	34.30	14:37	41.94	34.03	12:15	42.20	33.77	15:50	42.33	33.64
OW-2320L	73.19	Deep	16:20	43.68	29.51	10:41	44.07	29.12	10:44	44.14	29.05	14:04	44.42	28.77	11:34	44.67	28.52	12:45	44.81	28.38
OW-2320U	73.50	Lower	16:17	45.02	28.48	10:44	45.24	28.26	10:40	45.38	28.12	14:01	45.54	27.96	11:36	45.84	27.66	12:47	45.96	27.54
OW-2320U1	72.90	Upper	12:08	43.90	29.00	10:35	44.09	28.81	10:53	44.23	28.67	14:11	44.36	28.54	11:27	44.66	28.24	12:56	44.78	28.12
OW-2320U2	72.92	Upper	12:11	43.93	28.99	10:33	44.10	28.82	10:50	44.24	28.68	14:13	44.38	28.54	11:29	44.67	28.25	12:54	44.77	28.15
OW-2320U3	72.84	Upper	12:14	43.97	28.87	10:37	44.15	28.69	10:56	44.29	28.55	14:16	44.42	28.42	11:23	44.72	28.12	12:59	44.83	28.01
OW-2320U4	72.91	Upper	12:21	44.14	28.77	10:39	44.35	28.56	10:58	44.49	28.42	14:17	44.62	28.29	11:25	44.92	27.99	12:58	45.04	27.87
OW-2321L	73.54	Deep	11:57	52.28	21.26	11:06	52.68	20.86	10:21	52.91	20.63	13:47	53.28	20.26	11:57	53.55	19.99	12:34	53.76	19.78
OW-2321U	73.27	Lower	11:55	52.01	21.26	11:04	52.17	21.10	10:25	52.31	20.96	13:50	52.48	20.79	11:59	52.82	20.45	12:35	52.99	20.28
OW-2324L	26.27	Deep	10:03	13.08	13.19	9:28	13.84	12.43	8:27	14.29	11.98	12:22	14.91	11.36	9:54	14.86	11.41	15:16	15.07	11.20
OW-2324U	26.17	Lower	9:58	12.44	13.73	9:25	13.26	12.91	8:30	13.69	12.48	12:24	14.38	11.79	9:57	14.19	11.98	15:15	14.45	11.72
OW-2348L	52.70	Deep	13:24	40.66	12.04	14:15	41.20	11.50	15:00	41.61	11.09	15:27	42.16	10.54	10:11	42.23	10.47	13:35	42.49	10.21
OW-2348U	52.12	Lower	13:32	40.02	12.10	14:18	40.63	11.49	15:03	41.15	10.97	15:28	41.75	10.37	10:14	41.81	10.31	13:37	42.11	10.01
OW-2352L	64.60	Lower	13:56	45.21	19.39	13:55	45.36	19.24	15:23	45.47	19.13	15:04	45.56	19.04	12:25	45.74	18.86	13:58	45.79	18.81
OW-2352U	64.47	Upper	13:54	45.13	19.34	13:57	45.27	19.20	15:21	45.38	19.09	15:02	45.47	19.00	12:22	45.66	18.81	13:59	45.70	18.77
OW-2359L1	79.36	Deep	16:49	55.52	23.84	9:50	56.02	23.34	9:10	56.33	23.03	12:38	56.82	22.54	10:06	56.85	22.51	11:42	57.08	22.28
OW-2359L2	78.93	Deep	16:59	55.12	23.81	9:41	55.61	23.32	9:08	55.91	23.02	12:42	56.41	22.52	10:21	56.44	22.49	11:45	56.66	22.27
OW-2359L3	78.83	Deep	16:56	54.84	23.99	9:44	55.37	23.46	9:06	55.67	23.16	12:44	56.18	22.65	10:19	56.20	22.63	11:44	56.42	22.41
OW-2359U1	79.29	Upper	16:47	55.45	23.84	9:47	55.67	23.62	9:13	55.87	23.42	12:40	56.07	23.22	10:15	56.42	22.87	11:40	56.60	22.69

Notes:

Shaded areas indicate a typographical error corrected subsequent to submittal of FSAR Subsection 2.4.12 and ER Subsection 2.3.1 of the Exelon VCS COLA, Revision 0.

Shaded areas indicate an anomaly or suspect measurement reading.

* Wells OW-2253U/L were field mislabeled, sounding of the total depth of the wells on 3/31/08 indicated that the well numbers were reversed.

Abbreviations:

Deep = Deep aquifer
ftbtc = feet below top of casing
Lower = Lower Shallow aquifer
NAVD88 = North American Vertical Datum of 1988
Upper = Upper Shallow aquifer

Enclosure 3

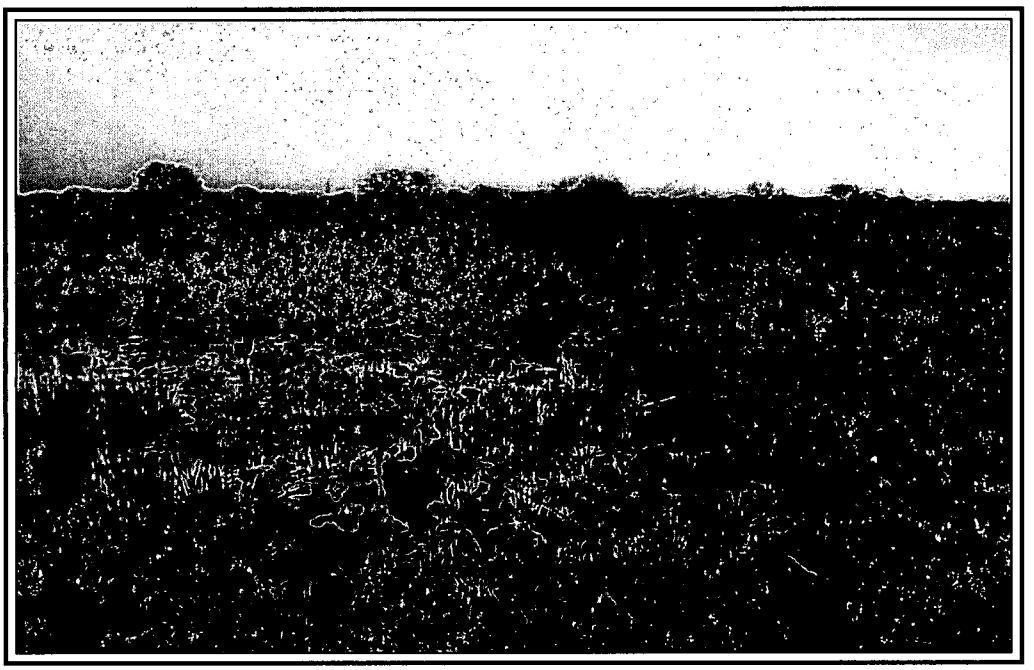
Surveys of Aquatic Biota for the Victoria County Station Site

Fall Interim Report

January – September 2008

SURVEYS OF AQUATIC BIOTA FOR THE VICTORIA COUNTY STATION SITE

Fall Interim Report
January-September 2008



NOVEMBER 2008

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1.0 INTRODUCTION

The purpose of this report is to summarize activities conducted and data collected during the first nine months of surveys for aquatic biota in relation to the Victoria County Station project. Data collected by BIO-WEST, Inc. are meant to aid TETRA TECH NUS, Inc. in preparing an Environmental Report to supplement the Combined Construction and Operating License Application (COLA) for a proposed nuclear facility in Victoria County, Texas (Figure 1-1). This third-quarter interim report covers data collected from January through September, 2008. The report provides a description of activities and brief summary of results relating to aquatic sampling at (1) 12 locations within the boundaries of the Victoria County Station Site and (2) seven off-site locations on the Guadalupe River and associated canals. The 12 on-site locations were surveyed April 21 through 25, July 22 through 25, and October 13-15. The April and July results are presented in this report. The October results will included in the next draft of this report. The 7 off-site locations were sampled monthly from January through October. Details of the off-site sampling schedule are in Section 3.2.

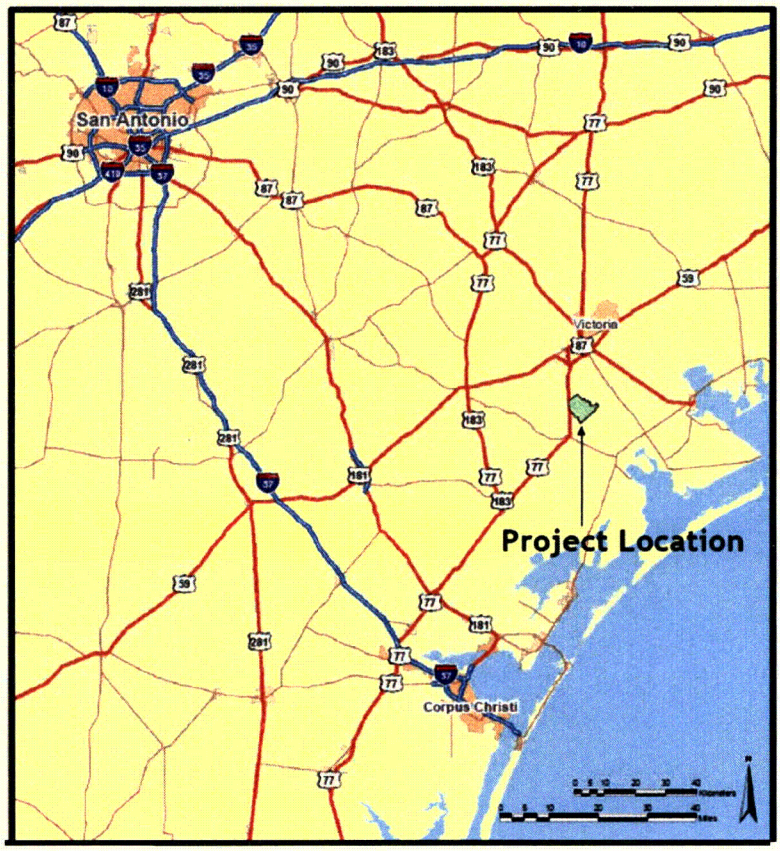

Figure 1- 1. Location of the Victoria County Station Site.

2.0 VICTORIA COUNTY STATION SITE

2.1 Station Locations and Descriptions

Twelve on-site aquatic sampling stations were selected by Tetra Tech NUS personnel within the boundaries of the roughly 11,000-acre Victoria County Station Site (Figure 2-1). Detailed maps of aquatic sampling stations were provided to BIO-WEST prior to the first sampling trip. A brief description of conditions observed at each station is presented below.

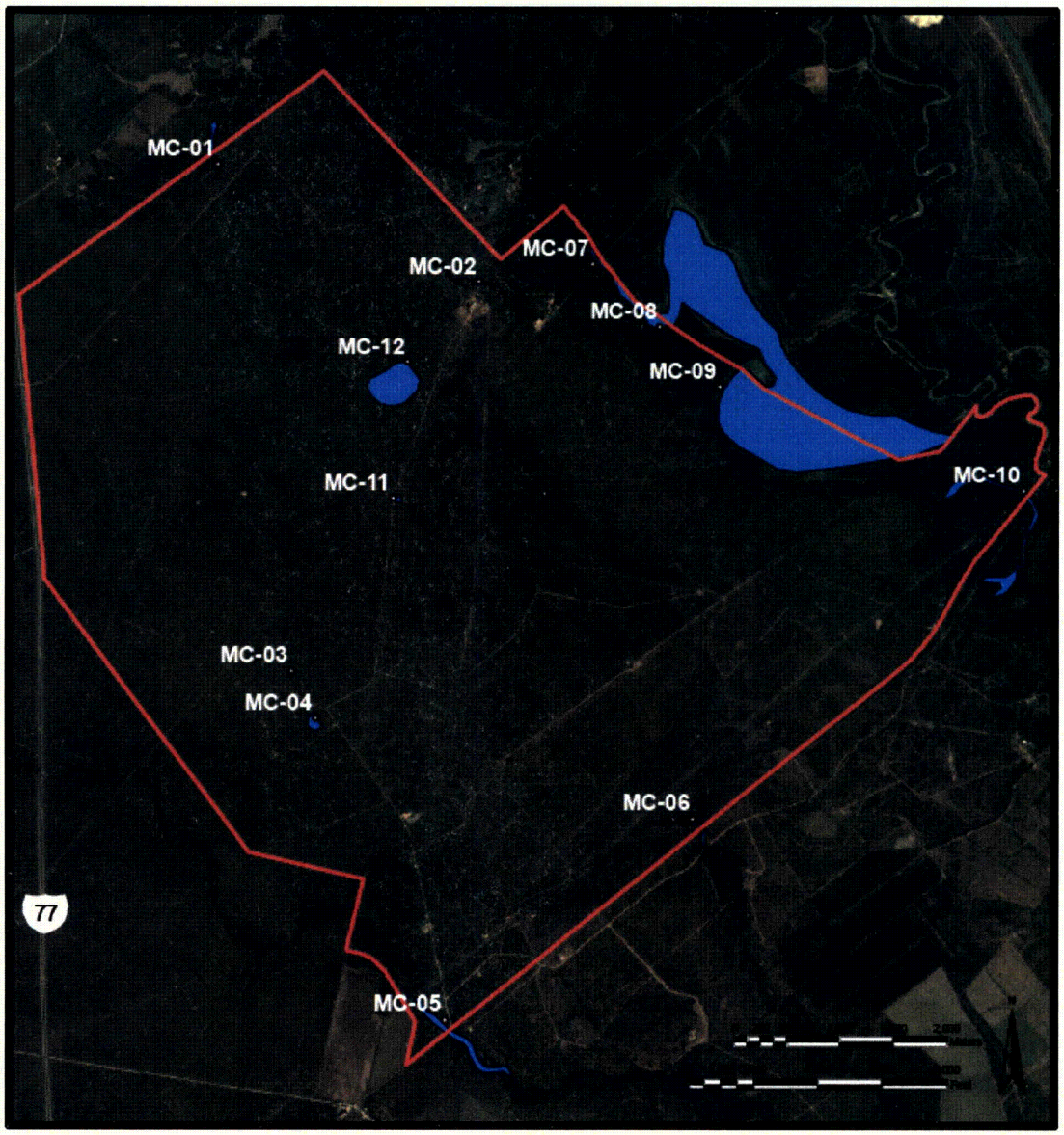

Figure 2-1. Location of 12 on-site sampling stations.

Station MC-01
MC-01 is located on a small tributary to Black Bayou along the northern boundary of the site. Just downstream of this station, on the adjacent property, the creek is dammed to form a small reservoir/pond. MC-01 is located in the extreme upper end of this reservoir where it pools water in the creek on the McCan property. During the April sampling event, the creek was approximately 10 meters (m) (35 feet [ft]) wide with an average depth of approximately 1 m (3.3 ft). MC-01 was almost entirely covered in floating primrose willow (*Ludwigia peploides*). Substrate consisted of firm clay with some organic deposition. Adjacent to the creek banks, which were slightly eroded, woody vegetation included live oak (*Quercus virginiana*) and Chinese tallow (*Triadica sebifera*). During the April sampling effort, areas upstream of MC-01, where water levels were no longer controlled by the aforementioned dam, were completely dry. During the July sampling effort, the water level had dropped approximately 1 meter (3.3 ft).

Station MC-02
MC-02 is located on an intermittent tributary of Black Bayou/Linn Lake which during the April sampling effort consisted of a few small isolated pools. Three separate pools were sampled. Pool 1 was approximately 2 m (6.5 ft) wide and 7 m (22 ft) across, with a maximum depth of 0.5 m (1.5 ft); pool 2 was approximately 2.5 m (8 ft) wide and 7 m (24 ft) across; and pool 3 was approximately 2.5 m (8 ft) wide and 4.5 m (15 ft) across. Substrate in all three pools was composed mainly of sand with small amounts of organic matter. No aquatic vegetation was observed in the pools, however, floating primrose willow, swamp smartweed (*Polygonum hydropiperoides*), and a species of millet were observed between the three pools. This site was completely dry during the July sampling effort.

Station MC-03
MC-03 is a small pond located near the center of the site used primarily to provide water for livestock. During the April sampling effort, the pond was approximately 16 m (55 ft) by 22m (72 ft) with an average depth of 0.7 m (2.3 ft). The pond was moderately clear and two species of submerged aquatic vegetation were quite abundant-muskgrass (*Chara* spp.) and bushy pondweed (*Najas guadalupensis*). The margins of the pond are dominated by squarestem spikerush (*Eleocharis quadrangulata*), intermixed with sedges (*Cyperus* spp.), floating primrose willow, and a colony of cattails (*Typha* spp.). Along the southern margin of the pond, grassland pasture is intermixed with huisache (*Acacia farnesiana*) and mesquite (*Prosopis glandulosa*). Sugar hackberry (*Celtis laevigata*), McCartney rose (*Rosa bracteata*), and introduced species of bamboo occur north of the pond. During the July sampling effort, this pond had receded to a shallow puddle only inches deep which was almost completely covered with floating primrose willow.

Station MC-04
MC-04 is a larger pond, located directly south of MC-03, and also used as a water source for livestock. During the April sampling effort, it was approximately 35 m (114 ft) by 70 m (228 ft) with an average depth of 0.5 m (1.5 ft). Livestock activity was very evident around the margins of the pond, water clarity was turbid, and no submerged aquatic vegetation was observed. The margin of the pond was dominated by floating primrose willow extending approximately 1 m (3.3 ft) into the water along the southern bank. Other vegetation associated with the pond includes rattlebush (*Sesbania drummondii*), squarestem spikerush, and jungle rice (*Echinochloa*

colona). The area surrounding MC-04 consists of grassland pasture with intermixed huisache and mesquite. During July, the water level of this pond had dropped substantially, and average depth was less than 0.3 m (1 ft).

Station MC-05 (Kuy Creek)
MC-05 occurs along Kuy Creek within a riparian woodland near the southern entrance to the site. During the April sampling effort, the creek was approximately 1.5 m (5 ft) wide with an average depth of 0.5 m (1.5 ft). However, a deep pool occurred directly below the bridge crossing with an average depth of 1 m (3.3 ft). The water in the creek was relatively clear with a soft to moderately firm bottom. No submerged aquatic vegetation was observed. The creek was stagnant with a thin sheen of pollen on the water's surface. Considerable debris and litter was scattered throughout the creek with the highest concentration near and below the bridge. MC-05 occurs beneath a dense canopy of trees dominated by box elder (*Acer negundo*), sugar hackberry, American elm (*Ulmus americana*), live oak, cedar elm, and pecan trees (*Carya illionoinensis*). The herbaceous layer was dominated by poison ivy (*Rhus toxicodendron*), plantago (*Plantago* spp.), wild rice (*Zizania* spp.), and various sedge species (*Carex* spp.). During July, the creek was no longer flowing, and the only water present was in the deep pool immediately below the bridge.

Station MC-06 (Dry Kuy Creek)
MC-06 is located along Dry Kuy Creek, an intermittent/ephemeral tributary of Kuy Creek, near the southeastern boundary of the site. During the April sampling effort, only two small stagnant pools remained in channel depressions. Pool 1 measured approximately 1 m (3.3 ft) by 2 m (6.5 ft), and pool 2 was even smaller. Water was extremely turbid due to recent livestock traffic through the pools. Substrate consisted of soft silt and sand, and no aquatic vegetation was present. This site was completely dry in July 2008.

Station MC-07 (Black Bayou)
Station MC-07 is located on Black Bayou at a pipeline crossing a short distance above its confluence with Linn Lake. During the April sampling effort, the stream was approximately 27 m (90 ft) in width with a maximum depth of approximately 1.2 m (4 ft). Very little flow was evident. Water in the bayou was turbid and the substrate was composed of moderately firm clay with some organic and soft silt deposition. No submerged aquatic vegetation was observed, however some filamentous algae was present along the shoreline. Woody debris in the form of cypress knees and fallen branches was present along the perimeter of the bayou. An adjacent bottomland forest was dominated by species of black willow (*Salix nigra*) and box elder. During the July sampling effort, the bayou was not flowing and the water level had receded 3-4 m (10-13 ft). This left much of the woody debris present along the banks well above the water line.

Station MC-08 (Linn Lake)
MC-08 was located in Linn Lake, a large oxbow lake, near the inflow of Black Bayou. At the mouth of the bayou, width was approximately 27 m (90 ft) with an average depth of 0.7 m (2.5 ft). However, the bayou empties into a shallow flat of Linn Lake (>100 m in width) that, at the time of sampling, was extremely shallow with depths of less than 0.3 m (1 ft). Substrate was composed of moderately firm clay and soft silt with an abundance of organic deposition. No

submerged vegetation was observed. Shoreline vegetation in the area was dominated by black willow and box elder. During the July sampling effort, this site was completely dry.

Station MC-09 (Linn Lake)
MC-09 is located in the lower basin of Linn Lake, southeast of and across a large peninsula from MC-08. At the time of sampling, Linn Lake was extremely shallow in this area with an average depth of <0.5m (1.5 ft). This depth was relatively consistent for several hundred meters into the lake. Substrate consisted of soft silt and clay, and no submerged vegetation was noted. Water clarity was turbid due to considerable wind action. Woody vegetation along the banks consisted of black willow, dwarf palmetto (*Sabal minor*), and bald cypress (*Taxodium distichum*). By July, the water line of Linn Lake had receded approximately 100 m (328 ft), exposing a large mud flat at this site. Only a few inches of water remained near the center of the lake.

Station MC-10 (Upper Cypress Lake)
MC-10 is located in the headwaters of Cypress Lake just upstream of the railroad trestle that marks the site boundary. The sample area included a small swampy pooled area and creek channel with a maximum depth of approximately 1 m (3.3 ft). The substrate was moderately firm sand with some silt in quiescent areas. Vegetation along shorelines and islands included bald cypress, black willow, and box elder. Large bald cypress trees were also present in the stream channel. No submerged aquatic vegetation was observed other than some limited filamentous algae occurring along the banks. During the July sampling effort, this site was completely dry.

Station MC-11
MC-11 is another pond used as a water source for livestock. The pond is approximately 42 m (138 ft) by 45 m (150 ft) with an average depth of 1.4 m (4.5 ft). Substrate in the pond consists of loose silty clays and sand. The water was very turbid with no evidence of submerged aquatic vegetation. No aquatic vegetation was observed along the pond edges, most likely as a result of heavy use by livestock. The shoreline was bare of vegetation except for scattered woody vegetation such as rattlebush. By July, the water line of the pond had dropped approximately 2-3 m (7-10 ft). Heavy use by livestock was evident around the pond margins.

Station MC-12
MC-12 consists of a large, ephemeral emergent wetland ranging from partially saturated soils to being fully inundated by water. During the April sampling effort, one small open area occurred in the middle of the wetland that was approximately 25 m (84 ft) by 37 m (120 ft) with an average depth of 13 cm (5 in). Water was clear, and substrate was composed of moderately soft soil with abundant organic deposition. The emergent wetland is dominated by squarestem spikerush and rattlebush. Other associated vegetation consisted of American lotus (*Nelumbo lutea*), longbarb arrowhead (*Sagittaria longiloba*), grassy arrowhead (*S. graminea*), spider lily (*Hymenocallis occidentalis*), and swollen bladderwort (*Utricularia vulgaris*). During the July sampling effort, this site was completely dry.

2.2 Fish

2.2.1 Methods

Spring on-site aquatic surveys were conducted during the week of April 21-25, 2008, and the summer survey was conducted during the week of July 21-25, 2008. During the summer sampling effort five of the 12 sites were devoid of water due to extremely dry conditions in central and southern Texas. Due to the variation in habitats observed at the 12 sites, a variety of sampling methods were employed to efficiently capture resident fishes. Active sampling techniques employed included backpack electrofishing and seining. A minimum of 500 seconds of shock time was conducted when electrofishing was used. Two different seines were used depending on conditions encountered. A 9.1 m x 1.8 m x 6.4 mm mesh (30 ft x 6 ft x 1/4" mesh) beach seine was used for open water habitats, and a smaller 4.6 m x 1.8 m x 4.8 mm mesh (15 ft x 6 ft x 3/16" mesh) seine was used for near-shore habitats.

Passive sampling gear included minnow traps, sunfish traps, and gill nets. Gee-style minnow traps and funnel-style sunfish traps were used at every site. Traps were baited with dry dog food and placed in littoral areas overnight. Gill nets were deployed overnight at two sites (MC-08 and MC-11) where water depth was appropriate during the spring effort. Due to the extremely low water levels, gill nets were not used during the July effort. The specific sampling methods used at each site are listed in Table 2-1.

Table 2-1. Methods used to sample fish at the Victoria County Station Site.

Station	Traps	Seines	Gill Nets	Backpack Electrofisher
MC-01 (unnamed stream)	√	√		√
MC-02 (unnamed stream)	√	√		
MC-03 (borrow pit)	√	√		
MC-04 (borrow pit)	√	√		
MC-05 (Kuy Cr.)	√	√		√
MC-06 (Dry Kuy Cr.)	√	√		
MC-07 (Black Bayou)	√	√		√
MC-08 (Linn Lake)	√	√	√	
MC-09 (Linn Lake)	√	√		
MC-10 (Upper Cypress Lk.)	√	√		√
MC-11 (stock pond)	√	√	√	
MC-12 (wetland)	√			√

Figure 2-2. BIO-WEST personnel backpack electrofishing at MC-07.

Once fish were captured, they were placed in a large bucket of water until sampling at that site was complete. Fish were then identified to species, enumerated, and measured (total length in mm). Specimens large enough to register on a digital scale (sensitivity of 10 grams [g]) were then weighed (g). Weight was not recorded for specimens less than 10 g. All fish were then released, excluding voucher specimens.

In addition to fish data, detailed notes were taken on the conditions observed at each site. These notes included dominant substrate, aquatic and riparian vegetation, water level/depth, weather conditions, water clarity, and presence of other wildlife (see section 2.1). Observations of other wildlife will not be discussed in this report, but are presented in the final report for the Herpetological and Small Mammal Survey conducted by BIO-WEST (BIO-WEST 2008a).

2.2.2 Results and Discussion

Spring and summer aquatic sampling efforts resulted in capture of 3,401 fish representing 16 families and 36 species. Species richness was highest at MC-07 where 22 species were captured, and was lowest at MC-12, where western mosquitofish (*Gambusia affinis)* was the only species captured (Table 2-2). In general, stations located on larger more-persistent water bodies (Black Bayou, Linn Lake) had the highest number of species. Species assemblages in small ponds and intermittent streams appear to have been influenced by occasional restocking ("angler introductions") or overflow from other more persistent water bodies. Dry conditions affected the results of on-site sampling, as several stations were dry during July. At sites that were not completely dry, community composition was affected by extreme low water. For example, at

MC-04, the water level had dropped to about 1 foot deep by July, and the number of fish species collected dropped from nine in April to four in July.

Table 2-2. Number of fish species captured at 12 stations on the Victoria County Station Site.

	MC-01	MC-02	MC-03	MC-04	MC-05	MC-06	MC-07	MC-08	MC-09	MC-10	MC-11	MC-12	Total
Species Richness	9	4	10	11	9	2	22	13	4	19	13	1	36

The sunfishes (Centrarchidae) were the most diverse and abundant family with 10 species comprising approximately 41% of the total relative abundance (Table 2-3). Other abundant families included the livebearers (Poeciliidae, approximately 31% relative abundance) and bullhead catfishes (Ictaluridae, approximately 18%). Western mosquitofish were the most abundant and widespread species overall. They were documented at 11 of the 12 sites and represented approximately 21% of all fish captured. This is not surprising given that habitat at several sites consisted of small stagnant pools. Western mosquitofish are very tolerant of poor water quality conditions and are often the last fish to survive in such habitats. Another tolerant species, black bullhead (*Ameiurus melas)*, ranked second in abundance overall, comprising approximately 16% of fish collected. However, this was due to an extremely large school of juvenile bullheads captured at MC-01 during the July sampling effort. These fish did not exhibit particularly high abundance in any other sample. Other abundant and widespread species included white crappie (*Pomoxis annularis*, approximately 12%), warmouth (*Lepomis gulosus*, approximately 11%), and bluegill (*Lepomis macrochirus*, approximately 10%), which were all caught at 8 out of the 12 sites.

Due to the large number of centrarchid species captured, this family also dominated the overall biomass – representing approximately 25% of the total relative weight (Table 2-4). Other families which contributed substantially to overall biomass included the cyprinids (approximately 22.7%) and gars (17.5%), due mainly to the large size of common carp (*Cyprinus carpio*) and alligator gar (*Atractosteus spatula*), which ranked first and third, respectively, on the species level. Smallmouth buffalo (*Ictiobus bubalus*) ranked second in overall biomass among species, representing approximately 15% of the total relative weight.

Six of the species captured are considered introduced or exotic - golden shiner (*Notemigonus crysoleucas)*, common carp, Mexican tetra (*Astyanax mexicanus*), Rio Grande cichlid (*Cichlasoma cyanoguttatum*), and suckermouth armored catfish (*Pterygoplichthys anisitsi*). The first four species have been established in many Texas waters outside their native range for years. The latter, suckermouth armored catfish, is a species native to South America that is popular in the aquarium trade and represents a relatively new introduction. This fish was originally misidentified as the vermiculated sailfin catfish (*Pterygoplichthys disjunctivus*, see BIO-WEST 2008c), but subsequent identification as *P. anisitsi* has since been confirmed by Dr. Jonathan Armbruster of Auburn University, an expert on catfishes of the family Loricariidae.

No state or federally listed threatened or endangered species were collected during the spring or summer aquatic surveys. Although not listed as threatened or endangered by TPWD or the United States Fish and Wildlife Service (USFWS), the American eel (*Anguilla rostrata)* is documented as rare within the state. This species spawns in the Atlantic Ocean, and adult females migrate up rivers throughout North America to live out the majority of their lives before

returning to the sea to spawn. Although it is possible for riverine fishes to occur in the more persistent onsite water bodies, which are occasionally hydraulically connected to the Guadalupe River, no eels were observed or captured in any of the onsite water bodies during the survey.

Table 2-3. Number collected (#) and percent relative abundance (%) of fishes captured at 12 locations on the Victoria County Station Site during April and July 2008.

Family	Common Name	Scientific Name	MC-01		MC-02		MC-03		MC-04		MC-05		MC-06		MC-07		MC-08		MC-09		MC-10		MC-11		MC-12		Total	
			#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Lepisosteidae																												
	Alligator gar	*Atractosteus spatula*															5	7.4									5	0.1
	Spotted gar	*Lepisosteus oculatus*							2	0.5					3	0.6	1	1.5					7	2.0			13	0.4
Clupeidae																												
	Gizzard shad	*Dorosoma cepedianum*													14	2.8	3	4.4			2	1.0	19	5.5			38	1.1
	Threadfin shad	*Dorosoma petenense*													69	13.8			9	69.2	2	1.0					80	2.4
Cyprinidae																												
	Golden shiner	*Notemigonus crysoleucas**					65	14.3																			65	1.9
	Red shiner	*Cyprinella lutrensis*																			6	3.0					6	0.2
	Common carp	*Cyprinus carpio**					25	5.5	18	4.2	1	0.6							2	15.4			6	1.7			52	1.5
	Pugnose minnow	*Opsopoeodus emiliae*																			1	0.5					1	0.0
	Bullhead minnow	*Pimephales vigilax*													5	1.0	1	1.5			12	5.9					18	0.5
Catostomidae																												
	Smallmouth buffalo	*Ictiobus bubalus*									1	0.6			1	0.2	1	1.5					5	1.4			8	0.2
Characidae																												
	Mexican tetra	*Astyanax mexicanus**									4	2.2			17	3.4					1	0.5					22	0.6
Ictaluridae																												
	Black bullhead	*Ameiurus melas*	513	64.0	3	1.5	1	0.2			1	0.6											11	3.2			529	15.6
	Yellow bullhead	*Ameiurus natalis*					19	4.2	15	3.5	10	5.6											3	0.9			47	1.4
	Blue catfish	*Ictalurus furcatus*													1	0.2	5	7.4	1	7.7	1	0.5					8	0.2
	Channel catfish	*Ictalurus punctatus*																			18	8.9					18	0.5
	Flathead catfish	*Pylodictis olivaris*																			1	0.5					1	0.0
Loricariidae																												
	Suckermouth armored catfish	*Pterygoplichthys anisitsi**													1	0.2											1	0.0
Mugilidae																												
	Striped mullet	*Mugil cephalus*													15	3.0											15	0.4
Atherinopsidae																												
	Inland silverside	*Menidia beryllina*													16	3.2	2	2.9			4	2.0					22	0.6
Fundulidae																												
	Golden topminnow	*Fundulus chrysotus*	10	1.2											1	0.2											11	0.3
Poeciliidae																												
	Western mosquitofish	*Gambusia affinis*	81	10.1	185	90.7	32	7.0	99	22.9	113	63.5	31	68.9	9	1.8	2	2.9			6	3.0	4	1.2	155	100.0	717	21.1
	Sailfin molly	*Poecilia latipinna*					30	6.6	205	47.3					62	12.4	22	32.4			9	4.5					328	9.6
Cyprinodontidae																												
	Sheepshead minnow	*Cyprinodon variegatus*													5	1.0											5	0.1
Moronidae																												
	White bass	*Morone chrysops*													3	0.6	1	1.5									4	0.1
Centrarchidae																												
	Green sunfish	*Lepomis cyanellus*			7	3.4	127	27.9	15	3.5	4	2.2															153	4.5
	Warmouth	*Lepomis gulosus*	69	8.6	9	4.4	145	31.8	49	11.3	37	20.8			36	7.2					21	10.4	9	2.6			375	11.0
	Orangespotted sunfish	*Lepomis humilis*																			2	1.0	19	5.5			21	0.6
	Bluegill	*Lepomis macrochirus*	5	0.6			3	0.7	16	3.7	7	3.9			185	37.1	23	33.8			67	33.2	34	9.8			340	10.0
	Longear sunfish	*Lepomis megalotis*													2	0.4					11	5.4					13	0.4
	Redear sunfish	*Lepomis microlophus*	3	0.4											14	2.8					2	1.0					19	0.6
	Bantam sunfish	*Lepomis symmetricus*	20	2.5					8	1.8					23	4.6					1	0.5					52	1.5
	Largemouth bass	*Micropterus salmoides*	8	1.0					1	0.2													4	1.2			13	0.4
	White crappie	*Pomoxis annularis*	92	11.5			9	2.0	5	1.2			14	31.1	15	3.0	1	1.5			35	17.3	225	64.8			396	11.6
	Black crappie	*Pomoxis nigromaculatus*													2	0.4											2	0.1
Sciaenidae																												
	Freshwater drum	*Aplodinotus grunniens*																	1	7.7			1	0.3			2	0.1
Cichlidae																												
	Rio Grande cichlid	*Cichlasoma cyanoguttatum**															1	1.5									1	0.0
Total			801		204		456		433		178		45		499		68		13		202		347		155		3401	

*Exotic or introduced species

Table 2-4. Combined weight (g) and percent of total weight (%) for each species based on data collected from 476 individuals** at 12 locations on the Victoria County Station Site in April and July 2008.

Common Name	Scientific Name	MC-01		MC-02		MC-03		MC-04		MC-05		MC-06		MC-07		MC-08		MC-09		MC-10		MC-11		MC-12		Total	
		(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%	(g)	%
Alligator gar	*Atractosteus spatula*															7470	47.1									7470	10.4
Spotted gar	*Lepisosteus oculatus*							230	3.6					2610	32.8							2220	9.5			5060	7.1
Gizzard shad	*Dorosoma cepedianum*													30	0.4					20	0.9	550	2.4			600	0.8
Golden shiner	*Notemigonus crysoleucas**					730	5.1																			730	1.0
Common carp	*Cyprinus carpio**					7560	53.2	2450	38.6	160	23.2											5360	22.9			15530	21.7
Smallmouth buffalo	*Ictiobus bubalus*													120	1.5	2500	15.8					8180	35.0			10800	15.1
Black bullhead	*Ameiurus melas*					1030	7.2			20	2.9											330	1.4			1380	1.9
Yellow bullhead catfish	*Ameiurus natalis*					1040	7.3	420	6.6	50	7.2											280	1.2			1790	2.5
Blue catfish	*Ictalurus furcatus*													670	8.4	4890	30.8			1130	50.0					6690	9.4
Channel catfish	*Ictalurus punctatus*																			20	0.9					20	0.0
Flathead catfish	*Pylodictis olivaris*																			20	0.9					20	0.0
Suckermouth armored catfish	*Pterygoplichthys anisitsi**													340	4.3											340	0.5
Striped mullet	*Mugil cephalus*													1937	24.3											1937	2.7
Sailfin molly	*Poecilia latipinna*					40	0.3																			40	0.1
White bass	*Morone chrysops*															900	5.7									900	1.3
Green sunfish	*Lepomis cyanellus*					370	2.6	590	9.3	10	1.4															970	1.4
Warmouth	*Lepomis gulosus*					2800	19.7	1490	23.5	410	59.4			120	1.5					50	2.2					4870	6.8
Bluegill	*Lepomis macrochirus*					70	0.5	430	6.8	40	5.8			280	3.5					20	0.9					840	1.2
Longear sunfish	*Lepomis megalotis*																			50	2.2					50	0.1
Redear sunfish	*Lepomis microlophus*	10	1.2											40	0.5											50	0.1
Largemouth bass	*Micropterus salmoides*	20	2.4					300	4.7													4830	20.7			5150	7.2
White crappie	*Pomoxis annularis*	796	96.4			570	4.0	430	6.8					1720	21.6	110	0.7			950	42.0	1500	6.4			6076	8.5
Black crappie	*Pomoxis nigromaculatus*													100	1.3											100	0.1
Freshwater drum	*Aplodinotus grunniens*																					110	0.5			110	0.2
Total		826		0		14210		6340		690		0		7967		15870		0		2260		23360		0		71523	

*Exotic or introduced species

**Fish for which the combined mass was less than 10 grams could not be weighed.

2.3 Benthic Invertebrates

2.3.1 Methods

According to the original scope of work, benthic macroinvertebrate samples were to be collected at 6 of the 12 sites (MC-05, MC-06, MC-07, MC-08, MC-09, and MC-10). However, this was overlooked during the April sampling event, and benthic data were collected from all 12 sites. During the July trip, only the originally designated sites were sampled for benthos (of these, only MC-05, MC-07, and MC-09 had water). Therefore, Table 2-5 summarizes data from all 12 sites during April, and sites MC-05, MC-07, and MC-09 during July.

Benthic macroinvertebrate samples were collected with an Ekman dredge. Three grabs were taken at each site, filtered through a sieve bucket to remove excess silt, and composited into one sample. Once fine sediments had been rinsed from the sample with the sieve bucket, contents were then transferred to a 1 liter plastic sample bottle and preserved in 95% ethanol for later processing in the laboratory.

In the laboratory, samples were sorted and identified to the lowest practical taxon with the aid of a digital zoom stereomicroscope. The number of individuals within each taxon was then enumerated for each site. Segmented worms (Phylum: Annelida) were labeled as present or abundant due to difficulty in accurately accessing the exact number present. These worms are easily broken during sample collection and processing, and counts of each piece can often misrepresent the actual number present.

Figure 2-3 BIO-WEST personnel sampling benthos at MC-03 with the Ekman dredge and sieve bucket.

2.3.2 Results and Discussion

The number of each taxa collected, as well as their percent relative abundance at each site is presented in Table 2-5. A total of 364 specimens representing at least 24 families and 42 genera were identified. The number of specimens identified from each station varied from a low of 0 at MC-06 to 85 at MC-01. The lack of invertebrate taxa collected at MC-06 is not surprising given the conditions observed at this station (see Section 2.1). As expected in shallow stagnant habitats, flies and midges (Order: Diptera) were the most abundant organisms, and accounted for approximately 77% of all specimens collected. Three families of Dipteran midge larvae (Ceratopogonidae, Chaoboridae, and Chironomidae) were particularly abundant. Excluding dipterans, the most common taxa were molluscs, crustaceans, mayflies, and beetles.

Two insect taxa are listed in the Texas Parks and Wildlife Departments (TPWD) Rare, Threatened, and Endangered Species of Texas database as potentially occurring in Victoria County: a mayfly (*Tortopus circumfluus*) and the Texas asaphomyian tabanid fly (*Asaphomyia texensis)* are both listed as rare. However, neither of these taxa was collected during on-site benthic sampling.

Table 2-5. Invertebrate taxa collected from benthic samples at 12 locations on the Victoria County Station Site in April and July 2008

Common Name	Family	Genus	MC-1		MC-2		MC-3		MC-4		MC-5		MC-6		MC-7		MC-8		MC-9		MC-10		MC-11		MC-12		Total	
			#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Mayflies	**Caenidae**	*Caenis*					8	**27.6**	3	**30.0**					1	**1.8**			1	**1.3**							13	**3.6**
Dragonflies	**Libellulidae**	*Perithemis*					1	**3.4**																			1	**0.3**
	Gomphidae	*Aphylla*	2	**2.4**							2	**11.1**															4	**1.1**
Water boatmen	**Corixidae**	*Trichocorixa*													1	**1.8**							1	**14.3**	1	**6.3**	3	**0.8**
Caddisflies	**Hydroptilidae**	*Orthotrichia* pupa					1	**3.4**																			1	**0.3**
Beetles	**Hydrophilidae**	*Berosus*															1	**25.0**	2	**2.7**							3	**0.8**
	Elmidae	*Dubiraphia*																			1	**16.7**					1	**0.3**
	Scarabidae																		1	**1.3**							1	**0.3**
	Haliplidae	*Haliplus*					4	**13.8**																			4	**1.1**
		Peltodytes					1	**3.4**																			1	**0.3**
	Curculionidae						1	**3.4**																			1	**0.3**
	Chrysomelidae										1	**5.6**															1	**0.3**
Flies and midges	**Brachycerca pupa**										1	**5.6**															1	**0.3**
	Ephydridae																		6	**8.0**							6	**1.6**
	Tabanidae	*Chrysops*					3	**10.3**																	1	**6.3**	4	**1.1**
	Ceratopogonidae	*Ceratopogon*	2	**2.4**					3	**30.0**	2	**11.1**			10	**17.9**	2	**50.0**	13	**17.3**	1	**16.7**					33	**9.1**
		Culicoides	1	**1.2**							1	**5.6**			1	**1.8**			9	**12.0**	2	**33.3**					14	**3.8**
		Probezzia	2	**2.4**											1	**1.8**											3	**0.8**
		Serromyia	1	**1.2**																							1	**0.3**
		Sphaeromias	1	**1.2**					1	**10.0**					2	**3.6**									2	**12.5**	6	**1.6**
	Chaoboridae	*Chaoborus*			42	**72.4**																					42	**11.5**
	Chironomidae	*Procladius*	25	**29.4**	10	**17.2**					2	**11.1**			6	**10.7**							1	**14.3**	2	**12.5**	46	**12.6**
		Clinotanypus	16	**18.8**							1	**5.6**															17	**4.7**
		Tanypus									1	**5.6**			15	**26.8**			30	**40.0**	1	**16.7**					47	**12.9**
		Rheotanytarsus	16	**18.8**					1	**10.0**							1	**25.0**	3	**4.0**							21	**5.8**
		Cryptochironomus	1	**1.2**											2	**3.6**							2	**28.6**			5	**1.4**
		Dicrotendipes									1	**5.6**							1	**1.3**							2	**0.5**
		Parachironomus	8	**9.4**					1	**10.0**																	9	**2.5**
		Polypedilum	4	**4.7**											1	**1.8**											5	**1.4**
		Chironomus									2	**11.1**			1	**1.8**							1	**14.3**	1	**6.3**	5	**1.4**
		Tanytarsus													1	**1.8**			1	**1.3**							2	**0.5**
		Coelotanypus													1	**1.8**			8	**10.7**							9	**2.5**
		Microchironomus													2	**3.6**											2	**0.5**
Molluscs	**Physidae**		4	**4.7**	1	**1.7**	2	**6.9**	1	**10.0**															3	**18.8**	11	**3.0**
	Planorbidae						2	**6.9**																			2	**0.5**
	Ancylidae																								2	**12.5**	1	**0.3**
	Sphaeriidae		2	**2.4**			6	**20.7**			4	**22.2**			6	**10.7**					1	**16.7**					12	**3.3**
	Unionidae														1	**1.8**											1	**0.3**
		Toxolasma texasiensis																					1	**14.3**			1	**0.3**
Crustaceans	**Palaemonidae**	*Palaemonetes*													4	**7.1**							1	**14.3**	4	**25.0**	9	**2.5**
	Cambaridae				5	**8.6**																					5	**1.4**
Segmented Worms	Phylum Annelida				P						P				P		P				P		P				P	
Totals			85		58		29		10		18		0		56		4		75		6		7		16		364	

Notes:

P = present

July data are included for MC-05, MC-07, and MC-09 only

2.4 Water Quality

2.4.1 Methods

A YSI model 6920 Data Sonde was used to measure water temperature (°C), dissolved oxygen (mg/L), pH, specific conductance (µS/cm), and turbidity (nephelometric turbidity units, NTU) at each station. The shallow nature of the sites prevented measurement at multiple depths, so data were collected from approximately mid-depth at each location. Data were recorded in a water-proof data book along with observation of time, water depth, water clarity, and ambient conditions.

2.4.2 Results and Discussion

Water quality parameters measured at each of the twelve sampling stations are presented in Table 2-6. Since no water was present at several sampling stations in July (MC-02, MC-06, MC-08, MC-10, and MC-12), no water quality measurements were taken. As expected given the variation in conditions observed, water quality parameters varied widely between stations.

Table 2-6. Water quality parameters measured at 12 locations on the Victoria County Station Site during April and July 2008.

Date	Time	Site	Temperature (°C)	pH	Specific Conductance (µS/cm)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
4/23/2008	12:15	MC-01	22.06	7.36	0.133	2.50	250.2
4/23/2008	14:38	MC-02	28.12	7.21	0.171	2.48	582.0
4/21/2008	12:26	MC-03	23.01	9.31	0.231	6.69	37.5
4/21/2008	10:08	MC-04	22.25	8.25	0.202	7.04	1243.4
4/24/2008	8:49	MC-05	21.12	7.52	1.300	3.47	13.6
4/23/2008	17:00	MC-06	25.96	8.55	0.479	13.77	589.9
4/22/2008	12:24	MC-07	24.45	8.05	1.360	4.63	84.5
4/22/2008	14:30	MC-08	26.18	8.24	1.330	7.57	78.0
4/23/2008	10:04	MC-09	24.15	8.13	1.220	6.82	585.0
4/22/2008	16:32	MC-10	29.08	8.62	1.220	8.50	86.4
4/21/2008	16:00	MC-11	23.70	8.41	0.354	8.19	203.7
4/21/2008	15:03	MC-12	25.81	8.10	0.271	8.10	56.2
7/22/2008	10:14	MC-01	25.46	7.28	0.22	2.78	416.9
7/22/2008	1:15	MC-03	31.80	7.94	0.89	7.31	1778.6
7/22/2008	12:30	MC-04	32.35	7.63	8.55	2.27	50.5
7/23/2008	10:00	MC-05	22.91	7.83	0.91	1.90	118.0
7/22/2008	17:34	MC-07	32.31	8.86	2.09	14.27	217.9
7/22/2008	15:25	MC-09	32.99	9.15	0.05	10.42	38.5
7/22/2008	11:26	MC-11	27.51	7.81	0.60	2.83	310.6

3.0 GUADALUPE RIVER AND ASSOCIATED CANALS

3.1 Station Locations and Descriptions

Seven sampling locations were identified for the off-site portion of this survey (Figure 3-1). Five of these sites are on the lower Guadalupe River between Victoria and the GBRA saltwater barrier. The remaining two sites are located on Goff Bayou and the Guadalupe-Blanco River Authority (GBRA) Main Canal, which are part of the Lavaca-Guadalupe Coastal Basin (Basin 17, TCEQ 2004). Table 3-1 provides GPS coordinates for all seven study sites.

Table 3-1. GPS coordinates for the seven study sites in the NAD 83 coordinate system.

Site	Coordinates	
GR-01	N 28° 39' 43.5"	W 96° 57' 56.9"
GR-02	N 28° 35' 54.8"	W 96° 56' 32.0"
GR-03	N 28° 34' 25.4"	W 96° 55' 03.4"
GR-04	N 28° 30' 48.2"	W 96° 53' 33.9"
GR-05	N 28° 30' 23.1"	W 96° 53' 14.1"
Goff Bayou	N 28° 29' 52.1"	W 96° 47' 51.5"
GBRA Main Canal	N 28° 30' 32.9"	W 96° 45' 04.4"

Habitat at the Guadalupe River sites (GR-01, GR-02, GR-03, GR-04, and GR-05) consists of a deep incised channel with a mud and silt substrate and large amounts of woody debris. Channel widths range from 34-54 m (112-177 ft), and mid-channel depths range from 2.3-6.0 m (8-20 ft). The Goff Bayou site is considerably shallower than the river sites with a maximum depth of 2.8 m (9 ft). The invasive aquatic plants water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes)* are abundant at the Goff Bayou site. The GBRA Main Canal has a maximum depth of 1.7 m (6 ft), and much less woody debris than the other six sites. The only cover available in the canal is limited to vegetation along the edges consisting mainly of water hyacinth and water willow (*Justicia americana)*. The seven off-site stations are described in more detail below, and shown on Figure 3-1.

Station GR-01 is located near the proposed discharge structure, southwest of the InvistaVictoria Plant. Effluent from this plant enters the river near the middle of this station. Mud and silt substrates are common along the banks; however, considerable sand is present in swifter mid-channel areas and lining a shallow sandbar near the upstream end of the site. The river here is somewhat wider, shallower, and less-incised than at the other locations downstream. Large woody debris is abundant at this station. During January, at flows of approximately 1,100 cubic feet per second (cfs) at the USGS gauge near Victoria, mid-channel depths ranged from 2.2 - 4.9 meters. Channel width near the upstream boundary of station GR-01 was 54 meters.

Station GR-02 is immediately downstream of the point at which Linn Bayou empties into the Guadalupe River. This station is located in a fairly straight stretch of river that is deeper and slower than GR-01. Mud and silt substrates dominate. Although a substantial amount of large

woody debris is present, it is more widely scattered than at other stations. During January, at flows of approximately 1,100 cfs, mid-channel depths ranged from 4.5 - 5.6 meters. Channel width was approximately 37 meters.

GR-03 is located near the approximate center of the 18-mile-long study area, and is located just upstream of a shallow area where a large log-jam often forms. As a result, considerable large woody debris is present along the south river bank at this station. Sand and silt substrates are dominant in this area. During January, at flows of approximately 1,100 cfs, mid channel depths ranged from 2.5 – 5.0 meters, and channel width near the upstream boundary was approximately 34 meters.

Station GR-04 lies just downstream of the Kuy Creek-Guadalupe River confluence, and just upstream of the San Antonio River-Guadalupe River confluence. The river here is more incised than in upstream locations. During January, at approximately 1,100 cfs, channel width measured 32 meters, and mid-channel depths exceeded 6 meters. A considerable amount of woody debris is present at this station, but is limited mainly to the river edges.

GR-05 is located immediately upstream of the GBRA Saltwater Barrier, and downstream of the San Antonio River confluence. Mud and silt substrates dominate. A considerable amount of woody debris is located along the banks, as at GR-04. At flows of approximately 1,100 cfs, stream width measured 36 meters at the upstream boundary, and mid-channel depths ranged from 3.9 – 4.5 meters.

The Goff Bayou station is considerably shallower and slower than the river sites with a maximum depth of 2.8 meters. The invasive aquatic plants water hyacinth (*Eichhornia crassipes*) and water lettuce (*Pistia stratiotes*) are abundant at the Goff Bayou site. In fact, large mats of floating water hyacinth can completely clog the bayou at times, preventing access via boat to certain areas. Although some woody debris is present in the form of fallen branches along the shoreline, Goff Bayou has much less woody debris than the river sites.

The GBRA Main Canal is a narrow (approximately 22 meters width), shallow (maximum depth of 1.7 meters), relatively barren waterway which has no woody debris. The only cover available in the canal is limited to vegetation along the edges consisting mainly of water hyacinth, water willow (*Justicia americana*), arrowhead (*Sagittaria* sp.), and water stargrass (*Heteranthera dubia*).

Figure 3-1. Map of seven off-site sampling stations.

Fish, ichthyoplankton, and benthic invertebrates were collected off-site on the following dates:

2008	Electrofishing and benthos (Off-site)	Ichthyoplankton (Off-site)
January	Jan. 28-29	
February	Feb. 19-20	Feb. 21-22
March	Mar. 17-19	Mar. 4-5, and Mar. 19-20
April	Apr. 14-15	Apr. 1-2, and Apr. 16-17
May	May 19-21	May 8-9, and May 21-22
June	June 16-17	June 5-6, and June 18-19
July	July 14-15	July 2-3, and July 16-17
August	Aug. 18-20	Aug. 20-21
September	Sept. 16-17	Sept. 17-18
October	Oct. 20-21	Oct. 21-22

3.2 Fish

3.2.1 Methods

Fish community sampling was conducted with a Smith-Root Model 5.0 GPP Electrofisher mounted on a 15-foot aluminum john boat. At each site, a minimum of 900 seconds of electrofishing was conducted beginning at the downstream boundary of a previously established transect. Sampling was conducted with a crew of three biologists: one driving the boat, one operating the electrofishing probe, and one netting the stunned fish. The crew sampled in an upstream direction, covering all available habitats thoroughly. An attempt was made to sample all habitats (woody debris, etc.) in proportion to their availability within the site.

Once fish were captured, they were placed in a large livewell with river water until sampling at that site was complete. Fish were then identified to species, enumerated, and measured (total length in mm). Specimens large enough to register on a digital scale (sensitivity of 10 grams [g]) were then weighed (g). Weight was not recorded for specimens less than 10 g. All fish were then released, excluding voucher specimens. Except for very large fish, at least one individual of each species was preserved in 10% formalin and retained as a voucher. Digital photographs were used as vouchers for larger specimens.

3.2.2 Results

To date, 9,915 fish have been collected representing 20 families and 47 species (Table 3-2). The minnows and carps (Cyprinidae) were the most abundant family comprising approximately 41% of all fish captured. Other abundant families included the shad (Clupeidae) (14.2% relative abundance), sunfish (Centrarchidae) (12.8%), and gars (Lepisosteidae) (8.0%).

High relative abundance of cyprinids was largely the result of red shiner (*Cyprinella lutrensis*) at stations GR-01, GR-02, and GR-03. The red shiner was the most numerically abundant species overall, representing 35.5% of all fishes captured. Abundance of red shiners is highest at GR-01 and decreases downstream. This is likely due to the presence of a shallow sandbar at GR-01 which provides habitat for riverine adapted cyprinids such as red shiners.. As the river moves downstream toward GR-05, it becomes deeper and more incised and such sandbar habitats are uncommon.

Other abundant species include gizzard shad (*Dorosoma cepedianum*) (8.3% relative abundance), striped mullet (*Mugil cephalus*) (6.2%), spotted gar (*Lepisosteus oculatus*) (6.2%), and longear sunfish (*Lepomis megalotis*) (5.1%). Gizzard shad and striped mullet exhibit high abundance at the Goff Bayou site, whereas, longear sunfish and other small-bodied insectivores exhibit their highest abundance at the GBRA Main Canal. Several estuarine species have been collected during the study and are most common at Goff Bayou and the GBRA Main Canal. These include pinfish (*Lagodon rhomboides)*, gulf pipefish (*Syngnathus scovelli)*, bay anchovy (*Anchoa mitchilli)*, gulf menhaden (*Brevoortia patronus)*, and ladyfish (*Elops saurus)*. Abundance of gulf menhaden increased drastically at Goff Bayou during the September sampling event. This is likely due to the influx of saltwater resulting from high tides of Hurricane Ike which overtopped the Goff Bayou saltwater barrier in early September.

Catch-per-unit-effort (CPUE) data are reported by site in Table 3-3. However, since sampling effort was similar between sites, trends in CPUE data are similar to those in relative abundance data provided in Table 3-2. Total shock time for the January through September samples varied from 7,561 seconds at the GBRA Main Canal to 8,811 seconds at GR-02.

Table 3-4 provides a summary of weight data for the 2,809 individuals for which these data were collected. Species which attain large sizes and are relatively abundant (i.e., spotted gar, smallmouth buffalo, and striped mullet) dominate the overall biomass in these systems. Other species which contribute substantially to overall biomass include common carp, longnose gar (*Lepisosteus osseus*), gizzard shad, and blue catfish (*Ictalurus furcatus*). The largest individual fish collected were a grass carp (*Ctenopharyngodon idella*), a flathead catfish (*Pylodictis olivaris*), and a smallmouth buffalo which weighed 10,480 g (23 lbs.), 9,025 g (20 lbs.), and 7,795 g (17 lbs.), respectively.

Table 3-2. Number collected (#) and percent relative abundance (%) of fishes captured by electrofishing from five stations on the lower Guadalupe River, Goff Bayou, and the GBRA Main Canal during January-September 2008.

Family	Common Name	Scientific Name	GR-01		GR-02		GR-03		GR-04		GR-05		Goff		Canal		Total	
			#	%	#	%	#	%	#	%	#	%	#	%	#	%	#	%
Lepisosteidae	Alligator gar	*Atractosteus spatula*							3	0.3							3	0.0
	Spotted gar	*Lepisosteus oculatus*	133	3.3	65	6.5	50	6.7	174	16.9	81	8.4	96	8.9	12	1.1	611	6.2
	Longnose gar	*Lepisosteus osseus*	38	0.9	27	2.7	34	4.5	34	3.3	32	3.3	9	0.8			174	1.8
Elopidae	Ladyfish	*Elops saurus*											1	0.1			1	0.0
Anguillidae	American eel	*Anguilla rostrata*†									1	0.1					1	0.0
Clupeidae	Bay anchovy	*Anchoa mitchilli*							1	0.1	1	0.1	55	5.1	1	0.1	58	0.6
	Gulf menhaden	*Brevoortia patronus*											96	8.9			96	1.0
	Gizzard shad	*Dorosoma cepedianum*	244	6.0	157	15.6	45	6.0	60	5.8	84	8.7	217	20.1	20	1.9	827	8.3
	Threadfin shad	*Dorosoma petenense*	317	7.9	3	0.3	2	0.3	19	1.9	13	1.3	66	6.1	4	0.4	424	4.3
Cyprinidae	Grass carp	*Ctenopharyngodon idella**									1	0.1					1	0.0
	Red shiner	*Cyprinella lutrensis*	2484	61.5	341	33.9	316	42.1	173	16.8	143	14.8	17	1.6	43	4.1	3517	35.5
	Common carp	*Cyprinus carpio**	3	0.1	1	0.1	5	0.7	21	2.0	19	2.0	45	4.2	4	0.4	98	1.0
	Ribbon shiner	*Lythrurus fumeus*	1	0.0													1	0.0
	Burrhead chub	*Macrhybopsis marconis*	1	0.0													1	0.0
	Pugnose minnow	*Opsopoeodus emiliae*	2	0.0	8	0.8			47	4.6	15	1.5	7	0.6	78	7.5	157	1.6
	Bullhead minnow	*Pimephales vigilax*	98	2.4	62	6.2	41	5.5	25	2.4	29	3.0	14	1.3	55	5.3	324	3.3
Catostomidae	Smallmouth buffalo	*Ictiobus bubalus*	10	0.2	13	1.3	25	3.3	15	1.5	20	2.1	52	4.8	10	1.0	145	1.5
	Gray redhorse	*Moxostoma congestum*													1	0.1	1	0.0
Characidae	Mexican tetra	*Astyanax mexicanus**	125	3.1	36	3.6	40	5.3	63	6.1	37	3.8	15	1.4	3	0.3	319	3.2
Ictaluridae	Blue catfish	*Ictalurus furcatus*	11	0.3	12	1.2	15	2.0	6	0.6	17	1.8	15	1.4			76	0.8
	Channel catfish	*Ictalurus punctatus*	1	0.0	8	0.8	5	0.7	10	1.0	14	1.4	3	0.3	1	0.1	42	0.4
	Tadpole madtom	*Noturus gyrinus*													6	0.6	6	0.1
	Flathead catfish	*Pylodictis olivaris*			6	0.6	8	1.1	4	0.4	3	0.3	4	0.4			25	0.3
Loricariidae	Suckermouth armored catfish	*Pterygoplichthys anisitsi**							3	0.3	4	0.4	3	0.3	3	0.3	13	0.1
Mugilidae	Striped mullet	*Mugil cephalus*	182	4.5	7	0.7	11	1.5	43	4.2	212	21.9	163	15.1			618	6.2
Atherinopsidae	Inland silverside	*Menidia beryllina*	172	4.3	5	0.5	1	0.1	46	4.5	33	3.4	37	3.4	92	8.8	386	3.9
Fundulidae	Golden topminnow	*Fundulus chrysotus*									1	0.1					1	0.0
	Bluefin killifish	*Lucania goodei**											3	0.3	2	0.2	5	0.1
Cyprinodontidae	Sheepshead minnow	*Cyprinodon variegatus*									1	0.1					1	0.0
Syngnathidae	Gulf pipefish	*Syngnathus scovelli*													2	0.2	2	0.0
Poeciliidae	Western mosquitofish	*Gambusia affinis*	57	1.4	45	4.5	17	2.3	70	6.8	52	5.4	50	4.6	137	13.1	428	4.3
	Sailfin molly	*Poecilia latipinna*	7	0.2	4	0.4	2	0.3	39	3.8	23	2.4	9	0.8	23	2.2	107	1.1
Moronidae	White bass	*Morone chrysops*	1	0.0							2	0.2	2	0.2			5	0.1
Centrarchidae	Green sunfish	*Lepomis cyanellus*			1	0.1	2	0.3									3	0.0
	Warmouth	*Lepomis gulosus*	11	0.3	20	2.0	6	0.8	38	3.7	27	2.8	6	0.6	104	10.0	212	2.1
	Orangespotted sunfish	*Lepomis humilis*	13	0.3	1	0.1	2	0.3							1	0.1	17	0.2
	Bluegill	*Lepomis macrochirus*	36	0.9	56	5.6	33	4.4	50	4.9	41	4.2	46	4.3	77	7.4	339	3.4
	Longear sunfish	*Lepomis megalotis*	57	1.4	74	7.4	40	5.3	18	1.8	16	1.7	23	2.1	276	26.4	504	5.1
	Redear sunfish	*Lepomis microlophus*					1	0.1									1	0.0
	Bantam sunfish	*Lepomis symmetricus*							1	0.1	2	0.2			3	0.3	6	0.1
	Spotted bass	*Micropterus punctulatus*	6	0.1	16	1.6	23	3.1	25	2.4	7	0.7	2	0.2	2	0.2	81	0.8
	Largemouth bass	*Micropterus salmoides*	2	0.0					1	0.1	1	0.1	11	1.0	2	0.2	17	0.2
	White crappie	*Pomoxis annularis*	2	0.0	3	0.3			14	1.4	10	1.0	2	0.2	6	0.6	37	0.4
	Black crappie	*Pomoxis nigromaculatus*	5	0.1	5	0.5	1	0.1	14	1.4	17	1.8	7	0.6	1	0.1	50	0.5
Sparidae	Pinfish	*Lagodon rhomboides*													1	0.1	1	0.0
Sciaenidae	Freshwater drum	*Aplodinotus grunniens*	5	0.1	6	0.6	4	0.5	6	0.6	8	0.8	4	0.4			33	0.3
Cichlidae	Rio Grande cichlid	*Cichlasoma cyanoguttatum**	13	0.3	23	2.3	22	2.9	4	0.4	2	0.2	1	0.1	75	7.2	140	1.4
Total			4037		1005		751		1027		969		1081		1045		9915	

*Exotic or introduced species

†Observed but not collected

Table 3-3. Number collected (#) and catch-per-unit-effort (CPUE, # fish/hr) of fishes captured by electrofishing from five sites on the lower Guadalupe River, Goff Bayou, and the GBRA Main Canal during January-September 2008.

Common Name	Scientific Name	GR-01		GR-02		GR-03		GR-04		GR-05		Goff		Canal		Total	
		#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE	#	CPUE
Alligator gar	*Atractosteus spatula*							3	1.3							3	0.2
Spotted gar	*Lepisosteus oculatus*	133	54.6	65	26.6	50	20.6	174	73.6	81	34.1	96	40.1	12	5.7	611	36.9
Longnose gar	*Lepisosteus osseus*	38	15.6	27	11.0	34	14.0	34	14.4	32	13.5	9	3.8			174	10.5
Ladyfish	*Elops saurus*											1	0.4			1	0.1
American eel	*Anguilla rostrata*†									1	0.4					1	0.1
Bay anchovy	*Anchoa mitchilli*							1	0.4	1	0.4	55	23.0	1	0.5	58	3.5
Gulf menhaden	*Brevoortia patronus*											96	40.1			96	5.8
Gizzard shad	*Dorosoma cepedianum*	244	100.2	157	64.1	45	18.5	60	25.4	84	35.4	217	90.7	20	9.5	827	50.0
Threadfin shad	*Dorosoma petenense*	317	130.1	3	1.2	2	0.8	19	8.0	13	5.5	66	27.6	4	1.9	424	25.6
Grass carp	*Ctenopharyngodon idella**									1						1	0.1
Red shiner	*Cyprinella lutrensis*	2484	1019.8	341	139.3	316	130.0	173	73.2	143	60.3	17	7.1	43	20.5	3517	212.6
Common carp	*Cyprinus carpio**	3	1.2	1	0.4	5	2.1	21	8.9	19	8.0	45	18.8	4	1.9	98	5.9
Ribbon shiner	*Lythrurus fumeus*	1	0.4													1	0.1
Burrhead chub	*Macrhybopsis marconis*	1	0.4													1	0.1
Pugnose minnow	*Opsopoeodus emiliae*	2	0.8	8	3.3			47	19.9	15	6.3	7	2.9	78	37.1	157	9.5
Bullhead minnow	*Pimephales vigilax*	98	40.2	62	25.3	41	16.9	25	10.6	29	12.2	14	5.8	55	26.2	324	19.6
Smallmouth buffalo	*Ictiobus bubalus*	10	4.1	13	5.3	25	10.3	15	6.3	20	8.4	52	21.7	10	4.8	145	8.8
Gray redhorse	*Moxostoma congestum*													1	0.5	1	0.1
Mexican tetra	*Astyanax mexicanus**	125	51.3	36	14.7	40	16.5	63	26.6	37	15.6	15	6.3	3	1.4	319	19.3
Blue catfish	*Ictalurus furcatus*	11	4.5	12	4.9	15	6.2	6	2.5	17	7.2	15	6.3			76	4.6
Channel catfish	*Ictalurus punctatus*	1	0.4	8	3.3	5	2.1	10	4.2	14	5.9	3	1.3	1	0.5	42	2.5
Tadpole madtom	*Noturus gyrinus*													6	2.9	6	0.4
Flathead catfish	*Pylodictis olivaris*			6	2.5	8	3.3	4	1.7	3	1.3	4	1.7			25	1.5
Vermiculated sailfin catfish	*Pterygoplichthys disjunctivus**							3	1.3	4	1.7	3	1.3	3	1.4	13	0.8
Striped mullet	*Mugil cephalus*	182	74.7	7	2.9	11	4.5	43	18.2	212	89.3	163	68.1			618	37.4
Inland silverside	*Menidia beryllina*	172	70.6	5	2.1	1	0.4	46	19.5	33	13.9	37	15.5	92	43.8	386	23.3
Golden topminnow	*Fundulus chrysotus*									1	0.4					1	0.1
Bluefin killifish	*Lucania goodei**											3	1.3	2	1.0	5	0.3
Sheepshead minnow	*Cyprinodon variegatus*									1	0.4					1	0.1
Gulf pipefish	*Syngnathus scovelli*													2	1.0	2	0.1
Western mosquitofish	*Gambusia affinis*	57	23.4	45	18.4	17	7.0	70	29.6	52	21.9	50	20.9	137	65.2	428	25.9
Sailfin molly	*Poecilia latipinna*	7	2.9	4	1.6	2	0.8	39	16.5	23	9.7	9	3.8	23	11.0	107	6.5
White bass	*Morone chrysops*	1	0.4							2	0.8	2	0.8			5	0.3
Green sunfish	*Lepomis cyanellus*			1	0.4	2	0.8									3	0.2
Warmouth	*Lepomis gulosus*	11	4.5	20	8.2	6	2.5	38	16.1	27	11.4	6	2.5	104	49.5	212	12.8
Orangespotted sunfish	*Lepomis humilis*	13	5.3	1	0.4	2	0.8							1	0.5	17	1.0
Bluegill	*Lepomis macrochirus*	36	14.8	56	22.9	33	13.6	50	21.1	41	17.3	46	19.2	77	36.7	339	20.5
Longear sunfish	*Lepomis megalotis*	57	23.4	74	30.2	40	16.5	18	7.6	16	6.7	23	9.6	276	131.4	504	30.5
Redear sunfish	*Lepomis microlophus*					1	0.4									1	0.1
Bantam sunfish	*Lepomis symmetricus*							1	0.4	2	0.8			3	1.4	6	0.4
Spotted bass	*Micropterus punctulatus*	6	2.5	16	6.5	23	9.5	25	10.6	7	3.0	2	0.8	2	1.0	81	4.9
Largemouth bass	*Micropterus salmoides*	2	0.8					1	0.4	1	0.4	11	4.6	2	1.0	17	1.0
White crappie	*Pomoxis annularis*	2	0.8	3	1.2			14	5.9	10	4.2	2	0.8	6	2.9	37	2.2
Black crappie	*Pomoxis nigromaculatus*	5	2.1	5	2.0	1	0.4	14	5.9	17	7.2	7	2.9	1	0.5	50	3.0
Pinfish	*Lagodon rhomboides*													1	0.5	1	0.1
Freshwater drum	*Aplodinotus grunniens*	5	2.1	6	2.5	4	1.6	6	2.5	8	3.4	4	1.7			33	2.0
Rio Grande cichlid	*Cichlasoma cyanoguttatum**	13	5.3	23	9.4	22	9.1	4	1.7	2	0.8	1	0.4	75	35.7	140	8.5
Total		**4037**		**1005**		**751**		**1027**		**969**		**1081**		**1045**		**9915**	

*Exotic or introduced species, †Observed but not collected

Table 3-4. Combined weight (g) and percent of total weight (%) for each species based on data collected from 2,809 individuals at five sites on the Guadalupe River, Goff Bayou, and the GBRA Main Canal during January-September 2008.

Common Name	Scientific Name	GR-01		GR-02		GR-03		GR-04		GR-05		Goff		Canal		Total	
		Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%	Weight	%
Alligator gar	*Atractosteus spatula*							8320	3.6							8320	0.7
Spotted gar	*Lepisosteus oculatus*	77171	32.5	23375	26.4	23304	16.7	91101	39.8	38094	21.4	44659	15.5	7119	23.8	304823	25.6
Longnose gar	*Lepisosteus osseus*	25722	10.8	8667	9.8	28692	20.5	9390	4.1	15745	8.8	7430	2.6			95646	8.0
Ladyfish	*Elops saurus*											10	0.0			10	0.0
Gulf menhaden	*Brevoortia patronus*											30	0.0			30	0.0
Gizzard shad	*Dorosoma cepedianum*	20929	8.8	19435	21.9	8420	6.0	6095	2.7	6330	3.6	8970	3.1	5069	16.9	75248	6.3
Threadfin shad	*Dorosoma petenense*	40	0.0	20	0.0											60	0.0
Grass carp	*Ctenopharyngodon idella**									10480	5.9					10480	0.9
Red shiner	*Cyprinella lutrensis*	85	0.0					482	0.2							567	0.0
Common carp	*Cyprinus carpio**	1590	0.7	420	0.5	4930	3.5	48580	21.2	30835	17.3	38094	13.3	4958	16.6	129407	10.9
Smallmouth buffalo	*Ictiobus bubalus*	18794	7.9	16123	18.2	49305	35.2	31220	13.6	30820	17.3	94066	32.7	9001	30.1	249329	20.9
Gray redhorse	*Moxostoma congestum*													110	0.4	110	0.0
Mexican tetra	*Astyanax mexicanus**	155	0.1	10	0.0	5	0.0									170	0.0
Blue catfish	*Ictalurus furcatus*	11790	5.0	7735	8.7	11105	7.9	4735	2.1	7735	4.3	11090	3.9			54190	4.6
Channel catfish	*Ictalurus punctatus*	450	0.2	1149	1.3	334	0.2	1327	0.6	1927	1.1	2680	0.9	2	0.0	7869	0.7
Flathead catfish	*Pylodictis olivaris*			4281	4.8	1803	1.3	4610	2.0	2375	1.3	10315	3.6			23384	2.0
Suckermouth armored catfish	*Pterygoplichthys anisitsi**							400	0.2	780	0.4	1090	0.4			2270	0.2
Striped mullet	*Mugil cephalus*	72691	30.6	2431	2.7	6290	4.5	13638	6.0	24092	13.5	60216	21.0			179359	15.1
White bass	*Morone chrysops*	370	0.2							600	0.3	660	0.2			1630	0.1
Warmouth	*Lepomis gulosus*	225	0.1	120	0.1	30	0.0	1040	0.5	455	0.3	80	0.0	575	1.9	2525	0.2
Bluegill	*Lepomis macrochirus*	2887	1.2	550	0.6	147	0.1	477	0.2	989	0.6	633	0.2	268	0.9	5951	0.5
Longear sunfish	*Lepomis megalotis*	225	0.1	210	0.2	75	0.1	255	0.1	40	0.0	50	0.0	130	0.4	985	0.1
Spotted bass	*Micropterus punctulatus*	299	0.1	1099	1.2	1373	1.0	3425	1.5	770	0.4	760	0.3	250	0.8	7976	0.7
Largemouth bass	*Micropterus salmoides*	580	0.2					210	0.1	160	0.1	4520	1.6	1270	4.2	6740	0.6
White crappie	*Pomoxis annularis*	140	0.1	85	0.1			980	0.4	485	0.3	180	0.1	685	2.3	2555	0.2
Black crappie	*Pomoxis nigromaculatus*	820	0.3	917	1.0	90	0.1	1230	0.5	1945	1.1	544	0.2	100	0.3	5646	0.5
Freshwater drum	*Aplodinotus grunniens*	2518	1.1	1700	1.9	3320	2.4	1504	0.7	3620	2.0	1305	0.5			13967	1.2
Rio Grande Cichlid	*Cichlasoma cyanoguttatum**	59	0.0	242	0.3	670	0.5							377	1.3	1348	0.1
Total		237541		88569		139893		229019		178277		287382		29914		1190595	

*Exotic or introduced species

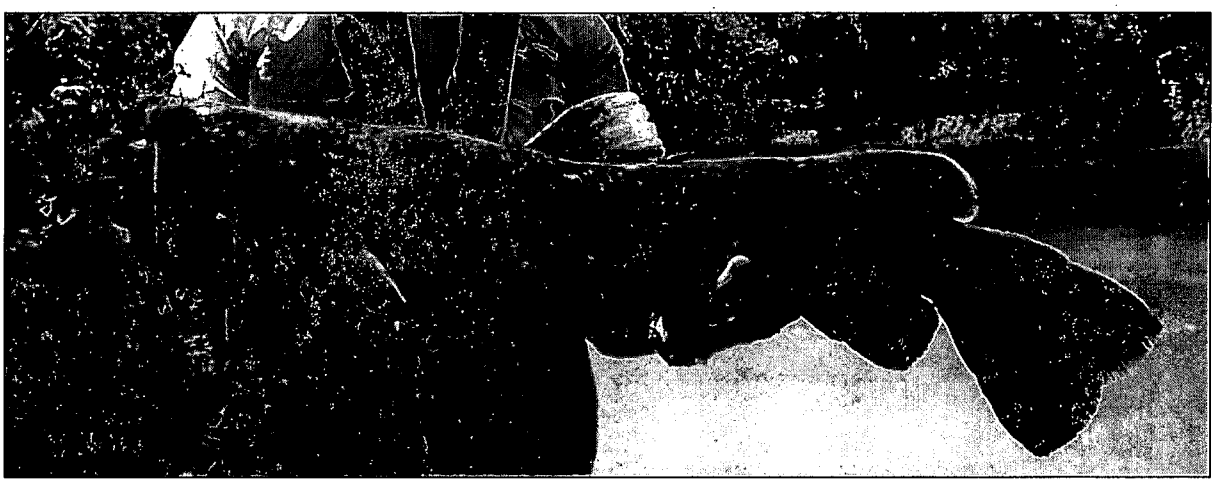

Figure 3-2. Flathead catfish (*Pylodictis olivaris*).

No state or federally listed threatened or endangered species have been collected during the off-site survey. Two fish species are listed in the TPWD Rare, Threatened, and Endangered Species of Texas database as potentially occurring in Victoria, Calhoun, Refugio, or Aransas counties. The opossum pipefish (*Microphis brachyurus*) is listed as a state threatened species potentially occurring in Refugio and Aransas counties. Although little information is available regarding the biology or distribution of this species, breeding adults are apparently found in freshwater, whereas young migrate to saltwater areas. The American eel (*Anguilla rostrata*), although not listed as threatened or endangered by TPWD or USFWS, is documented as rare within the state. This species spawns in the Atlantic Ocean, and adults migrate up rivers throughout North America to live out the majority of their lives before returning to the sea to spawn. One American eel was observed, but not captured, while electrofishing at site GR-05 in April.

Bluefin killifish (*Lucania goodei*) (Figure 3-3) have been captured at Goff Bayou and the GBRA Main Canal. Although specimens from this study were originally thought to be the first collected in Texas (see April interim report, BIO-WEST 2008b), the species was reported in an article published in the February 2008 issue of the Texas Journal of Science (Gallaway et al. 2008). Gallaway et al. (2008) suggest that the species was introduced with wetland vegetation imported from a nursery in Florida to an artificial wetland built on the DuPont/Invista plant near Victoria. Bluefin killifish were first noted from this wetland in 1998, and have since spread to the Guadalupe River. Our collections of bluefin killifish are from a location at least 20 miles downstream of the Invista Plant, suggesting that this species is successfully reproducing and dispersing throughout the lower Guadalupe River.

Figure 3-3. Bluefin killifish (*Lucania goodei*) captured from Goff Bayou.

Table 3-5. Number of fish species collected at five sites on the Guadalupe River, Goff Bayou, and the GBRA Main Canal from January-September 2008.

	GR-01	GR-02	GR-03	GR-04	GR-05	Goff	Canal	Total
Number of species	29	27	26	30	34	32	30	47

3.3 Ichthyoplankton

3.3.1 Methods

Ichthyoplankton sampling was conducted at three sites: GR-05, Goff Bayou, and the GBRA Main Canal. Sampling trips were conducted once in February, twice during the months of March-July, and once in August and September. During each trip, samples were collected in the afternoon and at night (at least 2 hours after recorded sunset) to examine diel shifts in larval fish densities. Sampling was conducted by towing paired nets (335-micron mesh, 0.5 m diameter) just below the surface and at mid-depth using a custom designed sampling apparatus mounted to a 15-foot aluminum john boat (Figure 3-8). Using this custom apparatus, a single net was deployed on each side of the boat, adjusted to the desired depth, and towed through the water for a minimum of three minutes in order to collect the desired sample volume. Flow meters attached to the front of each net were used to ensure that the correct volume was collected, as well as to calculate the total volume sampled. Once sampling was complete, nets were detached from the sampling apparatus, and contents were washed into the sample cup at the back of the net. Contents of each cup were then rinsed into labeled sample bottles and fixed with 10% formalin.

Figure 3-4. Ichthyoplankton sampling apparatus in design phase (left) and during a sampling effort (right).

At the BIO-WEST laboratory, samples were washed into large trays and all fish were sorted and separated from other contents (invertebrates, aquatic vegetation, detritus, etc.) and placed in separate vials with 5% formalin for long-term storage. Identification of larval fish was then conducted with the aid of a digital zoom stereomicroscope. An attempt was made to identify all larval fish to species; however, larval descriptions for some species are lacking, and therefore some specimens were keyed only to genus.

Figure 3-5. Larval and juvenile fishes captured during September ichthyoplankton sampling.

3.3.2 Results and Discussion

A total of 6,679 fishes representing at least 21 different taxa have been identified from ichthyoplankton samples thus far. This number includes 11 genera of larval fish, and also adults and juveniles of some small-bodied fishes that were not collected as larvae (e.g., western mosquitofish, gulf menhaden, and armored catfish). The term "larval" is used to designate the period of development from hatching to acquisition of an adult body form with the full complement of fin rays. Fishes are termed "juvenile" from the time of complete ray development in all fins until sexual maturity (Kelso and Rutherford 1996). Since a purpose of this study was to examine the potential for entrainment of fish embryos and larvae, larval fish were treated separately from adult and juvenile fish. No species of fish was collected solely as larvae. The only species that was collected in the ichthyoplankton samples that was not represented in the collections of adult fish is the naked goby. However, juvenile and adult stages of the naked goby were caught in the ichthyoplankton tows, also.

No fish embryos (eggs) have been collected thus far during ichthyoplankton sampling. This is not surprising given that most of the fishes that inhabit this area spawn demersal adhesive eggs which sink to the bottom and stick to the substrate. A total of 2,089 larval fish representing 11 different taxa were collected from February through September (Table 3-6). Shad larvae (*Dorosoma* spp.) (Figure 3-6) are by far the most abundant taxa captured in ichthyoplankton sampling and represent approximately 87% of all larval fish captured. Other abundant taxa include the inland silverside (*Menidia beryllina*) (8.1% of total) and sunfish (*Lepomis* spp.) (2.7% of total). Abundance of larval fishes is highest at Goff Bayou, whereas the GBRA Canal and GR-05 exhibited rather low larval fish abundance. Afternoon samples contained higher numbers of larval fish than did the night samples (1,393 and 696, respectively) due to the large number of shad larvae collected in afternoon samples. However, most other larval fish taxa are more abundant during night samples, and when shad were excluded from the analysis, larval abundance was higher at night than during the day (196 and 87, respectively).

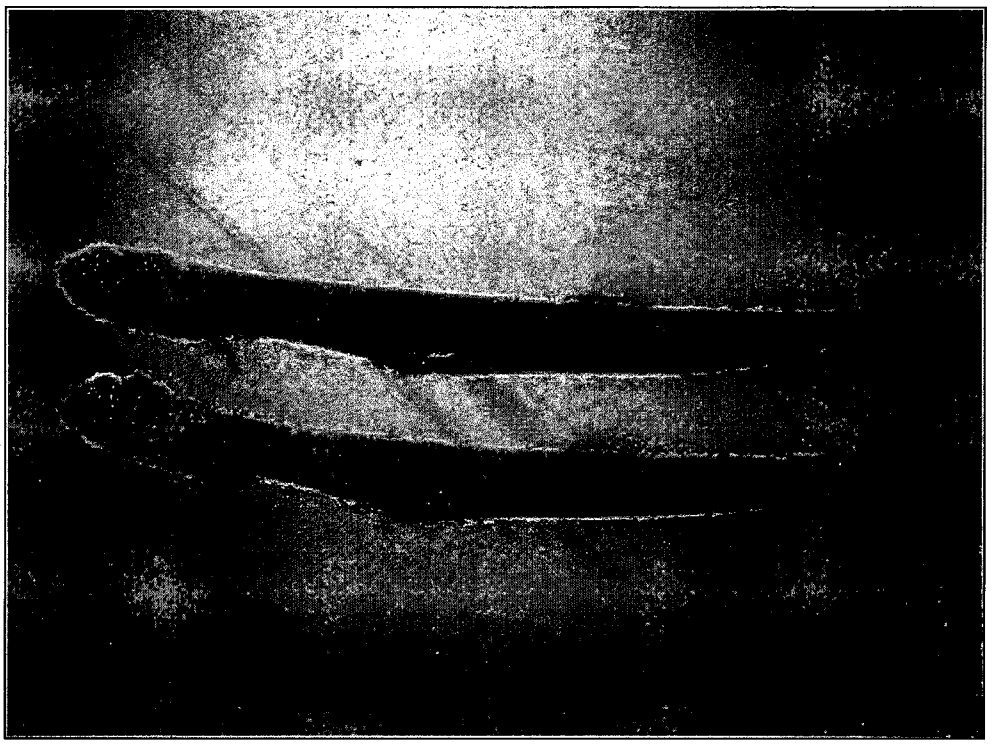

Figure 3-6. Larval shad (*Dorosoma* sp.) from ichthyoplankton samples.

Table 3-6. Number and relative abundance of larval fishes collected during ichthyoplankton sampling from February-September 2008.

Common Name	Scientific Name	Goff		Canal		GR-05		Total	
		#	%	#	%	#	%	#	%
Shad spp.	*Dorosoma* spp.	1784	*89.0*	21	*35.0*	1	*4.2*	1806	*86.5*
Inland silverside	*Menidia beryllina*	155	*7.7*	12	*20.0*	3	*12.5*	170	*8.1*
Pugnose minnow	*Opsopoeodus emiliae*	1	*0.0*	4	*6.7*			5	*0.2*
Red shiner	*Cyprinella lutrensis*	1	*0.0*	1	*1.7*	1	*4.2*	3	*0.1*
Bluefin killifish	*Lucania goodei*	4	*0.2*	1	*1.7*			5	*0.2*
Crappie spp.	*Pomoxis* spp.	19	*0.9*					19	*0.9*
Sunfish spp.	*Lepomis* spp.	36	*1.8*	20	*33.3*	1	*4.2*	57	*2.7*
Naked goby	*Gobiosoma bosc*	3	*0.1*					3	*0.1*
Bay anchovy	*Anchoa mitchilli*	1	*0.0*					1	*0.0*
Common carp	*Cyprinus carpio*			1	*1.7*	18	*75.0*	19	*0.9*
Largemouth bass	*Micropterus salmoides*	1	*0.0*					1	*0.0*
TOTAL		**2005**		**60**		**24**		**2089**	

A total of 4,590 juvenile and adult fishes were collected during ichthyoplankton sampling (Table 3-7). Although this number includes a small number of adults of several small bodied species such as the red shiner, western mosquitofish, and inland silverside; it is comprised mainly of young juveniles (<20 mm TL) of several species. This dataset is skewed by the extremely large number of bay anchovies collected at Goff Bayou during September (3,416). Only 12 bay anchovies were captured prior to September. However, high tides from Hurricane Ike overtopped the saltwater barrier system on Goff Bayou only a few days before sampling was conducted in September. The resulting influx of saltwater from San Antonio Bay carried a large number of juvenile bay anchovies; this event affected the composition of the the ichthyoplankton samples in September. Results of this saltwater intrusion are also evident in the number of Gulf menhaden captured during the Goff Bayou electrofishing survey conducted in September (see Section 3.2.2). Excluding bay anchovies, the most abundant species included juvenile inland silverside, threadfin shad (*Dorosoma petenense*), western mosquitofish, suckermouth armored catfish, blue catfish, and channel catfish (*Ictalurus punctatus*). Abundance of juvenile inland silverside, threadfin shad, and suckermouth armored catfish was highest at Goff Bayou, whereas abundance of juvenile channel catfish was highest at the canal. Juvenile blue catfish were most abundant at GR-05.

Adult and juvenile fishes were much more abundant at night (4,477) than during afternoon samples (113). In fact, juveniles of several species (e.g., blue catfish, channel catfish, and suckermouth armored catfish) were only captured at night.

Seasonal trends in distribution of larval and juvenile fishes of several species are also apparent. For example, abundance of larval shad peaked in April, then gradually declined throughout the summer months. Juvenile blue catfish, which were not captured until late May, peaked in early July, and have not been captured since late July. Additionally, common carp larvae were only captured in the late March sample, whereas crappie larvae (*Pomoxis* spp.) were only taken in April. The final report will include a more thorough analysis of temporal trends in larval and juvenile fish abundance, once all ichthyoplankton data are collected. Tables including all raw ichthyoplankton data to date are presented in the Appendix.

Table 3-7. Number and relative abundance of juvenile and adult fishes captured during ichthyoplankton sampling from February-September 2008.

Common Name	Scientific Name	Goff		Canal		GR-05		Total	
		#	%	#	%	#	%	#	%
Gulf pipefish	*Syngnathus scovelli*	6	*0.1*	12	*4.9*			18	*0.4*
Inland silverside	*Menidia beryllina*	258	*6.2*	70	*28.3*	23	*12.8*	351	*7.6*
Pugnose minnow	*Opsopoeodus emiliae*	14	*0.3*	8	*3.2*			22	*0.5*
Bluefin killifish	*Lucania goodei*	1	*0.0*					1	*0.0*
Bullhead minnow	*Pimephales vigilax*	7	*0.2*	2	*0.8*			9	*0.2*
Naked goby	*Gobiosoma bosc*	2	*0.0*	1	*0.4*			3	*0.1*
Red shiner	*Cyprinella lutrensis*	21	*0.5*	26	*10.5*	2	*1.1*	49	*1.1*
Threadfin shad	*Dorosoma petenense*	264	*6.3*	4	*1.6*	3	*1.7*	271	*5.9*
Gizzard shad	*Dorosoma cepedianum*	41	*1.0*					41	*0.9*
Bay anchovy	*Anchoa mitchilli*	3423	*82.2*	3	*1.2*	2	*1.1*	3428	*74.7*
Western mosquitofish	*Gambusia affinis*	54	*1.3*	4	*1.6*	53	*29.6*	111	*2.4*
Tadpole madtom	*Noturus gyrinus*	1	*0.0*			2	*1.1*	3	*0.1*
Bluegill	*Lepomis macrochirus*					1	*0.6*	1	*0.0*
Channel catfish	*Ictalurus punctatus*	5	*0.1*	76	*30.8*			81	*1.8*
Blue catfish	*Ictalurus furcatus*	1	*0.0*			84	*46.9*	85	*1.9*
Sailfin molly	*Poecilia latipinna*	2	*0.0*			4	*2.2*	6	*0.1*
Armored catfish	*Pterygoplichthys anisitsi*	53	*1.3*	41	*16.6*	5	*2.8*	99	*2.2*
Gulf menhaden	*Brevoortia patronus*	11	*0.3*					11	*0.2*
TOTAL		**4164**		**247**		**179**		**4590**	

3.4 Benthic Invertebrates

3.4.1 Methods

Benthic macroinvertebrate samples were collected monthly at the five Guadalupe River stations beginning in April 2008. Sampling was conducted with a standard manually-operated Petite Ponar Dredge. Three sediment grabs were taken at each site-one along each bank and one in mid-river, and then composited into one sample. Samples were then filtered through a sieve bucket to remove excess silt. Once fine sediments had been rinsed from the sample, it was transferred to a 1 liter plastic sample bottle and preserved in 95% ethanol for later processing in the laboratory. In the laboratory, samples were sorted and identified to the lowest practical taxon with the aid of a digital zoom stereomicroscope.

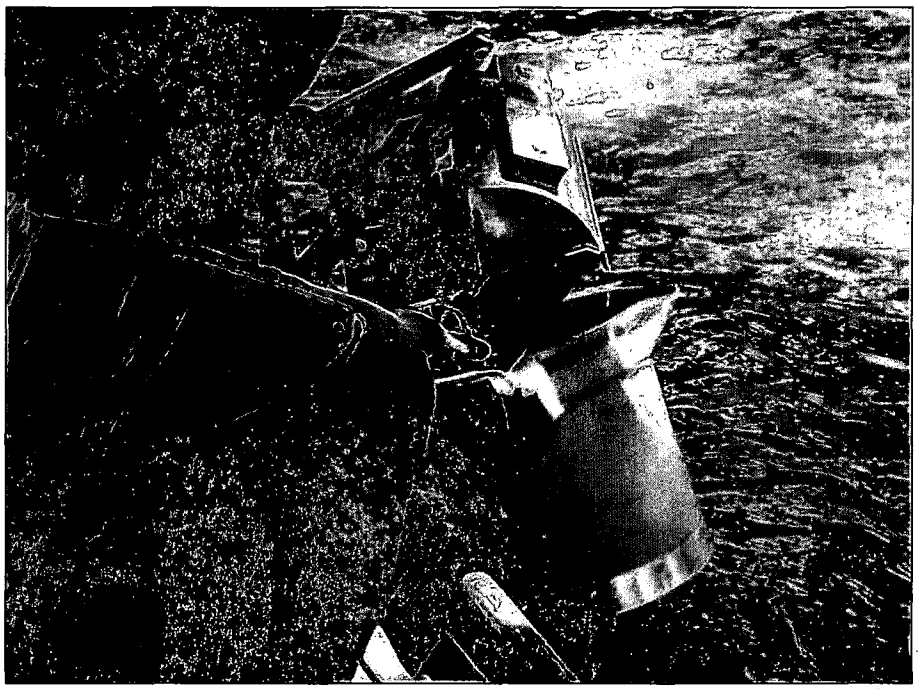

Figure 3-7. BIO-WEST personnel collecting benthic samples with the Petite Ponar dredge.

3.4.2 Results and Discussion

The number of each taxa collected, as well as their percent relative abundance at each site is presented in Table 3-8. One correction to the Mid-year Interim Report (BIO-WEST 2008c) should be noted. Two tiny crustaceans were originally identified as mysid shrimp (Family=Mysidae, Genus=*Mysis*) in the July interim report. However, upon further review of specimens and collection of additional individuals, these crustaceans were determined to be true shrimp of the family Palaemonidae (*Palaemonetes* spp.).

Two insect taxa are listed in the Texas Parks and Wildlife Departments (TPWD) Rare, Threatened, and Endangered Species of Texas database as potentially occurring in Victoria, Calhoun, Refugio, or Aransas counties: a mayfly (*Tortopus circumfluus*) and the Texas asaphomyian tabanid fly (*Asaphomyia texensis)* are both listed as rare. Aquatic life stages of the Tortopus mayfly were collected from GR-01 in April (four mayflies) and July (one mayfly), and from GR-02 in August (one mayfly). This mayfly is known to occur only in Victoria County.

Table 3-8. Invertebrate taxa collected from five sites on the lower Guadalupe River during April-September 2008.

Common Name	Family	Genus	GR-01		GR-02		GR-03		GR-04		GR-05		Total	
			#	%	#	%	#	%	#	%	#	%	#	%
Mayflies	Ephemeridae	*Hexagenia*	57	31.8	20	4.1	4	0.2	4	2.6	5	10.0	90	3.2
	Polymitarcyidae	*Tortopus*	6	3.4	1	0.2							7	0.2
	Caenidae	*Cercobrachys*	2	1.1			1	0.1					3	0.1
		Caenis	1	0.6			7	0.4			1	2.0	9	0.3
		Brachycercus	6	3.4									6	0.2
		Argia			1	0.2							1	0.0
	Palingeniidae	*Pentagenia vittegera*	4	2.2					3	1.9	1	2.0	8	0.3
	Baetidae	*Apobaetis*	1	0.6									1	0.0
Caddisflies	Leptoceridae	*Oecetis*	2	1.1	2	0.4	2	0.1	2	1.3			8	0.3
	Polycentropodidae	*Neureclipsis*					1	0.1					1	0.0
		Cyrnellus			1	0.2	3	0.2					4	0.1
	Hydroptilidae	*Hydroptila pupa*									1	2.0	1	0.0
		Neotrichia					3	0.2					1	0.0
Dragonflies	Gomphidae	*Gomphus*	4	2.2			2	0.1					6	0.2
		Dromogomphus			1	0.2							1	0.0
	Macromiidae	*Macromia*					1	0.1	1	0.6			2	0.1
Beetles	Scarabaeidae								1	0.6			1	0.0
	Elmidae	*Stenelmis*	4	2.2	3	0.6	8	0.4	2	1.3	6	12.0	23	0.8
		Dubiraphia	2	1.1									1	0.0
		Heterelmis	1	0.6			5	0.3					6	0.2
		Hexacylloepus			1	0.2					1	2.0	2	0.1
	Chrysomelidae				1	0.2							1	0.0
	Dryopidae	*Helichus*	1	0.6									1	0.0
Flies and midges	Ceratopogonidae	*Probezzia*	3	1.7			2	0.1					5	0.2
		Sphaeromias	5	2.8	2	0.4	1	0.1					8	0.3
		Culicoides									1	2.0	1	0.0
	Chironomidae	*Procladius*					1	0.1					1	0.0
		Ablabesmyia					3	0.2					3	0.1
		Microspectra	7	3.9									7	0.2
		Cryptochironomus	8	4.5	4	0.8	17	0.9	9	5.8			38	1.3
		Cryptotendipes							4	2.6			4	0.1
		Dicrotendipes			3	0.6							3	0.1
		Paracladopelma	1	0.6			1	0.1					2	0.1
		Polypedilum			3	0.6	6	0.3	2	1.3	1	2.0	12	0.4
		Chironomus			21	4.3	5	0.3					26	0.9
		Microchironomus			2	0.4	1	0.1					3	0.1
		Axarus					1	0.1	1	0.6	2	4.0	4	0.1
		Eukiefferiella			1	0.2							1	0.0
		Endochironomus	1	0.6									1	0.0
		Stictochironomus	2	1.1	6	1.2			5	3.2	1	2.0	14	0.5
		Xestochironomus					3	0.2					3	0.1
	Orthocladiinae	*Rheocricotopus*					1	0.1					1	0.0
		Cardiocladius							1	0.6			1	0.0
	Tanypodinae	*Larsia*	3	1.7									3	0.1
		Ablabesmyia			3	0.6	1	0.1					4	0.1
		Tanypus			7	1.4			2	1.3	1	2.0	10	0.4
		Coelotanypus			4	0.8							4	0.1
		Paramerina									2	4.0	2	0.1
	Tanytarsini	*Tanytarsus*					1	0.1	1	0.6			2	0.1
		Cladotanytarsus							3	1.9			3	0.1
Molluscs	Corbiculidae		9	5.0	6	1.2	14	0.7	13	8.4	3	6.0	45	1.6
	Hydrobiidae		45	25.1	392	80.2	1880	94.8	96	62.3	22	44.0	2435	85.3
	Ancylidae				1	0.2							1	0.0
	Unionidae		1	0.6	1	0.2	1	0.1					3	0.1
	Physidae		1	0.6					1	0.6			2	0.1
	Sphaeriidae						1	0.1	1	0.6			2	0.1
	Hirundea						3	0.2					3	0.1
	Planarian										1	2.0	1	0.0
	Marine Gastropod								1	0.6			1	0.0
Crustaceans	Palaemonidae	*Palaemonetes*	2	1.1	2	0.4			1	0.6			5	0.2
	Gammaridae	*Gammarus*					3	0.2			1	2.0	4	0.1
	Class: Branchiura						1	0.1					1	0.0
Segmented worms	*Annelids*		P		P		P		P		P		P	
Totals			179		489		1984		154		50		2856	

3.5 Water Quality

3.5.1 Methods

Water quality data were collected during monthly electrofishing trips at each of the seven sites. A YSI 6920 Data Sonde (Figure 3-10) was used to measure water temperature (°C), dissolved oxygen (mg/L), pH, specific conductance (µS/cm), and turbidity (NTU). In an effort to help explain differences in abundance of estuarine fishes between sites, salinity was also recorded beginning in May. At each site during each monthly electrofishing trip measurements were taken at the surface (1 m depth), at mid-depth, and at bottom. Data were recorded in a water-proof data book along with observation of time, river level, water clarity, and ambient conditions.

3.5.2 Results and Discussion

The lower Guadalupe River, Goff Bayou, and the GBRA Main Canal are naturally turbid systems with turbidity values ranging from 3.1-134 NTU (Table 3-7). Very little variation was evident based on depth, and no stratification was observed at any of the sites. The lack of stratification is not surprising with the strong current in the river and wind-mixing associated with the more shallow Goff Bayou and the GBRA Canal.

Considerable seasonal fluctuations in temperature are apparent. Water temperature increased from a low of 12° Celsius (C) in the river in January to over 30°C at several sites in June. Goff Bayou and the GBRA Canal had higher conductivities than the river sites. This may be a factor contributing to the presence of several estuarine species at these two sites. Conductivity tended to increase from upstream to downstream sites in the river. For example, GR-05 consistently exhibited higher conductivities than GR-01.

Dissolved oxygen (DO) levels identified throughout the study were sufficient to support healthy aquatic communities. However, as temperature increased during the study period, DO levels declined. The lowest DO level observed thus far was on a hot day in late August when DO at Goff Bayou dropped to 4.39 mg/L.

Table 3-9. Water quality data collected from five stations on the lower Guadalupe River, Goff Bayou, and the GBRA Main Canal during January-September 2008.

			Surface (1 m)						Mid-Depth						Bottom				
Date	Time	Site	Temperature (°C)	pH	Specific Conductance (µS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Temperature (°C)	pH	Specific Conductance (µS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Temperature (°C)	pH	Specific Conductance (µS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)
1/28/2008	12:51	GR-01	12.49	9.95	0.714	ND	12.94	15.1	12.48	9.94	0.715	ND	13.03	15.1	12.46	9.92	0.711	ND	12.91
1/28/2008	14:57	GR-02	12.61	9.39	0.737	ND	13.62	16.0	12.61	9.36	0.737	ND	13.68	15.3	12.62	9.32	0.738	ND	12.34
1/28/2008	16:20	GR-03	12.69	9.49	0.736	ND	12.09	14.3	12.68	9.49	0.737	ND	12.43	15.3	12.69	9.49	0.736	ND	11.28
1/29/2008	8:33	GR-04	14.99	9.43	0.893	ND	11.07	22.9	14.85	9.42	0.883	ND	10.96	23.2	14.60	9.41	0.912	ND	11.23
1/29/2008	10:22	GR-05	14.62	9.37	0.875	ND	7.86	21.9	14.60	9.36	0.882	ND	8.50	21.9	14.60	9.34	0.874	ND	10.33
1/29/2008	13:08	Goff Bayou	13.06	9.31	0.956	ND	8.92	36.5	12.13	9.31	1.743	ND	7.84	22.2	12.18	9.28	1.810	ND	7.58
1/29/2008	15:30	GBRA Canal	14.67	9.17	1.067	ND	6.82	47.4	14.67	9.17	1.067	ND	6.82	47.4	15.54	9.25	1.038	ND	6.22
2/21/2008	10:30	GR-01	17.24	8.15	0.648	ND	8.20	7.6	17.24	8.16	0.648	ND	8.17	7.9	17.24	8.17	0.647	ND	8.17
2/21/2008	11:55	GR-02	17.23	8.14	0.657	ND	8.04	7.2	17.23	8.15	0.657	ND	7.99	7.5	17.24	8.16	0.656	ND	7.83
2/21/2008	13:15	GR-03	17.24	8.13	0.696	ND	8.22	6.6	17.25	8.14	0.656	ND	8.27	6.9	17.25	8.16	0.656	ND	8.36
2/20/2008	10:55	GR-04	16.68	8.01	0.761	ND	8.00	8.6	16.67	8.01	0.761	ND	7.99	8.7	16.67	8.01	0.761	ND	8.10
2/20/2008	10:45	GR-05	16.73	8.03	0.825	ND	7.94	9.0	16.76	8.04	0.824	ND	7.96	8.5	16.74	8.05	0.812	ND	8.09
2/20/2008	13:40	Goff Bayou	17.12	7.82	0.778	ND	6.95	11.5	17.12	7.82	0.778	ND	6.95	11.5	17.01	7.82	0.781	ND	7.50
2/20/2008	16:40	GBRA Canal	17.92	7.85	0.782	ND	7.76	8.5	17.92	7.85	0.782	ND	7.75	8.5	17.92	7.85	0.782	ND	7.75
3/17/2008	11:48	GR-01	19.82	8.14	0.622	ND	9.37	128.0	19.82	8.14	0.619	ND	9.29	130.0	19.82	8.13	0.622	ND	9.66
3/17/2008	14:12	GR-02	20.28	8.16	0.637	ND	9.12	51.0	20.26	8.16	0.637	ND	9.09	54.4	20.27	8.16	0.637	ND	9.06
3/17/2008	15:50	GR-03	20.46	8.16	0.635	ND	7.05	52.8	20.46	8.17	0.635	ND	7.83	52.6	20.46	8.18	0.635	ND	9.29
3/18/2008	9:05	GR-04	20.87	7.95	0.762	ND	6.34	56.3	20.87	7.95	0.762	ND	6.53	58.0	20.87	7.95	0.761	ND	7.31
3/18/2008	11:00	GR-05	20.85	7.98	0.830	ND	6.52	53.7	20.85	7.98	0.829	ND	6.75	54.0	20.85	7.98	0.832	ND	7.25
3/19/2008	10:00	Goff Bayou	19.68	7.78	0.738	ND	6.55	58.2	19.68	7.78	0.738	ND	6.84	65.7	19.67	7.80	0.737	ND	7.30
3/18/2008	13:36	GRBA Canal	21.55	8.04	0.742	ND	5.81	75.2	21.55	8.04	0.742	ND	5.81	75.2	21.54	8.07	0.740	ND	6.78
4/14/2008	11:15	GR-01	21.31	8.27	0.653	ND	*	66.2	21.31	8.27	0.648	ND	*	65.9	21.30	8.27	0.655	ND	*
4/14/2008	13:45	GR-02	22.25	8.31	0.644	ND	*	70.1	22.22	8.31	0.644	ND	*	75.0	22.21	8.31	0.644	ND	*
4/14/2008	15:35	GR-03	22.51	8.31	0.640	ND	*	71.8	22.46	8.31	0.640	ND	*	71.0	22.49	8.34	0.639	ND	*
4/15/2008	9:14	GR-04	20.64	8.19	0.736	ND	8.64	60.9	20.64	8.19	0.737	ND	8.84	60.6	20.64	8.18	0.737	ND	8.66
4/15/2008	11:27	GR-05	20.65	8.19	0.838	ND	10.27	60.6	20.64	8.19	0.839	ND	9.42	62.0	20.63	8.19	0.842	ND	9.28
4/15/2008	14:30	Goff Bayou	22.26	8.12	0.837	ND	8.34	46.0	22.26	8.12	0.837	ND	8.34	46.0	22.07	8.12	0.837	ND	8.04
4/15/2008	17:03	GBRA Canal	23.72	8.15	0.839	ND	9.09	47.5	23.72	8.15	0.839	ND	9.09	47.5	23.35	8.13	0.841	ND	8.75
5/19/2008	12:13	GR-01	25.09	8.11	0.598	0.29	8.90	5.2	25.03	8.11	0.590	0.28	8.92	5.9	25.05	8.14	0.593	0.29	8.34
5/19/2008	14:48	GR-02	25.85	8.16	0.594	0.29	9.21	5.1	25.80	8.16	0.594	0.29	9.22	5.6	25.77	8.18	0.595	0.29	9.34
5/19/2008	16:20	GR-03	25.95	8.16	0.592	0.29	8.69	5.3	25.97	8.17	0.593	0.29	8.74	5.3	25.96	8.20	0.593	0.29	8.83
5/20/2008	8:45	GR-04	25.35	8.17	0.657	0.32	7.46	4.9	25.35	8.18	0.657	0.32	7.53	5.0	25.35	8.23	0.656	0.32	7.73
5/20/2008	10:08	GR-05	25.26	8.19	0.817	0.40	7.10	5.5	25.25	8.19	0.817	0.40	7.12	5.6	25.25	8.24	0.817	0.40	7.32
5/20/2008	12:30	Goff Bayou	26.55	8.10	0.834	0.41	7.05	3.1	26.44	8.09	0.833	0.41	7.00	3.4	25.92	8.07	0.834	0.41	6.41
5/20/2008	14:45	GBRA Canal	28.03	8.02	0.832	0.40	6.17	4.2	28.03	8.02	0.832	0.40	6.17	4.2	27.87	8.15	0.832	0.40	6.43

ND = no data collected

Table 3-9 (cont.). Water quality data collected from five stations on the lower Guadalupe River, Goff Bayou, and the GBRA Main Canal during January-September 2008.

			Surface (1 m)						Mid-Depth						Bottom					
Date	Time	Site	Temperature (˚C)	pH	Specific Conductance (µS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Temperature (˚C)	pH	Specific Conductance (µS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Turbidity (NTU)	Temperature (˚C)	pH	Specific Conductance (µS/cm)	Salinity (ppt)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
6/16/2008	12:30	GR-01	29.46	7.97	0.573	0.27	6.21	43.0	29.50	8.00	0.559	0.27	6.30	51.0	29.37	8.01	0.558	0.27	6.31	57.9
6/16/2008	14:45	GR-02	30.11	8.09	0.582	0.28	6.75	40.0	30.11	8.09	0.582	0.28	6.75	42.4	30.12	8.11	0.581	0.28	6.02	42.0
6/16/2008	15:50	GR-03	29.88	8.02	0.580	0.28	6.22	36.8	29.89	8.04	0.580	0.28	6.25	39.0	29.87	8.09	0.580	0.28	6.35	42.6
6/17/2008	9:05	GR-04	29.28	7.97	0.595	0.29	5.16	32.8	29.28	7.98	0.595	0.29	5.19	33.5	29.25	8.00	0.595	0.29	5.19	32.0
6/17/2008	8:00	GR-05	28.97	7.99	0.820	0.40	5.16	38.7	28.97	8.01	0.820	0.40	5.19	40.3	28.96	8.11	0.819	0.40	5.35	40.9
6/17/2008	11:20	Goff Bayou	29.21	7.95	0.845	0.41	4.97	31.0	29.22	7.96	0.845	0.41	4.96	44.0	29.12	7.98	0.845	0.41	4.91	48.5
6/17/2008	13:00	GBRA Canal	30.39	7.86	0.870	0.42	4.97	35.5	30.39	7.86	0.870	0.42	4.97	35.5	30.34	7.92	0.868	0.42	5.10	50.0
7/14/2008	14:24	GR-01	29.54	8.33	0.563	0.27	7.47	10	29.51	8.35	0.563	0.27	7.46	10.8	29.49	8.38	0.563	0.27	7.51	12.6
7/14/2008	12:40	GR-02	29.46	8.34	0.549	0.26	7.51	8.6	29.46	8.35	0.549	0.26	7.52	9.6	29.33	8.38	0.549	0.26	7.45	12.3
7/14/2008	11:15	GR-03	28.77	8.22	0.547	0.26	6.35	8.7	28.77	8.25	0.547	0.26	6.37	8.6	28.76	8.33	0.548	0.26	6.38	8.6
7/15/2008	11:34	GR-04	29.17	8.33	0.562	0.27	6.5	7.2	29.17	8.37	0.563	0.27	6.49	7.4	29.17	8.49	0.565	0.27	6.82	7.7
7/15/2008	13:17	GR-05	29.12	8.14	0.776	0.38	6.28	9.5	29.07	8.16	0.775	0.38	6.29	10.4	29.06	8.2	0.777	0.38	6.36	10.5
7/15/2008	9:31	Goff Bayou	28.86	8.7	0.858	0.42	6.22	11.4	28.77	8.26	0.859	0.42	5.97	13	28.75	8.28	0.859	0.42	5.95	15.8
7/15/2008	7:51	GBRA Canal	28.1	8.14	0.881	0.43	4.83	7.6	28.1	8.11	0.882	0.43	4.63	7.3	28.1	8.18	0.881	0.43	4.78	8
8/18/2008	11:20	GR-01	27.36	8.29	0.542	0.26	8.8	53.4	27.33	8.33	0.533	0.26	8.86	56.1	27.32	8.64	0.532	0.26	9.28	69.8
8/19/2008	9:13	GR-02	26.56	8.16	0.494	0.24	6.74	72.2	26.56	8.19	0.494	0.24	6.94	77.6	26.57	8.29	0.495	0.24	6.96	81.8
8/19/2008	10:29	GR-03	26.63	8.08	0.526	0.25	6.7	70.3	26.63	8.09	0.526	0.25	6.69	70.5	26.64	8.11	0.526	0.25	7.01	72.9
8/19/2008	12:16	GR-04	26.67	8.1	0.519	0.25	6.37	64.5	26.67	8.14	0.529	0.25	6.57	63	26.66	8.25	0.582	0.25	6.99	62.5
8/18/2008	2:15	GR-05	27.7	8.16	0.764	0.37	7.87	50.4	27.7	8.17	0.764	0.37	7.92	55.4	27.7	8.19	0.766	0.37	7.95	77
8/19/2008	7:12	GBRA Canal	25.43	7.81	0.792	0.39	6.16	52.6	25.49	7.96	0.794	0.39	6.17	51.4	25.47	7.93	0.794	0.39	6.35	53.6
8/20/2008	9:20	Goff Bayou	25.96	7.9	0.762	0.37	4.76	51.8	25.96	7.92	0.762	0.37	4.87	66.7	25.97	7.96	0.762	0.37	4.39	90.6
9/16/2008	11:42	GR-01	23.86	8.52	0.412	0.2	7.73	50.4	23.83	8.63	0.41	0.2	7.73	53	23.83	8.86	0.406	0.19	7.69	54.5
9/16/2008	13:38	GR-02	25.28	8.18	0.435	0.21	7.32	46.4	25.22	8.27	0.437	0.21	7.39	53	25.22	8.44	0.439	0.21	7.78	61.5
9/16/2008	15:18	GR-03	25.53	8.09	0.461	0.22	7.19	40.03	25.52	8.14	0.462	0.22	7.24	41	25.58	8.23	0.561	0.22	7.45	41.9
9/17/2008	8:26	GR-04	24.51	8.28	0.461	0.22	6.85	31.2	24.51	8.36	0.46	0.22	6.89	30.7	24.51	8.46	0.46	0.22	6.99	31.1
9/17/2008	9:42	GR-05	24.21	8.17	0.738	0.36	7.48	36.5	24.21	8.2	7.38	0.36	7.51	37.1	24.19	8.26	0.737	0.36	7.84	37.8
9/17/2008	14:08	Goff Bayou	25.53	8.03	1.385	0.69	7.22	30.5	24.57	7.97	1.523	0.76	5.24	38.4	24.5	8.05	1.568	0.79	5.24	44

ND = no data collected

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Appendix A
Ichthyoplankton Data

Table A-1. Number and density (#/100m^3) of larval fishes collected at Goff Bayou from February-September, 2008.

Date	Time	Depth	Shad spp.		Inland silverside		Pugnose minnow		Red shiner		Bluefin killifish		Crappie spp.		Sunfish spp.		Naked goby		Bay anchovy		Largemouth bass	
			#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^4	#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^3
Feb. 21-22	Day	Surface	1	1.5																		
Feb. 21-22	Day	Mid																				
Feb. 21-22	Night	Surface																				
Feb. 21-22	Night	Mid																				
Mar. 4-5	Day	Surface	44	47.3																		
Mar. 4-5	Day	Mid	84	99.5																		
Mar. 4-5	Night	Surface	5	8.5																		
Mar. 4-5	Night	Mid	8	11.4	1	1.4																
Mar. 19-20	Day	Surface	32	25.1	2	1.6																
Mar. 19-20	Day	Mid	119	153.0	1	1.3																
Mar. 19-20	Night	Surface	8	11.0	1	1.4																
Mar. 19-20	Night	Mid	16	18.1	1	1.1					1	1.1										
Apr. 1-2	Day	Surface	219	372.1									1	1.7								
Apr. 1-2	Day	Mid	624	1103.6											1	1.8						
Apr. 1-2	Night	Surface	34	77.3	3	6.8							4	9.1								
Apr. 1-2	Night	Mid	362	813.3	1	2.2							10	22.5								
Apr. 16-17	Day	Surface	19	25.4	2	2.7																
Apr. 16-17	Day	Mid	61	71.7																		
Apr. 16-17	Night	Surface	22	23.5	5	5.3							2	2.1	1	1.1						
Apr. 16-17	Night	Mid	10	12.9	2	2.6							2	2.6	1	1.3						
May 8-9	Day	Surface																				
May 8-9	Day	Mid	5	3.5																		
May 8-9	Night	Surface	1	1.1	65	69.7																
May 8-9	Night	Mid			3	3.4	1	1.1														
May 21-22	Day	Surface	19	15.5	2	1.6									1	0.8						
May 21-22	Day	Mid	1	0.9							2	1.7										
May 21-22	Night	Surface	13	10.5	8	6.5					1	0.8										
May 21-22	Night	Mid	3	2.8	1	0.9																
Jun. 5-6	Day	Surface	5	4.2	1	0.8									2	1.7						
Jun. 5-6	Day	Mid	4	3.9											2	2.0						
Jun. 5-6	Night	Surface	5	4.0	2	1.6																
Jun. 5-6	Night	Mid	1	0.9	2	1.7																
Jun. 18-19	Day	Surface	4	3.4	1	0.9									2	1.7						
Jun. 18-19	Day	Mid	2	1.8																		
Jun. 18-19	Night	Surface																				
Jun. 18-19	Night	Mid																				
July 2-3	Night	Surface			25	19.0			1	0.8												
July 2-3	Night	Mid			5	4.3																
July 2-3	Day	Surface	4	2.8																		
July 2-3	Day	Mid	2	1.5																		
July 16-17	Day	Surface	20	16.4	3	2.5									15	12.3						
July 16-17	Day	Mid	6	4.8											1	0.8						
July 16-17	Night	Surface			10	8.9																
July 16-17	Night	Mid	2	1.8											3	2.7						
Aug. 20-21	Day	Surface			7	5.9									2	1.7						
Aug. 20-21	Day	Mid	12	10.6											5	4.4						
Aug. 20-21	Night	Surface	1	0.9																		
Aug. 20-21	Night	Mid	4	3.6	1	0.9															1	0.9
Sept. 17-18	Night	Surface																				
Sept. 17-18	Night	Mid															3	2.48				
Sept. 17-18	Day	Surface	1	0.8																		
Sept. 17-18	Day	Mid	1	0.8															1	0.8		

Table A-2. Number and density (#/100m^3) of larval fishes collected at the GBRA Canal from February-September, 2008.

Date	Time	Depth	Shad spp.		Inland silverside		Common carp		Pugnose minnow		Red shiner		Bluefin killifish		Sunfish spp.	
			#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^4	#	#/100m^3	#	#/100m^3
Feb. 21-22	Day	Surface														
Feb. 21-22	Day	Mid														
Feb. 21-22	Night	Surface														
Feb. 21-22	Night	Mid														
Mar. 4-5	Day	Mid														
Mar. 4-5	Day	Surface	1	**1.1**												
Mar. 4-5	Night	Surface														
Mar. 4-5	Night	Mid														
Mar. 19-20	Day	Surface	5	**3.4**									1	**0.7**		
Mar. 19-20	Day	Mid			2	**1.5**	1	**0.8**								
Mar. 19-20	Night	Surface	1	**1.4**					1	**1.4**						
Mar. 19-20	Night	Mid	3	**4.4**	1	**1.5**										
Apr. 1-2	Day	Surface	5	**10.9**												
Apr. 1-2	Day	Mid	2	**4.5**	2	**4.5**									3	**6.8**
Apr. 1-2	Night	Surface			1	**2.5**										
Apr. 1-2	Night	Mid	1	**2.5**												
Apr. 16-17	Day	Surface	1	**1.4**												
Apr. 16-17	Day	Mid	1	**1.2**												
Apr. 16-17	Night	Surface														
Apr. 16-17	Night	Mid							1	**0.9**						
May 8-9	Day	Surface														
May 8-9	Day	Mid													1	**1.3**
May 8-9	Night	Surface			3	**3.0**										
May 8-9	Night	Mid														
May 21-22	Day	Surface														
May 21-22	Day	Mid	1	**0.8**												
May 21-22	Night	Surface														
May 21-22	Night	Mid			1	**0.9**										
Jun. 5-6	Day	Surface			2	**1.7**										
Jun. 5-6	Day	Mid														
Jun. 5-6	Night	Surface														
Jun. 5-6	Night	Mid														
Jun. 18-19	Day	Surface														
Jun. 18-19	Day	Mid														
Jun. 18-19	Night	Surface														
Jun. 18-19	Night	Mid														
July 2-3	Night	MId														
July 2-3	Night	Surface														
July 2-3	Day	Surface														
July 2-3	Day	Mid														
July 16-17	Day	Surface														
July 16-17	Day	Mid														
July 16-17	Night	Surface													1	**0.9**
July 16-17	Night	Mid														
Aug. 20-21	Day	Surface													6	**5.8**
Aug. 20-21	Day	Mid													8	**7.4**
Aug. 20-21	Night	Surface							2	**1.9**	1	**1.0**				
Aug. 20-21	Night	Mid													1	**0.8**

Table A-3. Number and density (#/100m^3) of larval fishes collected at GR-05 from February-September, 2008.

Date	Time	Depth	Shad spp.		Inland silverside		Common carp		Red shiner		Sunfish spp.	
			#	#/100m^3	#	#/100m^3	#	#/100m^3	#	#/100m^4	#	#/100m^3
Feb. 21-22	Day	Surface										
Feb. 21-22	Day	Mid										
Feb. 21-22	Night	Surface										
Feb. 21-22	Night	Mid										
Mar. 4-5	Day	Surface										
Mar. 4-5	Day	Mid										
Mar. 4-5	Night	Surface										
Mar. 4-5	Night	Mid										
Mar. 19-20	Day	Surface	1	0.6			2	1.2				
Mar. 19-20	Day	Mid					3	1.6				
Mar. 19-20	Night	Surface					6	4.8				
Mar. 19-20	Night	Mid					7	4.7				
Apr. 1-2	Day	Surface										
Apr. 1-2	Day	Mid										
Apr. 1-2	Night	Surface			1	1.4						
Apr. 1-2	Night	Mid										
Apr. 16-17	Day	Surface										
Apr. 16-17	Day	Mid										
Apr. 16-17	Night	Surface										
Apr. 16-17	Night	Mid										
May 8-9	Day	Surface										
May 8-9	Day	MId										
May 8-9	Night	Surface										
May 8-9	Night	Mid										
May 21-22	Day	Surface			2	1.8						
May 21-22	Day	Mid										
May 21-22	Night	Surface										
May 21-22	Night	Mid										
Jun. 5-6	Day	Surface										
Jun. 5-6	Day	Mid										
Jun. 5-6	Night	Surface										
Jun. 5-6	Night	Mid										
Jun. 18-19	Day	Surface										
Jun. 18-19	Day	Mid										
Jun. 18-19	Night	Surface										
Jun. 18-19	Night	Mid										
July 2-3	Night	Surface										
July 2-3	Night	Mid										
July 2-3	Day	Surface										
July 2-3	Day	Mid										
July 16-17	Day	Surface										
July 16-17	Day	Mid										
July 16-17	Night	Surface										
July 16-17	Night	Mid										
Aug. 20-21	Day	Surface										
Aug. 20-21	Day	Mid										
Aug. 20-21	Night	Surface							1	0.7	1	0.7
Aug. 20-21	Night	Mid										
Sept. 17-18	Night	Surface										
Sept. 17-18	Night	Mid										
Sept. 17-18	Day	Surface										
Sept. 17-18	Day	Mid										

Table A-4. Abundance of adult and juvenile fishes collected during ichthyoplankton sampling at Goff Bayou during February-September, 2008.

Date	Time	Depth	Gulf pipefish	Inland silverside	Pugnose minnow	Bluefin killifish	Bullhead minnow	Naked goby	Red shiner	Threadfin shad	Gizzard shad	Bay anchovy	Western mosquitofish	Tadpole madtom	Channel catfish	Blue catfish	Sailfin molly	Armored catfish	Gulf menhaden
Feb. 21-22	Day	Surface																	
Feb. 21-22	Day	Mid																	
Feb. 21-22	Night	Surface			3				1	2		3							
Feb. 21-22	Night	Mid			3					3		1							
Mar. 4-5	Day	Surface		2					5										
Mar. 4-5	Day	Mid							1										
Mar. 4-5	Night	Surface								1		2							
Mar. 4-5	Night	Mid			4				1	12									
Mar. 19-20	Day	Surface				1								1					
Mar. 19-20	Day	Mid											1						
Mar. 19-20	Night	Surface		4					3	1									
Mar. 19-20	Night	Mid																	
Apr. 1-2	Day	Surface																	
Apr. 1-2	Day	Mid																	
Apr. 1-2	Night	Surface																	
Apr. 1-2	Night	Mid																	
Apr. 16-17	Day	Surface		1							5								
Apr. 16-17	Day	Mid									11								
Apr. 16-17	Night	Surface	1	21					3		6								
Apr. 16-17	Night	Mid		3							13								
May 8-9	Day	Surface											1						
May 8-9	Day	Mid																	
May 8-9	Night	Surface		14							4								
May 8-9	Night	Mid						1		4	1	1							
May 21-22	Day	Surface		23									1						
May 21-22	Day	Mid																	
May 21-22	Night	Surface		67				1		4					1				
May 21-22	Night	Mid	1	7						4					1				
Jun. 5-6	Day	Surface											1				1		
Jun. 5-6	Day	Mid	1																
Jun. 5-6	Night	Surface	1	21						5			3					5	
Jun. 5-6	Night	Mid	2	7			2			19	1		1				1	3	
Jun. 18-19	Day	Surface																	
Jun. 18-19	Day	Mid																	
Jun. 18-19	Night	Surface		12						1			4		1				
Jun. 18-19	Night	Mid		3	1					4					1				
July 2-3	Night	Surface		20			1		2	29			6					14	4
July 2-3	Night	Mid		7	1		3		3	79					1			17	7
July 2-3	Day	Surface		4									4						
July 2-3	Day	Mid		2									1						
July 16-17	Day	Surface																	
July 16-17	Day	Mid																	
July 16-17	Night	Surface		8						3			4			1		3	
July 16-17	Night	Mid		2	2		1			3								7	
Aug. 20-21	Day	Surface		4									11						
Aug. 20-21	Day	Mid		3						1									
Aug. 20-21	Night	Surface		4						9			11					1	
Aug. 20-21	Night	Mid								59			3					3	
Sept. 17-18	Night	Surface		10					1	2		606	2						
Sept. 17-18	Night	Mid		3					1	19		2808							
Sept. 17-18	Day	Surface		6								1							
Sept. 17-18	Day	Mid										1							

Table A-5. Abundance of adult and juvenile fishes collected during ichthyoplankton sampling at the GBRA Canal during February-September, 2008.

Date	Time	Depth	Gulf pipefish	Inland silverside	Pugnose minnow	Bullhead minnow	Naked goby	Red shiner	Threadfin shad	Bay anchovy	Western mosquitofish	Channel catfish	Armored catfish
Feb. 21-22	Day	Surface											
Feb. 21-22	Day	Mid											
Feb. 21-22	Night	Surface						1					
Feb. 21-22	Night	Mid			2								
Mar. 4-5	Day	Mid						2					
Mar. 4-5	Day	Surface		2				1					
Mar. 4-5	Night	Surface	1	12	1	1		1	1		1		
Mar. 4-5	Night	Mid		7	2			5		1			
Mar. 19-20	Day	Surface	2	1									
Mar. 19-20	Day	Mid											
Mar. 19-20	Night	Surface	1					5		1			
Mar. 19-20	Night	Mid	2		3	1		1		1			
Apr. 1-2	Day	Surface											
Apr. 1-2	Day	Mid											
Apr. 1-2	Night	Surface	4	1									
Apr. 1-2	Night	Mid	1					1					
Apr. 16-17	Day	Surface											
Apr. 16-17	Day	Mid											
Apr. 16-17	Night	Surface		2									
Apr. 16-17	Night	Mid		2				2					
May 8-9	Day	Surface											
May 8-9	Day	Mid											
May 8-9	Night	Surface		3				1				15	
May 8-9	Night	Mid		3								8	
May 21-22	Day	Surface		2									
May 21-22	Day	Mid											
May 21-22	Night	Surface		6					1				
May 21-22	Night	Mid		6				1					
Jun. 5-6	Day	Surface											
Jun. 5-6	Day	Mid											
Jun. 5-6	Night	Surface		2							1	1	5
Jun. 5-6	Night	Mid											2
Jun. 18-19	Day	Surface											
Jun. 18-19	Day	Mid											
Jun. 18-19	Night	Surface		3				1				2	1
Jun. 18-19	Night	Mid		1				1				4	
July 2-3	Night	Mid		1				1				1	2
July 2-3	Night	Surface		5					2			5	2
July 2-3	Day	Surface											
July 2-3	Day	Mid		1									
July 16-17	Day	Surface		1									
July 16-17	Day	Mid											
July 16-17	Night	Surface										3	3
July 16-17	Night	Mid		3			1					8	12
Aug. 20-21	Day	Surface											
Aug. 20-21	Day	Mid											
Aug. 20-21	Night	Surface	1	6							2	4	
Aug. 20-21	Night	Mid						2				25	14

Table A-6. Abundance of adult and juvenile fishes collected during ichthyoplankton sampling at GR-05 during February-September, 2008.

Date	Time	Depth	Inland silverside	Red shiner	Bay anchovy	Western mosquitofish	Tadpole madtom	Bluegill	Blue catfish	Sailfin molly	Armored catfish	Threadfin shad
Feb. 21-22	Day	Surface										
Feb. 21-22	Day	Mid										
Feb. 21-22	Night	Surface										
Feb. 21-22	Night	Mid										
Mar. 4-5	Day	Surface										
Mar. 4-5	Day	Mid										
Mar. 4-5	Night	Surface										
Mar. 4-5	Night	Mid										
Mar. 19-20	Day	Surface										
Mar. 19-20	Day	Mid										
Mar. 19-20	Night	Surface										
Mar. 19-20	Night	Mid										
Apr. 1-2	Day	Surface										
Apr. 1-2	Day	Mid										
Apr. 1-2	Night	Surface				1						
Apr. 1-2	Night	Mid						1				
Apr. 16-17	Day	Surface										
Apr. 16-17	Day	Mid										
Apr. 16-17	Night	Surface	1									
Apr. 16-17	Night	Mid										
May 8-9	Day	Surface	2			1						
May 8-9	Day	MId										
May 8-9	Night	Surface	3			9						
May 8-9	Night	Mid										
May 21-22	Day	Surface	3									
May 21-22	Day	Mid										
May 21-22	Night	Surface	8	1		25			7	2		
May 21-22	Night	Mid	1			3	1		1			
Jun. 5-6	Day	Surface										
Jun. 5-6	Day	Mid										
Jun. 5-6	Night	Surface	3			9	1		14	2		1
Jun. 5-6	Night	Mid			2	1			2			2
Jun. 18-19	Day	Surface										
Jun. 18-19	Day	Mid										
Jun. 18-19	Night	Surface		1		1			3			
Jun. 18-19	Night	Mid							3			
July 2-3	Night	Surface				1			41		1	
July 2-3	Night	Mid				1			5		1	
July 2-3	Day	Surface										
July 2-3	Day	Mid										
July 16-17	Day	Surface	1									
July 16-17	Day	Mid										
July 16-17	Night	Surface	1						7		1	
July 16-17	Night	Mid							1		2	
Aug. 20-21	Day	Surface										
Aug. 20-21	Day	Mid										
Aug. 20-21	Night	Surface										
Aug. 20-21	Night	Mid										
Sept. 17-18	Night	Surface				1						
Sept. 17-18	Night	Mid										
Sept. 17-18	Day	Surface										
Sept. 17-18	Day	Mid										

Table A-7. Density (#/100m^3) of juvenile and adult fishes collected at Goff Bayou during February-September, 2008.

Sample	Time	Depth	Gulf pipefish	Inland silverside	Pugnose minnow	Bluefin killifish	Bullhead minnow	Naked goby	Red shiner	Threadfin shad	Gizzard shad	Bay anchovy	Western mosquitofish	Tadpole madtom	Channel catfish	Blue catfish	Sailfin molly	Armored catfish	Gulf menhaden
Feb. 21-22	Day	Surface																	
Feb. 21-22	Day	Mid																	
Feb. 21-22	Night	Surface			4.4				1.5	2.9		4.4							
Feb. 21-22	Night	Mid			4.9					4.9		1.6							
Mar. 4-5	Day	Surface		2.2					5.4										
Mar. 4-5	Day	Mid							1.2										
Mar. 4-5	Night	Surface								1.7		3.4							
Mar. 4-5	Night	Mid			5.7				1.4	17.2									
Mar. 19-20	Day	Surface				0.8								0.8					
Mar. 19-20	Day	Mid											1.3						
Mar. 19-20	Night	Surface		5.5					4.1	1.4									
Mar. 19-20	Night	Mid																	
Apr. 1-2	Day	Surface																	
Apr. 1-2	Day	Mid																	
Apr. 1-2	Night	Surface																	
Apr. 1-2	Night	Mid																	
Apr. 16-17	Day	Surface		1.3							6.7								
Apr. 16-17	Day	Mid									12.9								
Apr. 16-17	Night	Surface	1.1	22.4					3.2		6.4								
Apr. 16-17	Night	Mid		3.9							16.8								
May 8-9	Day	Surface											1.4						
May 8-9	Day	Mid																	
May 8-9	Night	Surface		15.0							4.3								
May 8-9	Night	Mid						1.1		4.6	1.1	1.1							
May 21-22	Day	Surface		18.8									0.8						
May 21-22	Day	Mid																	
May 21-22	Night	Surface		54.2				0.8		3.2					0.8				
May 21-22	Night	Mid	0.9	6.6						3.8					0.9				
Jun. 5-6	Day	Surface											0.8				0.8		
Jun. 5-6	Day	Mid	1.0																
Jun. 5-6	Night	Surface	0.8	16.9						4.0			2.4					4.0	
Jun. 5-6	Night	Mid	1.7	6.1			1.7			16.5	0.9		0.9				0.9	2.6	
Jun. 18-19	Day	Surface																	
Jun. 18-19	Day	Mid																	
Jun. 18-19	Night	Surface		10.3						0.9			3.4		0.9				
Jun. 18-19	Night	Mid		3.0	1.0					4.0					1.0				
July 2-3	Night	Surface		15.2			0.8		1.5	22.0			4.6					10.6	3.0
July 2-3	Night	Mid		6.0	0.9		2.6		2.6	67.4					0.9			14.5	6.0
July 2-3	Day	Surface		2.8									2.8						
July 2-3	Day	Mid		1.5									0.8						
July 16-17	Day	Surface																	
July 16-17	Day	Mid																	
July 16-17	Night	Surface		7.1						2.7			3.6			0.9		2.7	
July 16-17	Night	Mid		1.8	1.8		0.9			2.7								6.3	
Aug. 20-21	Day	Surface		3.4									9.2						
Aug. 20-21	Day	Mid		2.7						0.9									
Aug. 20-21	Night	Surface		3.6						8.1			9.9					0.9	
Aug. 20-21	Night	Mid								52.9			2.7					2.7	
Sept. 17-18	Night	Surface		8.0					0.8	1.6		487.1	1.6						
Sept. 17-18	Night	Mid		2.5					0.8	15.7		2321.3							
Sept. 17-18	Day	Surface		4.7								0.8							
Sept. 17-18	Day	Mid										0.8							

Table A-8. Density (#/100m^3) of juvenile and adult fishes collected at the GBRA Canal during February-September, 2008.

Sample	Time	Depth	Gulf pipefish	Inland silverside	Pugnose minnow	Bullhead minnow	Naked goby	Red shiner	Threadfin shad	Bay anchovy	Western mosquitofish	Channel catfish	Armored catfish
Feb. 21-22	Day	Surface											
Feb. 21-22	Day	Mid											
Feb. 21-22	Night	Surface						1.4					
Feb. 21-22	Night	Mid			2.5								
Mar. 4-5	Day	Mid						2.2					
Mar. 4-5	Day	Surface		2.2				1.1					
Mar. 4-5	Night	Surface	1.1	13.0	1.1	1.1		1.1	1.1		1.1		
Mar. 4-5	Night	Mid		9.0	2.6			6.5		1.3			
Mar. 19-20	Day	Surface	1.4	0.7									
Mar. 19-20	Day	Mid											
Mar. 19-20	Night	Surface	1.4					7.2		1.4			
Mar. 19-20	Night	Mid	3.0		4.4	1.5		1.5		1.5			
Apr. 1-2	Day	Surface											
Apr. 1-2	Day	Mid											
Apr. 1-2	Night	Surface	9.8	2.5									
Apr. 1-2	Night	Mid	2.5					2.5					
Apr. 16-17	Day	Surface											
Apr. 16-17	Day	Mid											
Apr. 16-17	Night	Surface		1.7									
Apr. 16-17	Night	Mid		1.7				1.7					
May 8-9	Day	Surface											
May 8-9	Day	Mid											
May 8-9	Night	Surface		3.0				1.0				15.1	
May 8-9	Night	Mid		3.2								8.4	
May 21-22	Day	Surface		1.8									
May 21-22	Day	Mid											
May 21-22	Night	Surface		5.8					1.0				
May 21-22	Night	Mid		5.4				0.9					
Jun. 5-6	Day	Surface											
Jun. 5-6	Day	Mid											
Jun. 5-6	Night	Surface		1.9							1.0	1.0	4.8
Jun. 5-6	Night	Mid											1.9
Jun. 18-19	Day	Surface											
Jun. 18-19	Day	Mid											
Jun. 18-19	Night	Surface		2.7				0.9				1.8	0.9
Jun. 18-19	Night	Mid		0.9				0.9				3.6	
July 2-3	Night	MId		0.8				0.8				0.8	1.6
July 2-3	Night	Surface		4.4					1.8			4.4	1.8
July 2-3	Day	Surface											
July 2-3	Day	Mid		0.8									
July 16-17	Day	Surface		0.9									
July 16-17	Day	Mid											
July 16-17	Night	Surface										2.7	2.7
July 16-17	Night	Mid		2.3			0.8					6.3	9.4
Aug. 20-21	Day	Surface											
Aug. 20-21	Day	Mid											
Aug. 20-21	Night	Surface	1.0	5.7							1.9	3.8	
Aug. 20-21	Night	Mid						1.6				19.9	11.2

Table A-9. Density (#/100m^3) of juvenile and adult fishes collected at GR-05 during February-September, 2008.

Sample	Time	Depth	Inland silverside	Red shiner	Bay anchovy	Western mosquitofish	Tadpole madtom	Bluegill	Blue catfish	Sailfin molly	Armored catfish	Threadfin shad
Feb. 21-22	Day	Surface										
Feb. 21-22	Day	Mid										
Feb. 21-22	Night	Surface										
Feb. 21-22	Night	Mid										
Mar. 4-5	Day	Surface										
Mar. 4-5	Day	Mid										
Mar. 4-5	Night	Surface										
Mar. 4-5	Night	Mid										
Mar. 19-20	Day	Surface										
Mar. 19-20	Day	Mid										
Mar. 19-20	Night	Surface										
Mar. 19-20	Night	Mid										
Apr. 1-2	Day	Surface										
Apr. 1-2	Day	Mid										
Apr. 1-2	Night	Surface				1.4						
Apr. 1-2	Night	Mid						1.6				
Apr. 16-17	Day	Surface										
Apr. 16-17	Day	Mid										
Apr. 16-17	Night	Surface	1.1									
Apr. 16-17	Night	Mid										
May 8-9	Day	Surface	2.4			1.2						
May 8-9	Day	MId										
May 8-9	Night	Surface	4.5			13.6						
May 8-9	Night	Mid										
May 21-22	Day	Surface	2.7									
May 21-22	Day	Mid										
May 21-22	Night	Surface	7.1	0.9		22.2			6.2	1.8		
May 21-22	Night	Mid	0.9			2.7	0.9		0.9			
Jun. 5-6	Day	Surface										
Jun. 5-6	Day	Mid										
Jun. 5-6	Night	Surface	2.1			6.4	0.7		9.9	1.4		0.7
Jun. 5-6	Night	Mid			1.9	1.0			1.9			1.9
Jun. 18-19	Day	Surface										
Jun. 18-19	Day	Mid										
Jun. 18-19	Night	Surface		0.8		0.8			2.4			
Jun. 18-19	Night	Mid							3.0			
July 2-3	Night	Surface				0.8			33.2		0.8	
July 2-3	Night	Mid				0.9			4.6		0.9	
July 2-3	Day	Surface										
July 2-3	Day	Mid										
July 16-17	Day	Surface	0.8									
July 16-17	Day	Mid										
July 16-17	Night	Surface	0.9						6.3		0.9	
July 16-17	Night	Mid							0.9		1.8	
Aug. 20-21	Day	Surface										
Aug. 20-21	Day	Mid										
Aug. 20-21	Night	Surface										
Aug. 20-21	Night	Mid										
Sept. 17-18	Night	Surface				0.9						
Sept. 17-18	Night	Mid										
Sept. 17-18	Day	Surface										
Sept. 17-18	Day	Mid										

Enclosure 4

US Fish and Wildlife Service letter dated October 3, 2008

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
c/o TAMU-CC, Campus Box 338
6300 Ocean Drive
Corpus Christi, Texas 78412

October 03, 2008

Joshua Trembley
Exelon Nuclear
200 Excelon Way, KSA 3-E
Kennett Square, PA 19348

Consultation Number 21410-2008-TA-0335

Dear Mr. Trembley:

Thank you for your inquiry to the U.S. Fish and Wildlife (Service) about a proposed nuclear plant to be sited approximately 13 miles south of Victoria, Victoria County, Texas. This involves the construction and operation of two new 1600 megawatt generating units and supporting facilities in about a 300 acre area in the northwest part of the approximately 11,000-acre site. Construction of the units may take eight and half years with associated offsite infrastructure, including a heavy-haul road from the plant to the barge slip on the Victoria Barge Canal. The barge slip would accommodate delivery of large components for the nuclear units. The road would traverse undeveloped land, Black Bayou, and the Guadalupe River (via a newly constructed bridge). A pipeline for discharging plant effluent to the Guadalupe River would parallel the heavy-haul road then turn south along the river.

A 4,800-acre cooling reservoir will also be built on the site with water purchased from the Guadalupe-Blanco River Authority (GBRA). Water would be obtained from the Calhoun Canal, southeast of Green Lake via a newly constructed pipeline. The ultimate source of the water would be the Guadalupe River. The construction of an approximately 1,300-acre water storage basin east of and adjacent to the proposed 4,800-acre cooling reservoir is also planned and the storage basin and associated pipeline would be operated by the GBRA. It may also be necessary to build at least two new electrical transmission lines, including a west-running line that would extend to the Coleto Creek Reservoir area of Goliad County and a northeast-running line that would pass through Calhoun, Jackson, Wharton, and Matagorda counties.

We are providing the following information to assist consultants and/cr federal action agencies assess and avoid impacts to federally listed threatened and endangered species, their habitat, migratory birds and designated wetlands.

Federally Listed Species

Your review included a 50-mile radius as shown on Figure 1.0, therefore, we have enclosed an updated list of federally listed or proposed threatened and endangered species that have been documented or are known to occur in Aransas, Bee, Calhoun, DeWitt, Goliad, Gonzales, Jackson, Karnes, Lavaca, Matagorda, Refugio, San Patricio, Victoria, and Wharton counties, Texas. Species information may be obtained at http://ifw2es.fws.gov/endangeredspecies/lists/. The species information should help you determine if suitable habitat for these listed species exists in any of the proposed project areas or if project activities may affect species on-site, off-site, and/or result in "take" of a federally listed species. It should also be

noted that the counties listed fall under the area of responsibility of two U.S. Fish and Wildlife Ecological Services Field Offices: Corpus Christi and Clear Lake.

"Take" is defined as harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. In addition to the direct take of an individual animal, habitat destruction or modification can be considered take, regardless of whether it has been formally designated as critical habitat, if it would result in the death or injury of wildlife by removing essential habitat components or impairing essential behavior patterns, including breeding, feeding, or sheltering.

Whooping Crane

Whooping cranes are known to occur on and around the proposed site and 50-mile radius as they migrate h to Aransas National Wildlife Refuge and use it and surrounding coastal areas from the Nueces River to the Colorado River for their wintering range. Whooping cranes use a variety of habitats during migrations between northern Canada and the Texas Coast. Croplands are used for feeding and large wetland areas are used for feeding and roosting. Water depth at roost is usually less than 10 inches, the majority between 1 and 6 inches deep. Principal wintering habitat consists of about 22,500 acres of marshes and salt flats on Aransas National Wildlife Refuge and adjacent publicly and privately owned islands that consist of marshes, tidal flats, uplands, and barrier islands. Whooping cranes usually arrive on the Texas coast between late-October and mid-November. They spend almost six months on the wintering grounds. As spring approaches, they leave for the breeding grounds normally between March 25 and April 15. The last birds are usually gone by May 1st, but occasional stragglers may stay into mid-May.

Tall structures including buildings, construction equipment, fences, antennas and transmission lines may need to be marked to provide higher visibility and such sites monitored for impacts to Federally-listed species and other migratory birds. We also recommend that a comprehensive look at migratory bird hazards in the project area such as refinery complexes, communication towers, and power lines be included in the endangered species effects analysis of baseline conditions and cumulative effects. Depletion of water to the downstream bays and estuaries may also impact whooping crane food resources. This will need to be analyzed and considered.

Attwater's Prairie Chicken

The Attwater's prairie chicken is an endangered bird represented by only a few remnant populations. Populations are known from Aransas, Goliad, Refugio and Victoria Counties. This species occurs in coastal grassland prairies in areas of diverse vegetation that provide a variety of cover. Grasslands providing appropriate prairie chicken habitat, will contain approximately 10% or less canopy cover and range between 25-40 cm in height. Adults and young will use this habitat for feeding and roosting. Tall grass (40-60 cm) clumps are also necessary for nesting, loafing, feeding and escape cover. Courtship (booming) and nesting occurs from January 1st through June 30th. Booming grounds can include naturally occurring, short grass flats or artificially maintained areas, such as roads, airport runways, oil well pads, drainage ditches, and pipeline rights-of-way.

In some areas where suitable habitat occurs, but the bird has not been in evidence lately, work may proceed with caution. Any work conducted in areas where prairie chickens may occur should begin after ten a.m. and end before 4 p.m. If mowing is to occur, the grass level should be cut no shorter than 20 cm and a "walk through" should be conducted in the area before mowing occurs in order to reduce impact to Attwater's prairie chickens and/or nests.

Black lace cactus

The black lace cactus of the Cactaceae Family occurs in natural open areas in mesquite brush, in loamy to

sandy loam soils. This species may be found near streams or in streambeds in Kleberg, Jim Wells, Nueces, and Refugio counties. The black lace cactus is a small, deep green cylinder shaped cactus with dark-tipped spines and pink to purple flowers. Project sites should be surveyed by a qualified biologist or botanist to determine if the species is present. Please notify the Service with the results of any surveys for review and further determinations of impacts.

Ocelot

The ocelot is a medium-sized (30-41 inches long and 15-30 lbs) feline. Its body coloration is variable; with the upper parts gray or buff with dark brown or black spots, small rings, blotches, and short bars. The under parts are white spotted with black. The tail is ringed or marked with dark bars on the upper surface. The backs of the rounded ears are black with a white central spot. They hunt and move around beginning at dusk. Their area of activity is normally 1-4 square miles. The female ocelot hunts during the night but spends the day at the den site. Kittens are born from late spring through December. The usual litter size is one or two kittens. They accompany the mother on hunts at about 3 months of age and stay with her until they are about a year old. In Texas, the ocelots occur in dense shrubland. Although the ocelot's prime habitat needs are 70 to 90% canopy coverage, it will utilize a lesser degree of cover for hunting areas, and travel corridors. Tracts of at least 100 acres of isolated dense brush, or 75 acres of brush interconnected with other habitat corridors are important, however, ocelots will use tracts as small as 5 acres, when adjacent to larger areas of habitat. Roads, narrow water bodies, and rights-of-way, brushy fence lines, watercourses and other brush strips connecting areas of habitat are important habitat.

The ocelot population in Texas is very small; probably no more than 80 to 120 individuals (1993 estimate) and approximately 30-35 are known to occur in the chaparral remaining at or near the Laguna Atascosa National Wildlife Refuge in Cameron County. Although the distribution of these endangered cats is limited mostly to the southern portion of Texas, a northern population of ocelot may range through portions of Jim Wells, Live Oak, Atascosa, and McMullen, San Patricio and Aransas counties.

Maintenance or creation of brush corridors, and, most importantly, conservation of the remaining habitat is necessary for the ocelot's survival in Texas. Clearing should be limited to areas essential for the proposed project and impacted areas should be restored with native vegetation. Habitat assessments should be performed, and if potential habitat is found to occur, the Service should be contacted.

Gulf Coast Jaguarundi

The jaguarundi is a small, slender-bodied, unspotted cat, slightly larger than a domestic cat (8-16 lbs). They have a long tail, short legs, small flattened head and have two color phases, a rusty-brown and a charcoal gray. They hunt primarily in the morning and evening. They are not as cautious as the ocelot and have been observed during the day. It is believed that the jaguarundi is similar to the ocelot in their requirement for dense brush cover, however, information from Mexico indicate that they may be more tolerant of open areas. They are good swimmers and enter the water freely. Mating season occurs in November and December, and kittens have been reported in March and also in August. Gestation period is 9 to 10 weeks and litters contain two to four young. In Texas, they occur in dense shrub lands. Although the distribution of these endangered cats is limited mainly to the Rio Grande Valley, there have been unconfirmed sightings of jaguarundi as far north as Aransas, Jim Wells, Kleberg, Live Oak, and San Patricio counties.

Maintenance or creation of brush corridors, and, most importantly, conservation of the remaining habitat is necessary for the jaguarundi's survival. Clearing should be limited to areas essential for the proposed project and impacted areas need to be restored with native vegetation. Habitat assessments should be performed. If potential habitat is found to occur, the Service should be contacted.

Northern aplomado falcon

The name aplomado means "steel gray" in Spanish. The aplomado falcon is a medium sized falcon with a total length about 15-18 inches and a wingspan of about 32-36 inches. Adults have rufous (rust) under parts, a gray back, a long, banded tail and a distinctive black and white facial pattern. They are extremely fast in level flight and agile on foot. Their habitat consists of open terrain with scattered trees, relatively low ground cover, abundance of insects and small to medium-sized birds for prey, a supply of previously constructed nests, and above ground nesting substrate such as yucca and mesquite habitat. Aplomado falcons hunt together, soar together, perch near one another, and even feed together outside the breeding season. During the spring of their second year, pair bonds are formed. They do not construct their own nests, but use the stick platforms built by other birds. Nests are usually 1-3 feet in diameter. They nest only once a year during the dry season (January-June) with most nesting in April and May. They lay 2-3 eggs between March and June and both parents incubate the eggs. Eggs hatch in about 32 days, and nestlings fledge at 32 to 40 days.

Project sites should be evaluated for suitable habitat. Grassland and savannah habitats with abundant small birds and stick nests built by ravens or other raptors should receive special attention. During March through June all large stick nests should be examined from a distance for signs of adults incubating eggs or brooding chicks. Observers should remain a safe distance away from the nest or perch, at least 100-300 yards, depending on the sensitivity of the individual bird, and keep human contact to a minimum. If suitable habitat is found to exist, further surveys should be performed and the Service should be contacted for further review of survey results and impact determinations.

Bald Eagle

The bald eagle has been removed from the Federal Endangered and Threatened list (rule effective August 8, 2007). However, protections provided to the bald eagle under the Bald and Golden Eagle Protection (BGEPA) and the Migratory Bird Treaty Act (MBTA) will continue to remain in place after the species is delisted. Both Federal laws prohibit "take," and the BGEPA prohibits disturbance as a form of "take" as well. To help provide more clarity on the management of the bald eagle after delisting, the Service published a regulatory definition of "disturb" (72 FR 31132), and the Final National Bald Eagle Management Guidelines (72 FR 31156). The management guidelines and further information on the bald eagle may be viewed at http://www.fws.gov.

Section 7

Section 7 of the Endangered Species Act of 1973, as amended (ESA) requires that all Federal agencies consult with the Service to ensure that actions authorized, funded or carried out by such agencies do not jeopardize the continued existence of any listed threatened or endangered species or adversely modify or destroy critical habitat of such species. *It is the responsibility of the Federal action agency to determine if the proposed project may affect threatened or endangered species.* If a "may affect" determination is made, the Federal agency shall initiate the formal section 7 consultation process by writing to: Field Supervisor; U.S. Fish and Wildlife Service; c/o TAMU-CC, Unit 5837; 6300 Ocean Drive; Corpus Christi, Texas 78412-5837. If no effect is evident, no further consultation is needed; however, we would appreciate the opportunity to review the criteria used to arrive at that determination.

Non-federal representatives (i.e. consultants, state agencies, county or local officials) may request and receive species lists, prepare environmental documents, biological assessments, and provide information for formal consultations. However, the Service requires the action agency to designate the non-federal representative in writing. If not designated, we recommend non-federal representatives provide a complete record of their evaluation to the federal action agency so that they may make a determination of affect and,

if necessary, consult with this office on the proposed action. After evaluating the potential for effect, one of the following determinations is made by the federal action agency or their non-federal representative.

No effect – the action agency determines its proposed action will not affect federally listed species or critical habitat. No section 7 consultation is necessary and the Service believes the agency has complied with section 7(a)(2) of the ESA by making the determination. However, if the project changes or additional information on the distribution of listed or proposed species becomes available the project should be reanalyzed for effects not previously considered.

May Affect, but is not likely to adversely effect – the action agency determines their project may affect listed species and or critical habitat; however, the effects are expected to be discountable, or insignificant, or completely beneficial. Certain avoidance and minimization measures may need to be implemented in order to reach this level of effects. The action agency should seek written concurrence from the Service that adverse effects have been eliminated. If agreement cannot be reached the agency is advised to initiate formal consultation.

Is likely to adversely affect – the action agency determines adverse effects to listed species may occur as a direct or indirect result of the proposed action or its interrelated or interdependent actions, and the effect is not discountable, insignificant, or beneficial. If the overall effect of the proposed action is beneficial to the listed species but also is likely to cause some adverse effects to individuals of that species, then the proposed action "is likely to adversely affect" the listed species. An "is likely to adversely affect" determination requires formal section 7 consultation.

The Service recommends the action agency and/or non-federal representative maintain a complete record that identifies steps leading to the determination of affect, the qualified personnel conducting the evaluation, habitat conditions, site photographs, and any other related articles. The Service's Consultation Handbook is available at http://endangered.fws.gov/consultations/s7hndbk/s7hndbk.html for further information on definitions and process.

State Listed Species

The State of Texas protects certain species. Please contact the Texas Parks and Wildlife Department (Endangered Resources Branch), Fountain Park Plaza Building, Suite 100, 3000 South IH-35, Austin, Texas 78704 (telephone 512/912-7011) for information concerning fish, wildlife, and plants of State concern or visit their website at http://www.tpwd.state.tx.us/nature/endang/animals/mammals/.

Migratory Birds

The Migratory Bird Treaty Act implements various treaties and conventions for the protection of migratory birds. Under the Act, taking, killing or possessing migratory birds is unlawful. Many may nest in trees, brush areas or other suitable habitat. The Service recommends activities requiring vegetation removal or disturbance avoid the peak nesting period of March through August to avoid destruction of individuals, nests or eggs. If project activities must be conducted during this time, we recommend surveying for nests prior to commencing work. If a nest is found, and if possible, the Service recommends a buffer of vegetation ($\geq$ 50m for songbirds, > 100m for wading birds, and > 180m for terns, skimmers and birds of prey) remain around the nest until young have fledged or the nest is abandoned. A list of migratory birds may be viewed at http://migratorybirds.fws.gov/intrnltr/mbta/proposedbirdlist.pdf. We also recommend that a comprehensive look at migratory bird hazards from the project and in the project area such as refinery complexes, communication towers, and power lines be included in the National Environmental Policy Act analysis cumulative effects section.

Wetlands

Wetlands and riparian zones provide valuable fish and wildlife habitat as well as contribute to flood control, water quality enhancement, and groundwater recharge. Wetland and riparian vegetation provides food and cover for wildlife, stabilizes banks and decreases soil erosion. These areas are inherently dynamic and very sensitive to changes caused by such activities as overgrazing, logging, major construction, or earth disturbance. Executive Order 11990 asserts that each agency shall provide leadership and take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance the natural and beneficial value of wetlands in carrying out the agency's responsibilities. Construction activities near riparian zones should be carefully designed to minimize impacts. If vegetation clearing is needed in these riparian areas, they should be re-vegetated with native wetland and riparian vegetation to prevent erosion or loss of habitat. We recommend minimizing the area of soil scarification and initiating incremental re-establishment of herbaceous vegetation at the proposed work sites. Denuded and/or disturbed areas should be re-vegetated with a mixture of native legumes and grasses. Species commonly used for soil stabilization are listed in the Texas Department of Agriculture's (TDA) Native Tree and Plant Directory, available from TDA at P.O. Box 12847, Austin, Texas 78711. The Service also urges taking precautions to ensure sediment loading does not occur to any receiving streams in the proposed project area. To prevent and/or minimize soil erosion and compaction associated with construction activities, avoid any unnecessary clearing of vegetation, and follow established rights-of-way whenever possible. All machinery and petroleum products should be stored outside the floodplain and/or wetland area during construction to prevent possible contamination of water and soils. No permanent structures should be placed in the 100-year floodplain.

If your project will involve filling, dredging, or trenching of a wetland or riparian area it may require a Section 404 permit from the U.S. Army Corps of Engineers (COE). For permitting requirements please contact the U.S. Corps of Engineers, District Engineer, P.O. Box 1229, Galveston, Texas 77553-1229, (409) 766-3002.

Beneficial Landscaping

In accordance with Executive Order 13112 on Invasive Species and the Executive Memorandum on Beneficial Landscaping, where possible, any landscaping associated with project plans should be limited to seeding and replanting with native species. A mixture of grasses and forbs appropriate to address potential erosion problems and long-term cover should be planted when seed is reasonably available. Although Bermuda grass is listed in seed mixtures, this species and other introduced species should be avoided as much as possible. The Service also recommends the use of native trees, shrubs, and herbaceous species that are adaptable, drought tolerant and conserve water.

Thank you for your concern for endangered and threatened species and other resources. We appreciate the opportunity to comment on the proposed project and if we can be of further assistance, please contact Mary Orms of my staff at 361/994-9005, extension 246. Please refer to the Service Consultation number listed above in any future correspondence regarding this project.

Sincerely,

E. Dawn Whitehead

for Allan M. Strand
Field Supervisor

cc: Clear Lake Ecological Services Field Office

Federally Listed as Threatened and Endangered Species of Texas
May 1, 2008

County-by-County lists containing species information is available at the U.S. Fish and Wildlife Service's (Service), Southwest Region, web site http://www.fws.gov/southwest/es/EndangeredSpecies/lists. This list represents species that may be found in counties throughout the state. It is recommended that the field station responsible for a project area be contacted if additional information is needed.

DISCLAIMER

This County by County list is based on information available to the U.S. Fish and Wildlife Service at the time of preparation, date on page 1. This list is subject to change, without notice, as new biological information is gathered and should not be used as the sole source for identifying species that may be impacted by a project.

(Aransas County)

Attwater's greater prairie-chicken	(E)	*Tympanuchus cupido attwateri*
Bald eagle	(DM)	*Haliaeetus leucocephalus*
Brown pelican	(E)	*Pelecanus occidentalis*
Green sea turtle	(T)	*Chelonia mydas*
Gulf Coast jaguarundi	(E)	*Herpailurus yagouaroundi cacomitli*
Hawksbill sea turtle	(E w/CH‡)	*Eretmochelys imbricata*
Kemp's Ridley sea turtle	(E)	*Lepidochelys kempii*
Leatherback sea turtle	(E w/CH‡)	*Dermochelys coriacea*
Loggerhead sea turtle	(T)	*Caretta caretta*
Northern aplomado falcon	(E)	*Falco femoralis septentrionalis*
Ocelot	(E)	*Leopardus pardalis*
Piping plover	(T w/CH)	*Charadrius melodus*
West Indian manatee	(E)	*Trichechus manatus*
Whooping crane	(E w/CH)	*Grus Americana*

(Bee County)

Gulf Coast jaguarundi	(E)	*Herpailurus yagouaroundi cacomitli*
Ocelot	(E)	*Leopardus pardalis*
Whooping crane	(E w/CH)	*Grus americana*

(Calhoun County)

Bald eagle	(DM)	*Haliaeetus leucocephalus*
Brown pelican	(E)	*Pelecanus occidentalis*
Green sea turtle	(T)	*Chelonia mydas*
Hawksbill sea turtle	(E w/CH‡)	*Eretmochelys imbricata*
Kemp's Ridley sea turtle	(E)	*Lepidochelys kempii*
Leatherback sea turtle	(E w/CH‡)	*Dermochelys coriacea*
Loggerhead sea turtle	(T)	*Caretta caretta*
Northern aplomado falcon	(E)	*Falco femoralis septentrionalis*
Piping plover	(T w/CH)	*Charadrius melodus*
West Indian manatee	(E)	*Trichechus manatus*
Whooping crane	(E w/CH)	*Grus americana*

(DeWitt County)

Bald eagle	(DM)	*Haliaeetus leucocephalus*
Whooping crane	(E w/CH)	*Grus americana*

(Goliad County)

Attwater's greater prairie-chicken	(E)	*Tympanuchus cupido attwateri*
Bald eagle	(DM)	*Haliaeetus leucocephalus*
Whooping crane	(E w/CH)	*Grus americana*

(Gonzales County)

Bald eagle	(DM)	*Haliaeetus leucocephalus*
Whooping crane	(E w/CH)	*Grus americana*

(Jackson County)

Bald eagle	(DM)	*Haliaeetus leucocephalus*
West Indian manatee	(E)	*Trichechus manatus*
Whooping crane	(E w/CH)	*Grus americana*

(Karnes County)

Gulf Coast jaguarundi	(E)	*Herpailurus yagouaroundi cacomitli*
Ocelot	(E)	*Leopardus pardalis*
Whooping crane	(E w/CH)	*Grus americana*

(Lavaca County)

Bald eagle	(DM)	*Haliaeetus leucocephalus*
Houston toad	(E w/CH)	*Bufo houstonensis*
Whooping crane	(E w/CH)	*Grus americana*

[Matagorda County]

Bald eagle	(DM)	*Haliaeetus leucocephalus*
Brown pelican	(E)	*Pelecanus occidentalis*
Green sea turtle	(T)	*Chelonia mydas*
Hawksbill sea turtle	(E w/CH‡)	*Eretmochelys imbricata*
Kemp's Ridley sea turtle	(E)	*Lepidochelys kempii*
Leatherback sea turtle	(E w/CH‡)	*Dermochelys coriacea*
Loggerhead sea turtle	(T)	*Caretta caretta*
Northern aplomado falcon	(E)	*Falco femoralis septrentrionalis*
Piping plover	(T w/CH)	*Charadrius melodus*
Whooping crane	(E w/CH)	*Grus americana*

(Refugio County)

Attwater's greater prairie-chicken	(E)	*Tympanuchus cupido attwateri*
Bald eagle	(DM)	*Haliaeetus leucocephalus*
Black lace cactus	(E)	*Echinocereus reichenbachii* var. *albertii*
Brown pelican	(E)	*Pelecanus occidentalis*
Green sea turtle	(T)	*Chelonia mydas*
Gulf Coast jaguarundi	(E)	*Herpailurus yagouaroundi cacomitli*
Hawksbill sea turtle	(E w/CH‡)	*Eretmochelys imbricata*
Kemp's Ridley sea turtle	(E)	*Lepidochelys kempii*

Leatherback sea turtle	(E w/CH‡)	*Dermochelys coriacea*
Loggerhead sea turtle	(T)	*Caretta caretta*
Northern aplomado falcon	(E)	*Falco femoralis septentrionalis*
Ocelot	(E)	*Leopardus pardalis*
Piping plover	(T w/CH)	*Charadrius melodus*
West Indian manatee	(E)	*Trichechus manatus*
Whooping crane	(E w/CH)	*Grus americana*

(San Patricio County)

Brown pelican	(E)	*Pelecanus occidentalis*
Green sea turtle	(T)	*Chelonia mydas*
Gulf Coast jaguarundi	(E)	*Herpailurus yagouaroundi cacomitli*
Hawksbill sea turtle	(E w/CH‡)	*Eretmochelys imbricata*
Kemp's Ridley sea turtle	(E)	*Lepidochelys kempii*
Leatherback sea turtle	(E w/CH‡)	*Dermochelys coriacea*
Loggerhead sea turtle	(T)	*Caretta caretta*
Ocelot	(E)	*Leopardus pardalis*
Piping plover	(T w/CH)	*Charadrius melodus*
West Indian manatee	(E)	*Trichechus manatus*
Whooping crane	(E w/CH)	*Grus americana*

(Victoria County)

Attwater's greater prairie-chicken	(E)	*Tympanuchus cupido attwateri*
Bald eagle	(DM)	*Haliaeetus leucocephalus*
Whooping crane	(E w/CH)	*Grus americana*

[Wharton County]

Bald eagle	(DM)	*Haliaeetus leucocephalus*
Whooping crane	(E w/CH)	*Grus americana*

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Statewide or areawide migrants are not included by county, except where they breed or occur in concentrations. The whooping crane is an exception; an attempt is made to include all confirmed sightings on this list.

E	=	Species in danger of extinction throughout all or a significant portion of its range.
T	=	Species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
DM	=	Delisted, monitoring for 5 years
C	=	Species for which the Service has on file enough substantial information to warrant listing as threatened or endangered.
CH	=	Critical Habitat (in Texas unless annotated ‡)
P/	=	Proposed ...
P/E	=	Species proposed to be listed as endangered.
P/T	=	Species proposed to be listed as threatened.
□	=	with special rule
‡	=	CH designated (or proposed) outside Texas
~	=	protection restricted to populations found in the "interior" of the United States. In Texas, the least tern receives full protection, except within 50 miles (80 km) of the Gulf Coast.

* = These species and their critical habitat are found in Hays and/or Comal counties but may be affected by activities within the southern segment of the Edwards Aquifer, which includes portions of Bexar County.

ES Field Office area of responsibility:

(Bee) = Corpus Christi ES office
[Galveston] = Clear Lake ES office