United States Department of the Interior

FISH AND WILDLIFE SERVICE

10711 Burnet Road, Suite 200
Austin, Texas 78758

In Reply Refer To:
Consultation No. 02ETAU00-2018-F-1181

SEP 2 4 2018

Kevin Jaynes, Federal Emergency Management Agency
FEMA Region 6
800 North Loop 288
Denton, Texas 76209

Stephen Brooks, U.S. Army Corps of Engineers
P.O. Box 17300
Fort Worth, Texas 76102-0300

Dear Messrs. Jaynes and Brooks:

This transmits the U.S. Fish and Wildlife Service's (Service) biological opinion for the proposed repairs to the Spring Lake Dam by Texas State University (TSU) funded in part by the Federal Emergency Management Agency (FEMA). The U.S. Army Corps of Engineers (USACE) would authorize activities in jurisdictional waters of the United States under § 404 of the Clean Water Act as amended. FEMA is the lead agency. Pursuant to the Endangered Species Act of 1973 (16 U.S.C. § 1531 et seq., Act) as amended, FEMA provided a biological assessment (BA) on May 31, 2018. The BA summarizes the determinations made for federally listed threatened and endangered species and federally designated critical habitat as follows (Table 1).

Consultation History

April 21, 2015	Spring Lake Dam site visit with TSU and City of San Marcos.
January 27, 2016	Meeting with FEMA, USACE, TSU, Texas Department of Emergency Management, City of San Marcos, Edwards Aquifer Authority, Logan Hurley, and Gary Lacy.
December 21, 2017	Meeting with TSU, Texas Parks and Wildlife Department (TPWD), and Freese and Nichols, Inc (FNI).
May 31, 2018	FEMA and USACE submit Biological Assessment to Service.

Consultation History - Continued

September 11, 2018 Service provides draft Biological Opinion to FEMA and USACE.

Common Name	Scientific Name	Federal Status	Species Determination	Critical Habitat Determination
Texas wild-rice	*Zizania texana*	Endangered	is likely to adversely affect	is likely to adversely affect
fountain darter	*Etheostoma fonticola*	Endangered	is likely to adversely affect	is likely to adversely affect
San Marcos salamander	*Eurycea nana*	Threatened with 4(d) rule	is likely to adversely affect	is likely to adversely affect
Comal Springs riffle beetle	*Heterelmis comalensis*	Endangered	not likely to adversely affect	is likely to adversely affect

Table 1. Summary of determinations of effects to trust resources by the proposed project funded in part by FEMA and subject to Clean Water Act authorization by USACE.

Biological Opinion

1) Description of Proposed Action

Spring Lake Dam impounds the headwaters of the San Marcos River and was built in 1849 using materials and construction techniques common to the mid-1800s. Under normal conditions, water from Spring Lake is intended to flow past the dam through two spillways: the western spillway with a headgate and stoplogs and the eastern spillway with a broad-crested weir. During high precipitation events and flooding, discharge from Spring Lake exceeds the conveyance of the spillways and overtops most of the dam or sometimes overtopping the entire dam. Multiple floods have damaged the spillways and dam itself. The combination of trees growing on the dam and porous materials in the dam has resulted in leaks and seepage through the dam. The proposed action is providing funding and authorization to repair the dam with a variety of materials including large rock (riprap), concrete, and a composite aggregate of crushed limestone coated with sodium bentonite clay (AquaBlok® 2080FW™).

The May 2018 Biological Assessment (BA) describes the proposed action in section 2-3. The construction activities are expected to last 6 to 10 weeks. The repair process includes:

(1) pre-construction mobilization and staging of materials,
(2) repairs of eastern spillway slab & installation of temporary bridge over eastern spillway,
(3) clearing of select vegetation and placing 225 cubic yards of riprap,
(4) treatment with AquaBlok to reduce seepage through the dam,
(5) leveling low-lying areas mainly on the crest of the dam, and
(6) post-construction demobilization and site restoration.

The action area (Figure 1) is described in the BA as: "Spring Lake Dam, the construction area, the staging area located at the parking lot area east of the eastern spillway, the San Marcos River, and the areas surrounding the project location that would be affected by dust, noise, and sediment plumes". We consider the downstream boundary of the action area as the San Marcos River at Sewell Park - City Park boundary because construction related effects such as turbidity are not expected to be discernable in reaches downstream of Sewell Park.

The first repairs will focus on the eastern spillway, the slab, and the scour below the current broken slab. A diversion dam will be used to reduce the discharge through the spillway by about half. Irregular parts of the slab will be removed and forms will be built to contain the slush grout that will fill the void below the slab.

Limestone or granite riprap will be carefully placed in nearby areas downstream of the eastern spillway. The BA describes the steps to repair the scour areas. Herbaceous vegetation, brush, and trees smaller than 8-inch diameter will be cleared. Riprap sized 6 to 36 inches in diameter will be washed and placed in three areas along the downstream toe of the embankment. The total volume of riprap for scour repairs is estimated at 225 cubic yards (CY).

To decrease the seepage through Spring Lake Dam, a bentonite-aggregate composite liner (AquaBlok) will be placed on the upstream embankment. Prior to placing the AquaBlok, weighted silt curtains will be deployed upstream and along seepage areas downstream to help minimize off-site movement of suspended sediment and reduce turbidity downstream. AquaBlok can be applied in the wet so dewatering the area to be treated is not necessary. The BA provides greater detail on construction methods and is incorporated by reference.

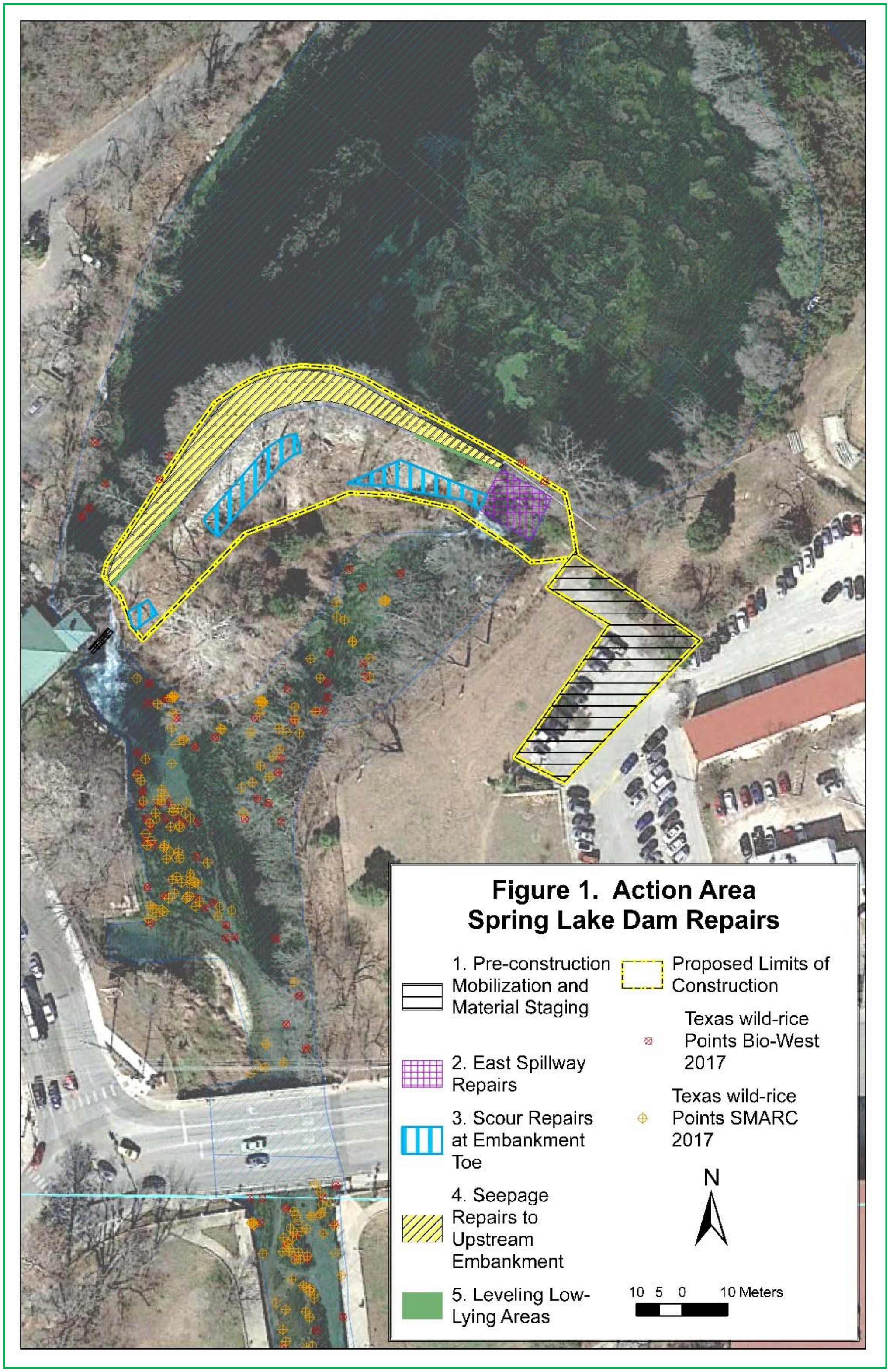

Figure 1. Overview of proposed Spring Lake Dam repairs and action area.

Conservation Measures

Conservation measures are part of the proposed action. The following are actions that FEMA, USACE, TSU, repair contractors, and project consultants working on Spring Lake Dam will implement to minimize adverse effects to listed species and their critical habitat.

The construction phase of the project will be preceded by implementation of stormwater best management practices (BMPs) to help ensure that storm runoff will not result in the movement of sediment from the repair areas to the San Marcos River downstream. Additionally, the BA lists these conservation measures:

- Minimize potential impacts of stormwater during demolition, land disturbance, riprap placement, and debris removal, through use of BMPs such as adequately constructed/monitored silt fences and silt curtains, stabilized construction entrance, sanitary facilities and trash receptacles, and vehicle washout.

- Maintain appropriate water flow over both spillways. At least 2.5 inches of water must be maintained over the eastern spillway. TSU will be responsible for continuously monitoring the levels of Spring Lake. Water flow and lake elevation would be maintained by adjusting the stoplogs on the western spillway's headgate.

- Minimize incidental take of threatened and endangered species by using biological monitors to survey and relocate individuals from the construction area. Biological monitors will have the necessary federal and state relocation permits and will be available onsite to oversee construction or any activities near the water that could potentially affect federally listed species.

- Reduce sediment runoff from riprap placement by using limestone or granite rock from a local quarry and washing loose sediments from riprap before placement.

Additionally, there will be an Aquatic Resource Relocation Plan (ARRP) provided to and approved by TPWD to help ensure that any native fishes and freshwater mussels are cleared from work areas just prior to disturbance and safely repatriated to nearby habitat outside the limits of construction activity. The ARRP will also help ensure that best management practices and protocols are followed for exotic and invasive aquatic species.

2) Status of the Species and Critical Habitat

Texas Wild-Rice and its Designated Critical Habitat

Texas wild-rice was listed as endangered on April 26, 1978, and its critical habitat was designated on July 14, 1980. Critical habitat includes Spring Lake and its outflow, and the San Marcos River, downstream to the confluence with the Blanco River.

Species Description and Life History

Texas wild-rice is a typically submergent aquatic perennial grass. Its leaves are 3 to 6.5 feet long. When flowering, the inflorescence and the upper culms and leaves emerge above the water surface. In slow moving waters, Texas wild-rice functions as an annual, exhibiting less robust vegetative growth, then flowering, setting seed, and dying within a single season. Texas wild-rice forms stands in the San Marcos River at depths from 0.7 to 7.0 feet. The species requires clear, relatively cool, thermally constant (about 72°F) flowing water. Texas wild-rice prefers gravel and sand substrates overlaying Crawford black silt and clay soils (Poole and Bowles 1999, Saunders et al. 2001).

Reproduction of Texas wild-rice occurs either asexually (clonally) through stolons or sexually via seeds. Asexual reproduction occurs where shoots arise as clones at the ends of rooting stolons (Emery and Guy 1979). Clonal reproduction appears to be the primary mechanism for expansion of established stands, but does not appear to be an efficient mechanism for dispersal and colonization of new areas. Texas wild-rice tillers have, however, been observed floating downstream and some of these tillers may become established plants; but only if lodged in suitable substrate and physical habitat. Seed production is therefore believed to be essential for dispersal and establishment of new stands of Texas wild-rice (Service 1996*a*).

Sexual reproduction occurs when wind pollinated florets produce seed. This typically takes place in late spring through fall, though flowering and seed set may occur at other times in warm years (Service 1996*a*). Triggers for flowering are not well understood. Texas wild-rice seed is not long-lived, and seed viability begins to drop markedly within one year of production. No appreciable seed bank is therefore expected to exist in the substrate.

Historic and Current Distribution

Texas wild-rice was first collected in the San Marcos River in 1892 (Service 1996*a*). When the species was originally described in 1933, it was reported to be abundant in the San Marcos River, including Spring Lake and its irrigation waterways (Silveus 1933, Terrell et al. 1978). In 1976, Emery (1977) surveyed Texas wild-rice and estimated its areal coverage at 1,131 m^2. In 1986, Vaughan (1986) estimated overall Texas wild-rice coverage at only 454 m^2.

From 1989 through 2013, Texas Parks and Wildlife Department with cooperators (volunteer citizens and scientists, and biologists from other agencies) monitored Texas wild-rice coverage (areal extent) on an annual basis. Since 2000, BIO-WEST, Inc., a consultant to the Edwards

Aquifer Authority, has monitored Texas wild-rice. Since 2013, the Service and our conservation partners have also conducted annual monitoring of Texas wild-rice coverage. The most recent rangewide estimate of Texas wild-rice coverage (2017) is 9,171 m^2 (pers. comm. Chris Hathcock, Service, San Marcos Aquatic Resource Center (SMARC)). This estimate is close to the August 2017 Texas wild-rice survey made by BIO-WEST that totaled 9,217 m^2 (BIO-WEST 2018). While the methodology for estimating the Texas wild-rice areal extent varies by researcher, there has been general agreement among researchers that Texas wild-rice coverage has increased particularly in Segments A, B and C, which are associated with Texas State University and City Park (Figure 2.).

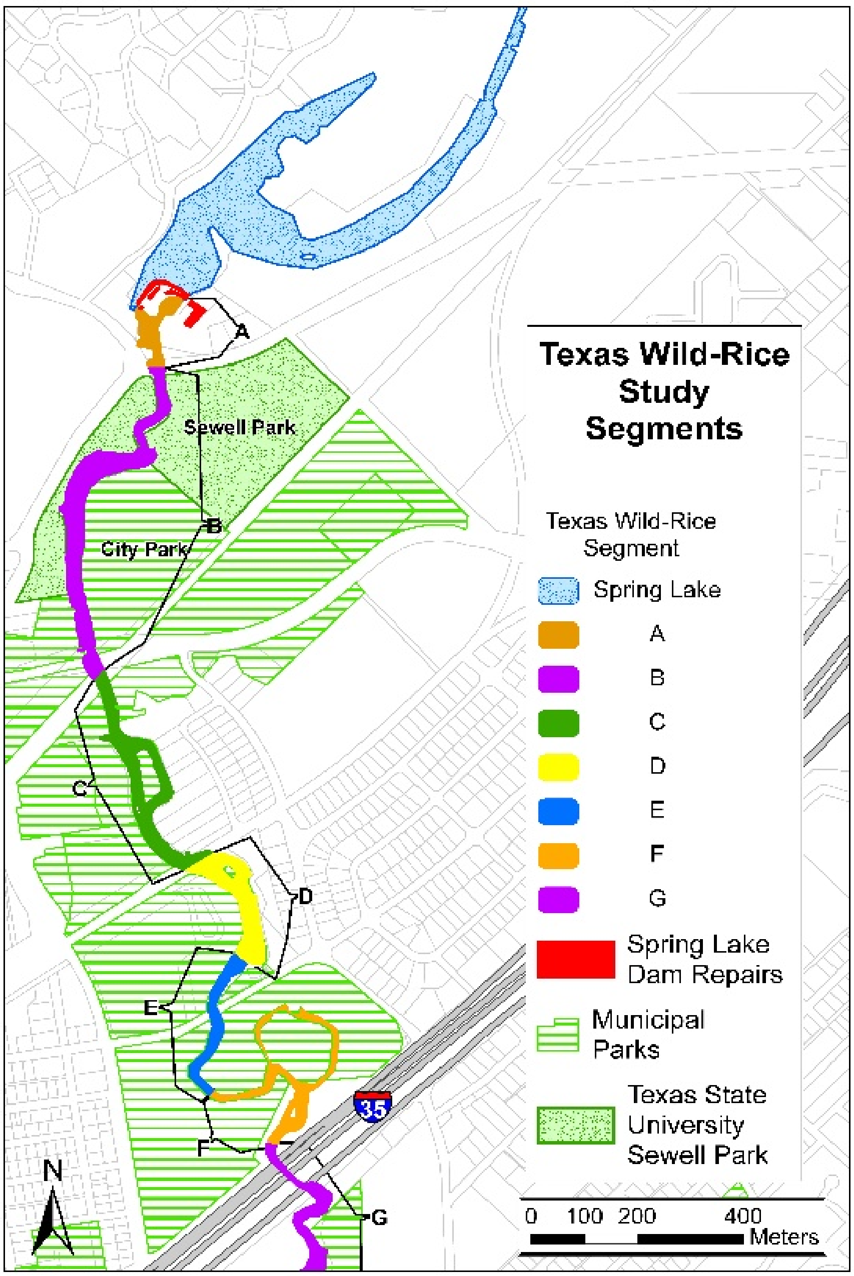

Figure 2. Texas wild-rice Segments above IH-35

The following figure (Figure 3) shows the overall (2001-2017) trend in Texas wild-rice coverage as reported by BIO-WEST (2018).

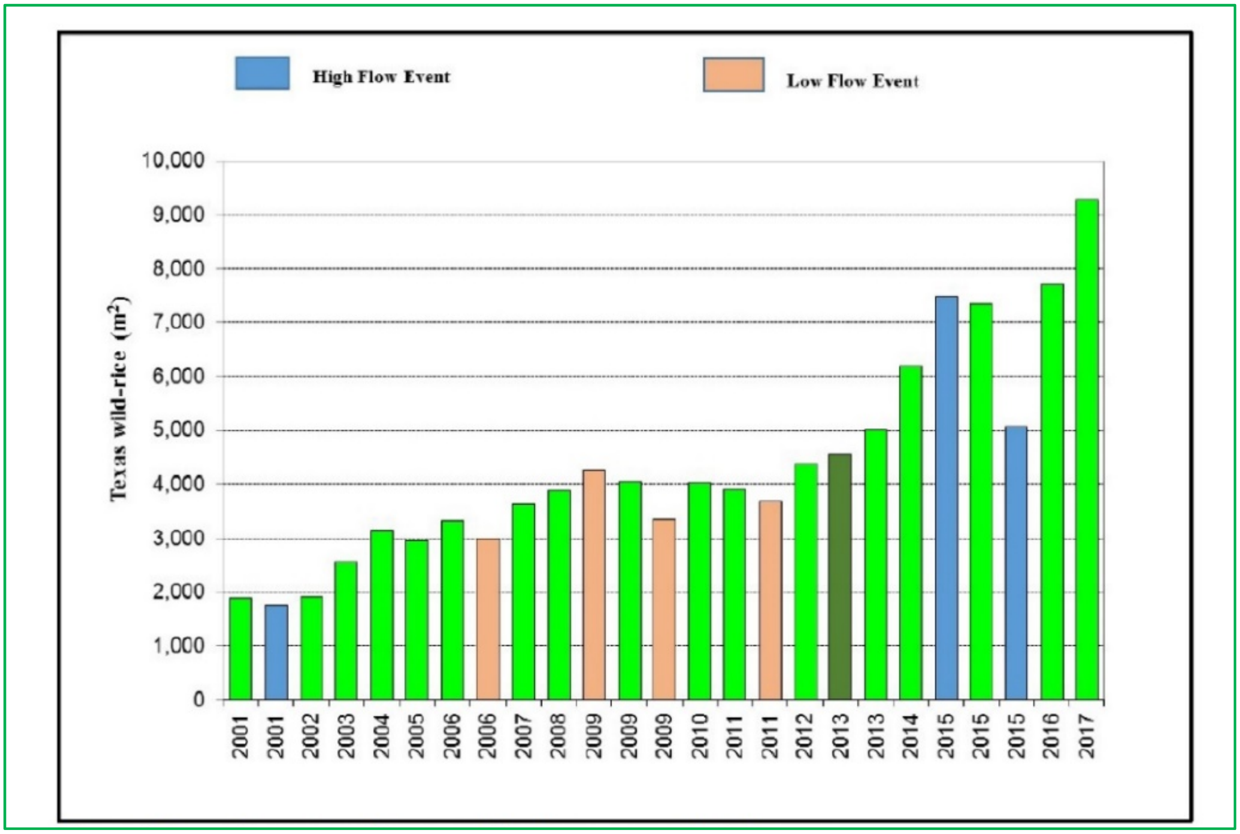

Figure 3. Total areal extent of Texas wild-rice as surveyed and reported by BIO-WEST (2018). The light green columns are annual summer sampling events and the dark green column was part of aquatic vegetation sampling in early spring 2013.

Reasons for Decline and Threats to Survival

Reduced springflow is the greatest threat to the survival of Texas wild-rice. Other threats include water quality degradation, physical alteration of Spring Lake or the San Marcos River, and physical disturbance of the species (Service 1996*a*). Non-native species have also been implicated as a threat to the species as detailed in the revised recovery plan for Texas wild-rice (Service 1996*a*).

Texas wild-rice is adapted to clear water, uniform flow rate, and constant year-round temperature (Beaty 1975). Low springflows and reduced San Marcos River flows can cause adverse effects to Texas wild-rice and designated critical habitat (Service 1996*a*). Drought conditions can adversely affect Texas wild-rice by reducing flows or eliminating water in portions of the river. Low flow conditions allow floating mats of vegetation (which normally move slowly downriver) to become lodged in stands of Texas wild-rice. Vegetation mats shade plants, may mechanically damage Texas wild-rice, and may interfere with culm emergence thereby interfering with sexual reproduction (Power 1996, Power 1997). Decreased flows expose Texas wild-rice to herbivory by waterfowl, nutria, and giant rams-horn snails (Rose and Power 1992). Altered flow conditions may also result in competitive advantages for non-native plants when conditions are sub-optimal for Texas wild-rice. Saunders et al. (2001) developed suitability criteria for various native (including Texas wild-rice) and non-native aquatic plants such as *Hydrilla*. Saunders et al. (2001) documented the predominance of aquatic macrophyte coverage by non-native species. The prevalence of *Hydrilla* and other non-natives was associated with their broader range of depth and water velocity preferences (relative to Texas wild-rice). Lower flows disproportionately adversely affected Texas wild-rice habitat and were expected to have greater impacts from recreational activities.

Recreational use of the river has been shown to have measurable adverse effects on Texas wild-rice (Breslin 1997). Breslin (1997) detailed the relative impacts of various activities (tubing, swimming, boating, and dog activities) to Texas wild-rice, and Bradsby (1994) discussed the relative levels of use at different flows. These studies did not, however, quantify effects to the species at various discharge levels. As discharge decreases and the river becomes shallower, a greater percentage of Texas wild-rice plants are exposed to trampling. At shallower depths, more Texas wild-rice leaves are on or near the water surface and therefore more exposed to physical disturbance. Recreational use of the river has also been postulated to interfere with flowering and seed set (Service 1996*a*). In September 2006, a significant areal reduction in Texas wild-rice stands between Spring Lake Dam and the bridge at University Drive was reported and attributed to vandalism (BIO-WEST 2007).

Range-wide Survival and Recovery Needs

There are specific recovery actions listed in the 1996 San Marcos and Comal Springs and Associated Aquatic Ecosystems (Revised) Recovery Plan (Service 1996*a*). These include: (1) ensuring adequate flows and water quality in Spring Lake and the San Marcos River; (2) maintenance of genetically diverse reproductive populations *ex situ* (in cultivation); (3) creation of reintroduction techniques for use in the event of a catastrophic event; (4) removal or reduction of threats due to: (a) non-native species, (b) recreational use of the river, and (c) habitat alteration; and (5) maintenance of healthy, self-sustaining, reproductive populations in the wild. Please refer to the Recovery Plan for additional details and priority recovery actions.

Adequate springflows and river flows are needed throughout the year for existing Texas wild-rice to survive, grow, and recruit new stands. Texas wild-rice stands may consist of a few to many genetically unique individual plants. Stands commonly need adequate water depth, an adequate water velocity, adequate water quality (particularly low turbidity), adequate sunlight, and protection from disturbance, e.g., by water recreationists. The San Marcos River flow regime is characterized by generally stable flows punctuated by small and large floods. However, during droughts, springflow and river flow (as estimated by daily mean discharge) may decrease 100 cubic feet per second (cfs) in less than one year. Survival and recovery of Texas wild-rice depends on regional aquifer management provided through the Edwards Aquifer Habitat Conservation Plan to avoid critically low springflows.

Status of Texas Wild-Rice Critical Habitat

Texas wild-rice critical habitat includes Spring Lake and extends downstream to the confluence of the Blanco River. Critical habitat for Texas wild-rice (45 FR 47355) was designated July 14, 1980. Texas wild-rice critical habitat encompasses about 253,000 m^2 (about 62 acres) of the upper San Marcos River. The important physical and biological features of Texas wild-rice habitat were described in the final rule designating critical habitat for Texas wild-rice. These features are: (1) clear high quality water, (2) unaltered San Marcos River flow, (3) constant year-round temperature, and (4) maintenance of the natural substrate. The upper San Marcos River presently is providing important habitat components as evidenced by the trend in Texas wild-rice coverage.

The Edwards Aquifer Habitat Conservation Plan (EAHCP) provides a regional and local approach to sustaining Texas wild-rice critical habitat. TSU is one of the five EAHCP permittees. The EAHCP formalizes an agreement by the permittees to implement critical period groundwater withdrawal reductions based on levels at the J-17 index well in San Antonio and springflow discharge at Comal and San Marcos Springs. Texas wild-rice critical habitat depends water levels in the San Marcos River which depend on the Edwards Aquifer water level. Drought and groundwater pumping reduce water contained in the Edwards Aquifer. The EAHCP stakeholders have committed to maintaining an adequate spring discharge to sustain Texas wild-rice critical habitat and critical habitat of the fountain darter, San Marcos salamander, and Comal Springs riffle beetle (see below). The Texas Commission on Environmental Quality (TCEQ) and the EAHCP stakeholders are also working to maintain water quality in the Edwards Aquifer and San Marcos Springs, thus benefitting the habitat for threatened and endangered species.

Fountain Darter and its Designated Critical Habitat

The fountain darter was listed as endangered on October 13, 1970, and critical habitat was designated on July 14, 1980. The designated critical habitat is described as "Texas, Hays County; Spring Lake and its outflow, the San Marcos River, downstream approximately 0.5 miles below Interstate Highway 35 Bridge" (IH-35). Fountain darter critical habitat encompasses about 199,772 m^2 (49 acres) of the upper San Marcos River.

Species Description and Life History

The fountain darter is a small benthic, reddish-brown fish. Adult fountain darters range in length from 0.75 to 1.5 inches. Fountain darter habitat requirements as described in the Recovery Plan (Service 1996*a*) include: undisturbed stream floor habitats; a mix of submergent plants (algae, mosses, and vascular plants), in part for cover; clear and clean water; invertebrate food supply of living organisms; constant water temperatures within the natural and normal river gradients; and adequate springflows. Fountain darters have reduced densities, or are absent, in areas lacking submergent vegetation (Service 1996*b*, BIO-WEST 2011).

Historic and Current Distribution

The historic range of the fountain darter includes the San Marcos and Comal rivers in central Texas (Service 1996*a*). In 1884, Jordan and Gilbert (1886) collected the type specimens of *E. fonticola* in the San Marcos River from immediately below the confluence of the Blanco River.

In the San Marcos River system, the fountain darter is found in Spring Lake and the San Marcos River downstream to an area just below the emergency spillway to the Smith Ranch impoundment. The fountain darter population in the San Marcos River downstream of Spring Lake Dam was estimated annually over a 9 year period (2002 to 2010) and ranged from a minimum of 58,562 to a maximum of 471,315 (EARIP 2012). Fountain darter densities appear to be highest in the upper segments of the San Marcos River and decrease markedly below Cape's Dam (Linam 1993; Service, unpublished data, 1996*b*).

In the Comal River system, the fountain darter is found in Landa Lake and throughout the Comal River system downstream to the confluence with the Guadalupe River (Service 1996*b*). The fountain darter population in the Comal River system, including Landa Lake, was estimated annually over the same 9 year period as in the San Marcos River, and ranged from a minimum of 172,783 to a maximum of 775,567 (EARIP 2012). Similar to the San Marcos River, Comal River fountain darter densities are lowest in the downstream reaches, due in part to a limited coverage of rooted aquatic plants.

Reasons for Decline and Threats to Survival

The Recovery Plan (Service 1996*a*) identifies several threats to the fountain darter. The primary threats are related to the quality and quantity of aquifer and spring water. Drought conditions or increased groundwater utilization resulting in reductions to or loss of springflows threaten the species recovery. Activities that may pollute the Edwards aquifer and its springs and streamflows may also threaten or harm the species (Service 1996*a*). Additional threats include effects from increased urbanization near the rivers, recreational activities, alteration of the rivers, habitat modification (e.g., dams, bank stabilization, and flood control measures), predation, competition, habitat alteration by non-native species, and introduced parasites (Service 1996*a*).

Fountain darters are being affected by an introduced parasitic trematode that attaches the gills. Multiple researchers have documented the presence of a trematode parasite that threatens fountain darters (Mitchell et al. 2000 and McDonald et al. 2006). This trematode is likely more widespread in the Comal than the San Marcos system. However, little research has been conducted in the San Marcos River on *Centrocestus formosanus*. The effect of these parasites on darters is likely to increase during stressful low spring discharge periods (Cantu 2003), and the parasite's adverse effects may be greater on younger fountain darters (McDonald et al. 2006). On August 16, 2018, the Service collected fountain darters from the San Marcos River near

IH-35 about one mile south of Spring Lake Dam and had 10 of these fish examined by the Service's Southwestern Fish Health Unit. *Centrocestus formosanus* cysts were found on all fountain darters inspected. Ten fountain darters from the Comal River system were also all found to have *Centrocestus formosanus* cysts (Service 2018). A comprehensive investigation into the distribution and prevalence *Centrocestus formosanus* in snails, fishes, and birds associated with the San Marcos River would be an essential study that may be undertaken at TSU in the coming years. This trematode may have already spread through the upper San Marcos River system through movement of infected host species such as snails, fishes, and black-crowned night-herons (*Nycticorax nycticorax*), and adversely impact the health of the San Marcos fountain darter population.

Range-wide Survival and Recovery Needs

The Recovery Plan specifies the need to develop and implement management plans for both the San Marcos and Comal systems. Recovery depends on protecting species and their habitats by management of river recreation entry and exit points to help avoid aquatic plant losses (Service 1996*a*, EARIP 2012). Recreational use of the river adversely impacts aquatic vegetation. Rooted submergent plants are an important component of fountain darter habitat. Aquatic plants provide: (1) surface area for egg attachment; (2) nursery habitats; (3) habitat for prey species such as amphipods; and (4) cover from predators. The recovery plan calls for enhancement of fountain darter habitat by protecting and restoring rooted aquatic plants, including Texas wild-rice in the upper San Marcos River.

Status of Fountain Darter Critical Habitat

The final rule designating fountain darter critical habitat (45 CFR 47362) focuses on the upper San Marcos River and includes Spring Lake downstream to approximately 0.5 miles below the IH-35 Bridge.

Actions that would adversely modify designated critical habitat are those that would significantly reduce aquatic vegetation in the San Marcos River, impound water, excessively withdraw water, reduce flow, and pollute the water. Important physical and biological features of fountain darter critical habitat are: (1) an undisturbed stream bed habitats (including runs, riffles, and pools), (2) a mix of submergent vegetation (algae, mosses, and vascular plants), (3) clear and clean water, (4) a food supply of small, living invertebrates, (5) constant water temperatures within the natural and normal river gradients, and (6) adequate spring flows to maintain the conditions above.

The water quality in the upper San Marcos River is generally recognized as good. However, a gradient of increasing turbidity from upstream to downstream is notable, particularly during daylight hours in the months of May through September.

Aquatic plants have been mapped and highest densities are found in the uppermost reaches. Below IH-35 and particularly below Capes Dam, aquatic plants in the San Marcos River become less dense. Thus, overall, as one moves downstream from Spring Lake to the Capes Dam and continuing to the downstream boundary of fountain darter critical habitat, the water quality and the density of aquatic vegetation decreases.

As discussed above, the EAHCP permittees are actively working to sustain springflow and water quality in the San Marcos Springs ecosystem. TSU in cooperation with the City of San Marcos and other EAHCP permittees are planting native submergent plants in the upper San Marcos River and actively monitoring overall fountain darter habitat. The current condition of fountain darter critical habitat is good.

San Marcos Salamander and its Designated Critical Habitat

Species Description and Life History

The San Marcos salamander was listed as threatened on July 14, 1980 (45 FR 47355) with a special rule (§ 17.43, Subchapter B of Chapter 1. Title 50 of the Code of Federal Regulations) that allows taking in accordance with Texas State law such as with a valid fishing license. This dark reddish-brown slender salamander reaches lengths of one to two inches (2.5 to 5 cm), and has moderately large eyes with a dark ring around the lens. The species has well developed and highly pigmented gills, relatively short, slender limbs with four toes on the fore feet and five on the hind feet. San Marcos salamanders have a slender tail with a well-developed dorsal fin (Service 1996*a*).

The San Marcos salamander is a member of the family Plethodontidae (lung-less salamanders) and is a neotenic salamander that retains its external gills throughout life. The salamander does not leave the water to metamorphose into a terrestrial form, but instead becomes sexually mature and breeds in the water. Most evidence suggests reproduction occurs throughout the year with a possible peak about May and June (Service 1996*a*).

San Marcos salamander habitat consists of algal mats where rocks are associated with spring openings (Nelson 1993). Sandy substrates devoid of vegetation and muddy silt or detritus-laden substrates with or without vegetation are apparently unsuitable habitats for this species. Specimens are occasionally collected from beneath stones in predominantly sand and gravel areas. In view of the abundance of predators (primarily larger fish, but also crayfish, turtles, and aquatic birds) in the immediate vicinity of spring orifices, protective cover such as that afforded by algal mats and rocks is essential to the survival of the salamander. The flowing spring waters in the principal habitat are near neutral (pH 6.7 - 7.2), range in temperature from 69.8 - 73.4°F (21 - 23°C), are clear, and have low levels of dissolved oxygen levels (less than 50 percent saturated, 3-4 mg/L (Tupa and Davis 1967, Najvar 2001).

San Marcos salamanders prey on amphipods, tendipedid (midge fly) larvae and pupae, other small insect pupae and naiads (an aquatic life stage of mayflies, dragonflies, damselflies, and stone flies), and small aquatic snails (Service 1996*a*).

Historic and Current Distribution

A total of 20 San Marcos salamanders were collected from San Marcos Springs on 22 June 1938 (Bishop 1941). Subsequent researchers found the species near all of the major spring openings scattered throughout Spring Lake and downstream as far as 500 feet below Spring Lake dam (Tupa and Davis 1976, Nelson 1993, BIO-WEST 2011, BIO-WEST 2018).

Population estimates for the San Marcos salamander have ranged from 17,000 to 21,000 individuals in the floating algal mats at the uppermost portion of Spring Lake (Tupa and Davis 1976), to as many as 53,200 salamanders from Spring Lake and the rocky substrates within about 150 feet (46 m) downstream of the Spring Lake Dam (Nelson 1993). Seven years of quarterly monitoring of San Marcos salamander populations using visual surveys by divers showed stable visual counts (BIO-WEST 2007).

Estimating San Marcos salamander populations is difficult because juveniles are small and salamanders can move undetected into interstitial spaces in the substrate. Tupa and Davis (1976) and Nelson (1993) estimated the number of San Marcos salamanders in and near Spring Lake and found them distributed throughout Spring Lake among rocks near spring openings, in algal mats, mosses, and other plants, and in rocky areas just downstream from the dams (Nelson 1993; BIO-WEST 2007, 2011). The species occurs near all of the major spring openings scattered throughout Spring Lake and is abundant at some of these springs (Nelson 1993). Nelson (1993) estimated a total population of 53,200 salamanders in and just below Spring Lake, including 23,000 associated with algal mats, 25,000 among rocky substrates around spring openings, and 5,200 in rocky substrates below Spring Lake.

San Marcos salamander density estimates based on 21 sampling events since 2000 indicate that the size of the current salamander population appears to be thriving and generally similar to observations made over the previous eight-years of sampling (BIO-WEST 2011, BIO-WEST 2018). Figure 4 shows the two most recent surveys conducted by BIO-WEST of San Marcos salamanders at Spring Lake Dam and the long-term monitoring averages.

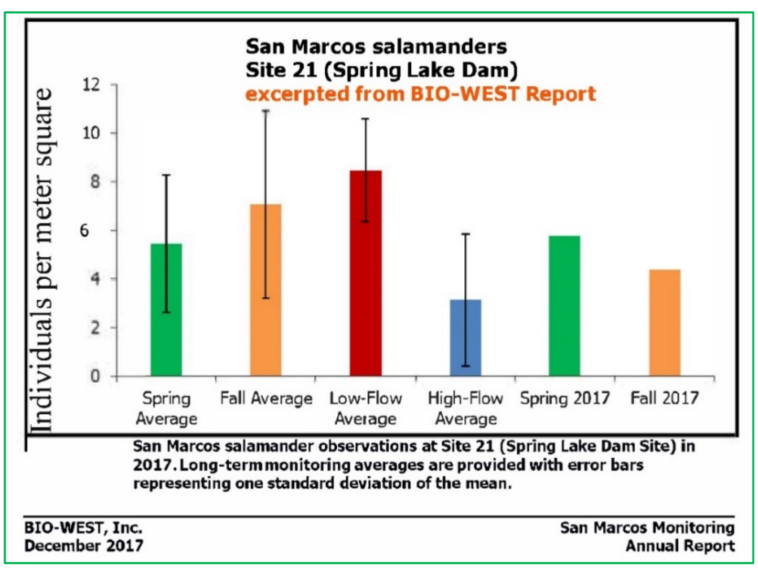

Figure 4. San Marcos salamander densities estimated in 2017 compared to previous monitoring at Spring Lake Dam by BIO-WEST (2018)

Reasons for Decline and Threats to Survival

The primary threats to the San Marcos salamander are related to the quality (e.g., contaminants and siltation) and quantity of aquifer and spring water. The restricted distribution of the species, loss of protective cover, and introduced predators may also threaten the species (45 FR 47355, Service 1996*a*). Both water quality and quantity impacts are discussed below.

Groundwater or surface water contamination or pollution resulting from a catastrophic event such as a hazardous material spill into Spring Lake or one of its tributaries could threaten the San Marcos salamander or its designated critical habitat. Spring Lake, its tributaries, and the portion of the San Marcos occupied by the species are crossed by six road bridges making the local area more vulnerable to this dangerous spill scenario. Stormwater runoff and other non-point sources also contribute pollutants into the aquifer or the surface water that could threaten the species or affect its habitat. Sediment and siltation in Spring Lake and the uppermost portions of the San Marcos River may be associated with the increasing urbanization of the lands surrounding the upper San Marcos River (Saunders et al. 2001, Earl and Wood 2002, Kollaus et al. 2015).

The reduction and loss of San Marcos springflows during times of severe drought could also significantly affect the San Marcos salamander. During periods of low San Marcos springflow, the aquatic habitats of the Spring Lake Dam spillways would receive less drift (small food items such as microcrustaceans in the water current). If the water surface elevation (stage) of Spring Lake falls below the eastern spillway crest, the flow supporting the spillway habitat of the San Marcos salamander would be severely reduced. In the event that Spring Lake's stage falls below the eastern spillway crest, only a few square meters of low quality aquatic habitat would be expected to temporarily persist due to leakage through the eastern part of the dam. If discharge through the eastern spillway fails during summer, the elevated water temperature of the remaining aquatic habitat would be expected to become unsuitable for San Marcos salamanders (Norris et al. 1963, Berkhouse and Fries 1995, Crow et al. 2016).

Range-wide Survival Needs and Recovery

The San Marcos salamander recovery needs are addressed in the San Marcos and Comal Springs and Associated Aquatic Ecosystems Recovery Plan (USFWS 1996*a*). Recovery tasks identified in the plan include: ensuring adequate flows and water quality in San Marcos Springs and the San Marcos River; maintenance of genetically diverse reproductive populations in captivity and creation of reintroduction techniques for use in the event of a catastrophic event; removal or reduction of threats due to non-native species, recreational use of the river, and habitat alteration; and maintenance of healthy, self-sustaining, reproductive populations in the wild.

The Service's SMARC has developed captive breeding techniques for San Marcos salamander in the event that the wild population at San Marcos Springs is lost. The facility successfully produced more than 5,000 eggs by 2009, with an average hatch success at about 20 percent. Reproduction of this species, however, remains unpredictable (J. Fries, 2009, pers. obs., Service, San Marcos, Texas). Techniques for maintaining this species' genetic diversity have been improved over the past several years. The ability to maintain this species in captivity (without supplemental wild caught individuals) over the long-term remains uncertain (Fries 2003).

Status of San Marcos Salamander Critical Habitat

The designated critical habitat for the San Marcos salamander is Spring Lake and a reach of the San Marcos River downstream 50 m from Spring Lake Dam. Both the current physical and biological conditions of Spring Lake and the aquatic habitat just downstream of Spring Lake dam satisfies all of the important habitat requirements of the San Marcos salamander. The known range of the species has not changed since listing with the exception of a few individuals found by Prof. Timothy Bonner downstream of designated critical habitat on the margins of the San Marcos River in Sewell Park. There are effectively two populations of San Marcos salamanders and both occur in designated critical habitat. The first is associated with San Marcos Springs in the spring – dominated upper parts of Spring Lake. The second is associated with Spring Lake Dam and its spillways. Based on salamander surveys by the Service (SMARC 2018), Texas State University (Kollaus and Hardy 2016; Bonner, Texas State University, pers. comm.) and annual surveys by BIO-WEST (2001, 2007, 2011, 2018) both populations are estimated to be at their respective long-term average densities and consistently occupying suitable habitat.

Comal Springs Riffle Beetle and its Designated Critical Habitat

Species Description and Life History

The Comal Springs riffle beetle (CSRB) is a small aquatic beetle first described in 1988 (Bosse et al. 1988). The species was listed as endangered on December 18, 1997 (62 FR 66295).

Larval CSRB are elongate, tubular in cross-section and light tan in color. The CSRB pupa is pale in color and legs and wing pads project loosely from the body. The number of larval instars among species in the family Elmidae ranges from 5 to 8 (Brown 1987), but the specific number of instars for CSRB is unknown. The incubation period of elmid eggs typically ranges from 5 to 15 days, and the larval stages may last from 3 to 36-months (Brown 1987) before pupation occurs. Brown (1987) noted that other Elmid species pupate in protected areas above the water line.

Adult CSRB are reddish-brown in color, and range in length from 0.067 to 0.83 inches. The sides of the body are approximately parallel and the entire dorsal surface is coated with fine golden-colored setae (hairs) (Bosse et al. 1988). The hind wings of CSRBs are short and non-functional and the species is incapable of flying (Bosse et al. 1988).

Larval and adult populations at Comal Springs reach their greatest densities (about 0.5 / ft^2 [5 / m^2]) in late fall through winter, but all life stages can be found throughout the year suggesting multiple broods in a season with overlapping generations (Bowles et al. 2003). Completion of the life cycle in the CSRB from egg, to larvae, to adult has been reported as requiring six-months to three-years (BIO-WEST 2007).

The CSRB is an epigean (surface-dwelling) species that inhabits fast flowing waters with gravel and cobble substrates (Bowles et al. 2003). Food sources include, but are not limited to, detritus, leaf litter, and decaying roots. Little is known of their life history and habitat (Bowles et al. 2003).
Recent research describes the species' strong associations with springs, and microhabitat preferences for spring outlet conditions and water quality parameters characteristic of Edwards Aquifer spring water. The CSRB exhibited preferences for temperatures near 73.4°F (23 °C), elevated CO_2, darkness, and low flow conditions (as might be expected for a species associated with gravel and cobble substrates) (Cooke 2012).

Historic and Current Distribution

The CSRB was first collected at Comal Springs in 1976 (Bosse et al. 1988). A single specimen was then collected at San Marcos Springs (Barr 1993). CSRBs are now known from Comal Springs spring runs no.1, 2, and 3; at several spring outflows and seeps along the northwestern shore of Landa Lake; and near springs in Landa Lake and on Spring Island. Adults and larvae have been collected at San Marcos Springs from the springs along the escarpment near the TSU's Meadows Center for Water and the Environment and in locations in upper Spring Lake, indicating the presence of a reproducing population (Gibson et al. 2008). Efforts to verify the presence of the species from other springs in central Texas have failed to locate any individuals beyond those associated with Comal and San Marcos Springs. We estimated a total surface population of 10,959 individuals in the Comal Springs system in 2012 (02ETAU00-2012-F-0021), but we are unable to estimate the surface population size of CSRB in the San Marcos system due to a lack of information on CSRB density and area of habitat occupied (Bowles et al 2003, Service 2011).

Reasons for Decline and Threats to Survival

The reduction or loss of water of adequate quality and quantity are the main threats to the Comal Springs riffle beetle. This decline is due primarily to human activities including withdrawal of water from the San Antonio segment of the Edwards Aquifer (62 FR 66295). The limited amount of available habitat is likely to be reduced or lost through drying or decreased volume of spring flow during drought conditions. During droughts springs can become stagnant or become completely dry. When this happens flowing water with sufficient concentrations of dissolved oxygen for respiration may not be available to CSRB and they may suffocate.

The CSRB is only known from two spring systems. As a flightless aquatic beetle it has limited opportunities to expand its range and may never have been very abundant. The species was first collected in 1976. There are no records of species abundance and distribution before, during, or immediately after the 1950s drought of record. As a result, it is unknown how abundant or widely distributed the species was prior to prolonged 1950s drought to compare with its current status.

Pollution in the recharge zone for springs supporting CSRB is threat to the species. Because CSRB occur in shallow parts of Landa Lake and Spring Lake, these populations may be exposed to contaminants in runoff reaching tributaries of these lakes. The potential for contaminated stormwater to flow to Landa Lake and Spring Lake increases as land use becomes more urbanized in areas surrounding New Braunfels and San Marcos.

Competition is not known to be a significant threat to this species, although the presence of non-native species (such as the giant ramshorn snails (*Marisa cornuarietis*) and red-rim melania (*Melanoides tuberculatus*), which are present in the spring runs) that may compete directly or indirectly for food resources have been identified as an ongoing threat to the continued survival of the Comal Springs riffle beetle (62 FR 66295).

Range-wide Survival and Recovery Needs

The chief survival need of the Comal Springs riffle beetle identified in the listing rule is conservation of suitable habitat to sustain populations of the species. The conservation of Comal Springs riffle beetle habitat includes maintenance of water quality and continuous natural springflow at Comal and San Marcos springs.

Comal Springs Riffle Beetle Critical Habitat

Critical habitat for the Comal Springs riffle beetle is designated for two units, referred to as the Comal Springs Unit and the San Marcos Springs Unit (78 FR 63100, October 23, 2013). Only the San Marcos unit overlaps with the action area for this consultation. The designated critical habitat for the Comal Springs riffle beetle in the San Marcos Springs unit includes aquatic habitat within Spring Lake upstream of Spring Lake dam, with the exception of the southeastern part of Spring Lake, formed by inundation of the lowest reach of Sink Creek.

Primary threats to designated critical habitat may vary for individual springs according to the degree of urbanization and availability of aquifer source water. Threats generally include groundwater pumping, pollutants, and non-native aquatic species. To reduce or eliminate these threats, the Service has recommended regional and local conservation efforts. These efforts include regional management of aquifers to maintain springflows and subsurface flows, use of adequate buffers in and near sensitive features such as geologic faultlines for water quality protection, selection of appropriate pesticides, and implementation of integrated pest management plans.

The important physical and biological features identified in the 2013 critical habitat designation for the Comal Springs riffle beetle are:

- High-quality water with no or minimal levels of pollutants, such as soaps and detergents and other compounds containing surfactants, heavy metals, pesticides, nutrients, petroleum hydrocarbons, pharmaceuticals and veterinary medicines, and semi-volatile compounds, such as industrial cleaning agents, and including:
    - (a) Low salinity with total dissolved solids that generally range from 307 to 368 mg/L; and,

- (b) Low turbidity of generally less than 5 nephelometric turbidity units;

- Aquifer water temperatures that range from approximately 68 to 75 °F (20 to 23.9°C);
- A hydrologic regime that allows for adequate spring flows that provide levels of dissolved oxygen in the approximate range of 4.0 to 10.0 mg/L;
- Food supply that includes detritus (decomposed materials), leaf litter, living plant material, algae, fungi, bacteria and other microorganisms, and decaying roots; and,
- Bottom substrate in surface water habitat that is free of sand and silt, and is composed of gravel and cobble ranging in size between 0.3 to 5.0 inches (0.76 to 12.7 cm).

Both the Comal Springs and San Marcos Springs designated critical habitat units currently provide physical and biological features considered important for the conservation of the species. Water quality at both sites remains free from contamination and salinity and turbidity are within the parameters discussed in the final rule designating critical habitat. Water temperature averages about 74°F (23.3°C) in the Comal Springs system, and about 70°F (21.1°C) at San Marcos Springs. Springflows continue to maintain dissolved oxygen levels at both locations, and food supplies are present. Substrates in the designated critical habitat unit in the Comal system remain largely free of sand and silt. Substrates in Spring Lake have been impacted by sediments to a greater degree relative to Comal Springs habitat for CSRB.

3) Environmental Baseline

The environmental baseline section describes the status of the species in the action area. Consideration of previous authorizations of take in this biological opinion is focused on the last 8 years due to: (a) the reproductive ecology of Texas wild-rice, fountain darters, and San Marcos salamanders and (b) the stability of habitat quantity and quality in the upper San Marcos River. Since 2010, there have been four formal consultations and three habitat conservation plans affecting this action area: Table 2 summarizes the authorized incidental take from these consultations and habitat conservation plans.

	Biological Opinion (BO)	Date of BO Signature	Texas Wild-rice Effects	Incidental Take Fountain Darters San Marcos System	Incidental Take San Marcos Salamanders	Incidental Take Comal Springs Riffle Beetle	Edwards Aquifer Dependent Species Related Action Area	Consultation No. Permit No. & Notes
1	Joint Base San Antonio Edwards Aquifer Use	5-Aug-2013	Decrease of 2% of Texas wild-rice	‡	3,898 [1]	‡	Comal Hueco and San Marcos	02ETAU00-2013-F-0060
2	USACE § 206 Spring Lake Aquatic Ecosystem Restoration	23-Jun-2005	No Damage or Destruction of Texas wild-rice	965 [2]	732 [2]	0	San Marcos	2-15-F-0087 Restoration activities occurred in 2012
3	USACE § 206 San Marcos River Aquatic Ecosystem Restoration	18-Oct-2013	Less than of 5% of Texas wild-rice coverage in any segment would be lost	55,820 [3]	n/a	n/a	San Marcos	02ETAU00-2013-F-0214
4	USFWS NFH intraService Edwards Aquifer Use	1-Mar-2010	No Discussion	‡	‡	‡	Comal Hueco and San Marcos	21450-2010-F-0066
1	Edwards Aquifer HCP (EARIP HCP)	28-Jan-2013		549,129	263,857	11,179	Comal Hueco and San Marcos	21450-2010-F-0110 TE-63663A 15-YR Permit, expires 31 March 2028
2	Hays Co Regional HCP	26-Apr-2011		‡	‡	‡	San Marcos and Fern Bank	21450-2010-F-0173 TE-220793 30-YR Permit, expires 30 June 2042
3	Southern Edwards Plateau (SEP HCP)	20-Nov-2015		n/a	n/a	n/a	Bexar and Comal Counties	21450-2011-F-0210 TE-48571B 30-YR Permit, expires 31 January 2046

[1] take for drought of record plus one defined low flow event [2] take in Spring Lake only ‡ number of individuals not specified

Table 2. Summary of formal consultations and habitat conservation plans involving Texas wild-rice, fountain darters, San Marcos salamanders, and Comal Springs riffle beetles in Hays County.

Texas Wild-rice

For Texas wild-rice, the action area constitutes a small subset of the species range and Texas wild-rice is represented in nominally suitable habitat around Spring Lake dam. The BA states that about 0.8 acre of Texas wild-rice critical habitat occurs in the construction project area. Texas wild-rice is associated with flowing but not excessively turbulent water. Within Spring Lake, favorable water velocities occur just upstream of the both of Spring Lake Dam's spillways. Downstream of Spring Lake Dam, Texas wild-rice occurs among the calmer parts of the spillways' tailwaters.

Fountain Darters

Fountain darters occur among the submerged plants and moss above, within, and downstream of the spillways. While submerged plants are preferred habitat for fountain darters to shelter and feed, fountain darters will also occur among woody debris and large gravel to cobble substrates where small velocity shelters occur and food in the form of drift is available. This describes a sizable part of the area below the eastern spillway. The BA reports that about 0.8 acre of fountain darter critical habitat occurs in the construction project area.

San Marcos Salamanders

As discussed above, the San Marcos salamander occurs among the plants, cobble, and gravel of Spring Lake Dam's eastern spillway and nearby aquatic habitat downstream of both spillways. The construction project area includes about 0.8 acre of San Marcos salamander critical habitat. The San Marcos salamander is typically associated with habitats near spring openings. However, due to its type of substrate, the constant flow of high-quality oxygenated water, and the availability of cover and drifting prey for food, the aquatic habitats around Spring Lake Dam are highly suitable for the San Marcos salamander even though the nearest mapped springs are about 185 meters north of Spring Lake Dam.

Comal Springs Riffle Beetles

While critical habitat for the CSRB occurs in the action area, no CSRB are known to occur in the action area. There are other elmid species present around the dam and CSRB may eventually colonize Spring Lake Dam habitats given appropriate vicariance events.

Summary

The listed species known from the Spring Lake Dam area are presently well represented among their respective habitats in the action area. The current conditions are supportive of Texas wild-rice, fountain darter, and San Marcos salamander, due in part to the regional management of the Edwards Aquifer through participation in the Edwards Aquifer HCP, which helps maintain San Marcos Springs discharge and habitat restoration management in the upper San Marcos River.

4) Effects of the Action

The BA discusses the expected effects of the dam repairs, particularly stemming from construction methods for each species. Table 3 describes the various areas involved in the repairs and in particular the areal extent of habitats that are known to support Texas wild-rice, fountain darters, and San Marcos salamanders are identified for the proposed repair activities. Not all repair activities are expected to affect listed species. To identify the location and extent of a repair activity, please refer to the BA and Figure 4.

Factors to be considered

The duration of the repair work is expected to take less than 10 weeks. However, weather and storms could adversely affect dam repair efforts and progress. The areal extent of the project's disturbance represents a small percentage of each species current range. The repair efforts are expected to stabilize the dam for the foreseeable future and the durability of the repairs will be tested when a large rain event results in local flooding and overtopping of Spring Lake Dam.

Analyses for effects of the action

The project will have immediate and direct effects on eastern spillway habitats for the Texas wild-rice, fountain darter, and San Marcos salamander. The presence of all three of these species in various parts of Spring Lake is expected to continue at current levels irrespective of the dam repair project and backwater effect of Spring Lake Dam. No effort has been made to analyze the amount or configuration of listed species habitat above and below Spring Lake Dam should a dam breach occur. No reliable historical account is available to describe the habitat conditions for these species prior to impoundment of the upper San Marcos River in the mid-1800s. The headwaters are inferred to have had a mosaic of lake-like and riverine habitats. The aquatic habitats near Spring Lake Dam with moderate water velocities would have been more suitable for Texas wild-rice and historic reports indicated Texas wild-rice was present in parts of Spring Lake prior to listing. Large patches of submergent aquatic vegetation has likely been common in both Spring Lake and nearby downstream reaches of the upper San Marcos River and thus supported relatively large numbers of fountain darters. San Marcos salamanders are found in two main areas: (1) habitat in and near the San Marcos Springs in the main part of Spring Lake and (2) habitat associated with the spillways of Spring Lake Dam. To date, no Comal Springs riffle beetles (CSRB) are known to occur near Spring Lake Dam, although CSRB occur in the upper part of Spring Lake near springs by the Meadows Center for Water and the Environment about a 550 m northeast (heading 35°) from the eastern spillway of Spring Lake Dam. No CSRB are expected to occur in the action area but the action area does include designated critical habitat of the CSRB.

Species response to action

Texas Wild-rice

Texas wild-rice is present is small patches upstream from both the eastern and western spillways. The limits of construction are close to the closest known Texas wild-rice plants (Figure 4). The Texas wild-rice in Spring Lake near the limits of construction may need to be removed if placement of the diversion dam and/or deployment of the weighted silt curtain for AquaBlok treatment impinges these plants. The Texas wild-rice downstream of the action area are not expected to be affected by the project because temporary BMPs are anticipated to keep water flows and water quality at a level that supports extant stands of Texas wild-rice including those nearest the dam.

Fountain Darter

Fountain darters are present in relatively high densities in vegetated parts of Spring Lake. They are also present in lower densities near the spillways. Kollaus and Hardy (2016) sampled for fountain darters using dip nets, seines, and visual observation among the seeps below the dam and in aquatic habitat just west of the eastern spillway. Relatively high densities of fountain darters were found just upstream of a stand of Texas wild-rice (medium blue polygon in Figure 4 with a reported fountain darter density of 11 to 30 per m sq.). Herein, the mid-range of the densities reported by Kollaus and Hardy (2016) are used to estimate the number of fountain darters in areas sampled, particularly those in dam repair areas. There are three areas in this project that fountain darters are likely to disturbed, harmed, or possibly killed: (1) near the eastern spillway, (2) among the seeps, and (3) along the upstream embankment where AquaBlok will be used to reduce seepage through the dam. The fountain darter densities in (1) and (2) are estimated to be about 0.5 individuals per m sq. while the upstream embankment (effectively Spring Lake on the upstream side of the dam) is estimated to have an average of 7.9 individuals per m sq. based on drop sampling done by the Service (July 1994 through August 1996). Fountain darters not captured in work areas prior to treatments with riprap and AquaBlok are expected to be trapped in place where they shelter.

San Marcos Salamander

San Marcos salamanders occur in low densities (less than 1.0 individual per m sq.) near the eastern spillway and among the seeps on the downslope toe of Spring Lake Dam. They occur in the water filled spaces among cobble and gravels and on and near submerged aquatic plants in and near the dam. Kollaus and Hardy (2016) found slightly higher densities of San Marcos salamanders below a large seep outflow just west of the eastern spillway. That specific area appears to slightly overlap with the scour repairs planned for Scour area 3. Similarly, there is a slight overlap between seep habitat with salamanders and Scour area 2 (Figure 4). No San Marcos salamanders are known to occur in the upstream embankment where the AquaBlok treatment is planned.

		Area (m sq.)	Presence	Density (Ind per m sq.)	Density (Ind per m sq.)	Critical Habitat (m sq.)	Critical Habitat (m sq.)	Critical Habitat (m sq.)	Critical Habitat (m sq.)
Description Work Area	**Description**	Area	*Zizania texana*	*Etheostoma fonticola*	*Euycea nana*	*Zizania texana*	*Etheostoma fonticola*	*Euycea nana*	*Heterelmis comalensis*
Limits of Construction	subarea - Dam	2,533	1 or 2 individual plants	varies	varies	539	539	539	539
Limits of Construction	subarea - Staging	786	**Upland - no effects to listed species are expected**						
Eastern Spillway Repairs	Spillway Slab Repairs	134	**Slab is not suitable habitat for any listed species occupying the dam area**						
Eastern Spillway Repairs	Void size (estimate)	40	0	31	31	Substrate not suitable	62	62	62
Eastern Spillway Repairs	Area Just Downstream of Limits of Construction	72	0	36	36	72	72	72	72
Scour Area 1 (western)		264	**No identified aquatic habitat in Scour 1**						
Scour Area 2 (middle)		128	Absent			n/a			
Scour Area 2 (middle)	Seepage area overlap with Scour 2	42	Absent			n/a			
Scour Area 2 (middle)	Seepage area down gradient from Scour 2	37		0.5	0.5	n/a	37	37	37
Scour Area 2 (middle)	Area of potential nana and fonticola habitat where no repairs are proposed	154		0.5	0.5	n/a			
Scour Area 3 (eastern)		115		0.5	3.5	n/a			
Scour Area 3 (eastern)	Area of seep in Scour 3 repair area	6		0.5	0.5	n/a	6	6	6

Table 3. Repair Work Areas and Expected Effects to Listed Species

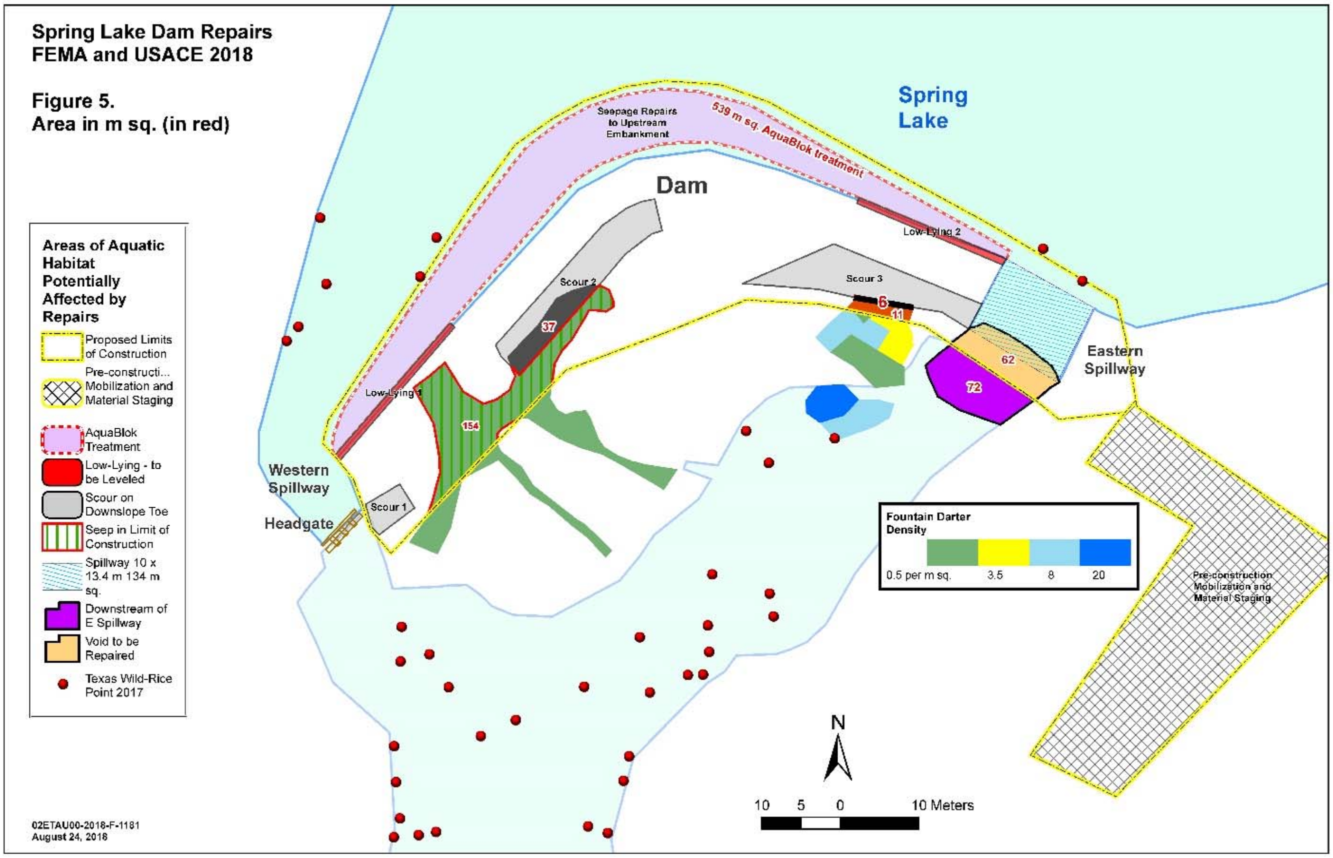

Figure 5. Proposed Spring Lake Dam repair areas and listed species habitats nearby.

5) Cumulative Effects

Cumulative effects include the effects of future State of Texas, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act. At this time, given the participation of TSU in the EA HCP, there are no foreseen actions that are reasonably certain to occur in the action area other than adverse effects to aquatic habitat for Texas wild-rice, fountain darters, and San Marcos salamanders from river – lake recreation activities. The dam itself and the eastern spillway has a long history of unauthorized visitation and disturbance and in recent years, substrates and plants have been altered despite prominent signage advising people to not disturb these sensitive and protected aquatic habitats. Once repairs to the dam are finished, TSU is expected to allow water recreationist to wade and swim in the San Marcos River below Spring Lake Dam. The River Ranger program may be able to reduce the adverse effects to aquatic habitats by the return of people to this part of the river, which has been closed to visitation until the dam is repaired.

6) Conclusion

After reviewing the current status of Texas wild-rice, fountain darter, San Marcos salamander, and the Comal Springs riffle beetle, the environmental baseline for the action area, the effects of the proposed Spring Lake Dam Repair project, and the cumulative effects, it is the Service's biological opinion that the project as proposed, is not likely to jeopardize the continued existence of the any of the species in this formal consultation, and is not likely to destroy or adversely modify designated critical habitat for Texas wild-rice, fountain darter, San Marcos salamander, or the Comal Springs riffle beetle. The bases for both non-jeopardy and no adverse modification of designated critical habitat determinations are: (1) the area affected by the project is small relative to the extant range of each species in consultation; (2) the majority of each species range and population in the San Marcos Springs ecosystem will not be affected by the project; and (3) the project's permanent effect to critical habitat is limited to less than 1000 m sq. for the Texas wild-rice and fountain darter critical habitat and less than 200 m sq. for San Marcos salamander and Comal Springs riffle beetle critical habitat. The overall extent and value of critical habitat for all four species in this consultation after the project is expected to be similar to pre-project levels.

Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary and must be undertaken by FEMA and USACE so that they become binding conditions of any grant or permit issued to the applicant (TSU), as appropriate, for the exemption in section 7(o)(2) to apply. FEMA and USACE have a continuing duty to regulate the activity covered by this incidental take statement. If FEMA and USACE: (1) fail to assume and implement the terms and conditions or (2) fail to require TSU to adhere to the terms and conditions of the incidental take statement through enforceable terms that are added to the permit or grant document, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, FEMA, USACE and TSU must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement. [50 CFR § 402.14(i)(3)].

Extent of Take Anticipated

The Service anticipates incidental take of fountain darters and San Marcos salamanders will occur as a result of the proposed action. Individuals of this species are difficult to detect due to their small size and aquatic environment. Because quantifying take of an individual is difficult, this biological opinion instead evaluates m sq. of habitat removed as a surrogate for the level of incidental take. The incidental take from the proposed action is expected to occur in the form of harm through direct injury to individuals and in through loss of habitat where aquatic plants are reduced and substrates altered.

We anticipate the following incidental take as result of the proposed action:

Fountain Darter	Eastern Spillway	134 m sq.
Fountain Darter	Scour Repairs	43 m sq.
Fountain Darter	Seepage Treatment	539 m sq.
	Fountain Darter total	716 m sq.
San Marcos Salamander	Eastern Spillway	134 m sq.
San Marcos Salamander	Scour Repairs	43 m sq.
	San Marcos Salamander total	177 m sq.

Effect of Take

The Service has determined that this level of anticipated take is not likely to result in jeopardy of the fountain darter due to the relatively small areal extent of habitat affected with the proposed action and the relatively large population of fountain darters in Spring Lake and the upper San Marcos River.

Similarly, the Service has determined that this level of anticipated take is not likely to result in jeopardy of the San Marcos salamander due to the relatively small areal extent of habitat affected with the proposed action and the relatively large population of San Marcos salamanders in habitats in and near Spring Lake Dam and Spring Lake.

Reasonable and Prudent Measures

Pursuant to section 7(b)(4) of the Act, we believe the following reasonable and prudent measures (RPM) are necessary and appropriate to minimize effects of incidental take on fountain darters and San Marcos salamanders:

RPM 1. Dam repair activities affecting (a) substrate, (b) water quality, (c) aquatic plants, and (d) animals of the San Marcos River will avoid disturbances to Texas wild-rice, fountain darters, and San Marcos salamanders to the maximum extent practicable. Where avoidance is not practical, TSU will minimize the disturbance in space and time. Best management practices to maintain water flow and adequate water quality for affected habitats shall be employed.

RPM 2. TSU (applicant) shall monitor the project and ensure appropriate and relevant information on the project is provided in a timely manner to FEMA, USACE, and the Service.

RPM 3. The USACE shall ensure that the coverage of submergent aquatic plants is not permanently reduced by the dam repair activities. TSU must plant an equal or larger areal extent of native submergent plants within one year of removing or destroying any rooted macrophytes in the work area.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the Act, the USACE must ensure compliance with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. The applicant shall be responsible for complying with these terms and conditions, which are non-discretionary.

The following are terms and conditions that implement the RPMs above.

1. TSU, FEMA, and USACE will ensure the project actions and environmentally protective measures described in the BA are followed; e.g., equipment will be generally serviced at a safe distance away from sensitive areas.

2. Work by TSU and/or its contractors shall be done with careful staging of heavy equipment by the river and inspections for leakage of fuels, hydraulic fluids, coolants, and any other fluids are required. If fluid leakage is detected, equipment must be repaired and cleaned prior to working in or along the river. Care must be taken to prevent material falling into the river.

3. The biologists working to clear fountain darters and San Marcos salamanders from the areas will carefully move these species along with algae, moss, or higher plants, to nearby suitable habitat outside the work areas.

4. Captured fountain darters and San Marcos salamanders will be removed and released in a manner that avoids predation by larger fishes, by releasing individuals with aquarium nets near plant cover on the river bed. Persons involved in these efforts should have proper equipment and authorizations/permits from the Service (section 10(a)(1)(A)) and Texas Parks and Wildlife Department (Scientific Permits pursuant to Texas Parks and Wildlife Code Chapter 43, subchapter C). Habitat will be swept with small (D-frame type or similar) dipnets or small seine to salvage fountain darters immediately prior to repair work. The amount of time that netted fountain darters are out of water must be kept to a minimum.

5. Turbidity will be visually monitored during construction periods. If project-related turbidity in the San Marcos River as evaluated just above University Drive Bridge precludes light reaching the river bed, the applicant will contact the Service to discuss the source of turbidity. If indicated, additional measures to reduce turbidity may be recommended.

6. If Texas wild-rice plants or stands occur in an area to be disturbed, the trans-location of Texas wild-rice may be done after written coordination and approval by the Service and TPWD's lead biologist for Texas wild-rice.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered or threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or designated critical habitat, to help implement recovery plans, or to develop information. The Service recommends that Texas State University, FEMA, and the USACE support implementation of recovery activities for Texas wild-rice, fountain darter, and San Marcos salamander, when possible. These include but are not limited to habitat protection, management, and enhancement efforts in and near Spring Lake complementary to the EA HCP. In order for the Service to stay informed, the Service requests notification of the implementation of any actions that are part of this conservation recommendation.

Reinitiation Notice

This concludes formal consultation on the proposed repairs to Spring Lake Dam by TSU. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. If the final action to be carried out differs from the proposed action that our opinion is based on, FEMA and USACE need to communicate with the Service to make sure the effects to species and the amount of take are not changed. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation. Reinitiation would be indicated if final plans differ from the proposed action in a manner that additional aquatic habitats or species numbers are affected.

Thank you for your efforts to protect the ecologically unique fish and wildlife resources of Spring Lake, Spring Lake Dam, and the upper San Marcos River. If you have any questions or needs, please contact Tanya Sommer at (512) 490-0057 extension 222.

Sincerely,

Adam Zerrenner
Field Supervisor

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