Recovery Plan for *Zizania texana* (Texas wild-rice), Fountain Darter (*Etheostoma fonticola*) and Texas Blind Salamander (*Typhlomolge rathbuni*)
https://ecos.fws.gov/docs/recovery_plan/960214.pdf

Original Approved: February 14, 1996
Original Prepared by: San Marcos/Comal Recovery Team and the Austin Ecological Services Field Office

DRAFT AMENDMENT 1

We have identified best available information that indicates the need to amend recovery criteria for *Zizania texana* (Texas wild-rice), fountain darter (*Etheostoma fonticola*), and Texas blind salamander (*Typhlomolge rathbuni*) since the San Marcos & Comal Springs & Associated Aquatic Ecosystems Recovery Plan (Recovery Plan) was last revised in February 1996. In this proposed modification, we synthesize the adequacy of the existing recovery criteria, show amended recovery criteria, and the rationale supporting the proposed recovery plan modification, and recommend ongoing implementation of existing recovery actions to foster and achieve recovery of *Zizania texana*, fountain darter, and Texas blind salamander. The proposed modification is shown as an appendix that supplements the Recovery Plan, superseding only recovery criteria for these species in Section A found in pages 53 through 57 of the 1996 revised Recovery Plan.

For
U.S. Fish and Wildlife Service
Southwest Region
Albuquerque, New Mexico

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BACKGROUND INFORMATION

Recovery plans should be consulted frequently, used to initiate recovery activities, and updated as needed. A review of the recovery plan and its implementation may show that the plan is out of date or its usefulness is limited, and therefore warrants modification. Keeping recovery plans current ensures that the species benefits through timely, partner-coordinated implementation based on the best available information. The need for, and extent of, plan modifications will vary considerably among plans. Maintaining a useful and current recovery plan depends on the scope and complexity of the initial plan, the structure of the document, and the involvement of stakeholders.

An amendment involves a substantial rewrite of a portion of a recovery plan that changes any of the statutory elements. The need for an amendment may be triggered when, among other possibilities: (1) the current recovery plan is out of compliance with regard to statutory requirements; (2) new information has been identified, such as population-level threats to the species or previously unknown life history traits, that necessitates new or refined recovery actions and/or criteria; or (3) the current recovery plan is not achieving its objectives. The amendment replaces only that specific portion of the recovery plan, supplementing the existing

recovery plan, but not completely replacing it. An amendment may be most appropriate if significant plan improvements are needed, but resources are too scarce to accomplish a full recovery plan revision in a short time.

Although it would be inappropriate for an amendment to include changes in the recovery program that contradict the approved recovery plan, it could incorporate study findings that enhance the scientific basis of the plan, or that reduce uncertainties as to the life history, threats, or species' response to management. An amendment could serve a critical function while awaiting a revised recovery plan by: (1) refining and/or prioritizing recovery actions that need to be emphasized, (2) refining recovery criteria, or (3) adding a species to a multispecies or ecosystem plan. An amendment can, therefore, efficiently balance resources spent on modifying a plan against those spent on managing implementation of ongoing recovery actions.

METHODOLOGY USED TO COMPLETE THE RECOVERY PLAN AMENDMENT

Since the revision of the Recovery Plan in 1996, additional studies have been conducted including: (a) annual census surveys of *Zizania texana* (Poole 2012, Bio-West 2017, Hathcock 2018), (b) annual fountain darter sampling by Bio-West (2017), and (c) a capture-mark-recapture local population estimates for Texas blind salamanders at Ezell's Cave and Rattlesnake Cave (Krejca and Gluesenkamp 2007). These data, combined with recommendations we received from State and local species experts at Texas Parks and Wildlife Department (TPWD) and the Service's San Marcos Aquatic Resources Center (SMARC) contributed to this Recovery Plan amendment. See the following links for data and documents made available by the Edwards Aquifer Habitat Conservation Plan (EAHCP) program, the Edwards Aquifer Authority (EAA), Texas State University, and TPWD:

http://eahcp.org/index.php/documents_publications_lib/

https://www.edwardsaquifer.org/science-and-maps/research-and-scientific-reports/science-document-library

https://digital.library.txstate.edu/handle/10877/134

https://tpwd.texas.gov/huntwild/wild/wildlife_diversity/nongame/publications/staff-publications.phtml

https://tpwd.texas.gov/landwater/water/conservation/fwresources/reports.phtml

We plan to conduct peer review of this amendment concurrent with publication of a Notice of Availability for the draft amendment in the *Federal Register*.

ADEQUACY OF RECOVERY CRITERIA

Section 4(f)(1)(B)(ii) of the Endangered Species Act (Act) requires that each recovery plan shall incorporate, to the maximum extent practicable, "objective, measurable criteria which, when met, would result in a determination…that the species be removed from the list." Legal challenges to recovery plans (see Fund for Animals v. Babbitt, 903 F. Supp. 96 (D.D.C. 1995))

and a Government Accountability Audit (GAO 2006) have also affirmed the need to frame recovery criteria in terms of threats assessed under the five threat factors (ESA 4(a)(1)).

Recovery Criteria
The current recovery criteria for downlisting these three species can be found on pages 53-57 of the revised Recovery Plan (1996). Delisting was considered unattainable at the time the revised Recovery Plan was completed.

Synthesis
We used multiple reputable sources of information on the ecology of *Zizania texana*, fountain darter, and Texas blind salamander in our consideration of establishing criteria for delisting. We incorporated information from published scientific papers on *Zizania texana* habitat; fountain darter feeding ecology, growth rate, reproduction, habitat reliance on mosses and aquatic macrophytes, water temperature and water quality tolerances, and susceptibility to disease and parasites; and Texas blind salamander distribution and abundance. In the past two decades, there have been a handful of comprehensive system-wide surveys of aquatic macrophytes in the Comal River system and the upper San Marcos River system: Bartsch et al. 1999, Hardy et al. 2000, Saunders et al. 2001, Doyle 2001; Hardy and Shoemaker 2004, Owens 2009, Hardy 2009. In addition we have data and annual reports from the EAHCP (TE63663A) and scientists with section 10(a)(1)(A) permits. There have been three reports by the National Academies of Sciences reviewing the EAHCP (2015, 2017, 2018). Finally, we used the results of research conducted by the San Marcos Aquatic Resources Center, TPWD, and Texas State University on the upper San Marcos River including hydraulic habitat models, results of macrophyte restoration efforts, and the removal of non-native macrophytes.

AMENDED RECOVERY CRITERIA
Recovery criteria serve as objective, measurable guidelines to assist in determining when an endangered species has recovered to the point that it may be downlisted to threatened, or that the species is no longer at risk of extinction and may be delisted. Delisting is the removal of a species from the Federal Lists of Endangered and Threatened Wildlife and Plants. Downlisting is the reclassification of a species from an endangered species to a threatened species. The term "endangered species" means any species (species, sub-species, or DPS) which is in danger of extinction throughout all or a significant portion of its range. The term "threatened species" means any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.

Revisions to the Lists, including delisting or downlisting a species, must reflect determinations made in accordance with sections 4(a)(1) and 4(b) of the Act. Section 4(a)(1) requires that the Secretary determine whether a species is an endangered species or threatened species (or not) because of threats to the species. Section 4(b) of the Act requires that the determination be made "solely on the basis of the best scientific and commercial data available." Thus, while recovery plans provide important guidance to the U.S. Fish and Wildlife Service (Service), States, and other partners on methods of minimizing threats to listed species and measurable objectives against which to measure progress towards recovery, they are guidance and not regulatory documents.

Recovery criteria should help indicate when we would anticipate that an analysis of the species' status under section 4(a)(1) would result in a determination that the species is no longer an endangered species or threatened species. A decision to revise the status of or remove a species from the Federal Lists of Endangered and Threatened Wildlife and Plants, however, is ultimately based on an analysis of the best scientific and commercial data then available, regardless of whether that information differs from the recovery plan, which triggers rulemaking. When changing the status of a species, we first propose the action in the *Federal Register* to seek public comment and peer review, followed by a final decision announced in the *Federal Register*.

We provide delisting criteria for *Zizania texana*, fountain darter, and Texas blind salamander, which will supplement the downlisting criteria included in the current Recovery Plan, as follows:

Downlisting Recovery Criteria
Downlisting criteria will remain the same for *Zizania texana*, fountain darter, and Texas blind salamander as in the revised Recovery Plan (Service 1996, pp. 53-57).

Delisting Recovery Criteria

Zizania texana

Zizania texana will be considered for delisting when all of the following criteria are met:

1. Mean daily discharge in the San Marcos River as measured by the U.S. Geological Survey (USGS) San Marcos streamflow gage (USGS 08170500) equals or exceeds 55 cubic feet per second (cfs), 95 percent of the time, for 30 years.

   Justification: Adequate stream discharge is required to support *Zizania texana* habitat throughout the entire historic range. Due to its limited range (only one river system), the distribution of *Zizania texana* in all parts of its range provides population redundancy and is important for the species to withstand catastrophic events like floods which may scour the river bed and *Zizania texana* stands along with it. The instream flow requirements of *Zizania texana* are related in part to depth of water in the upper San Marcos River. Given a depth criteria of 2 feet or more for *Zizania texana*, a discharge of 50 cfs eliminates 90 percent of suitable habitat (Appendix IV: Figure 8 in Saunders et al. 2001). The impacts to *Zizania* habitat from recreation are expected to be severe and increase as the river discharge decreases to the historic minimum recorded flow. The lowest flows recorded were during the summer of 1956 and were in the 50 to 60 cfs (daily mean) range according to the U.S. Geological Survey.

   The timeframe of 30 years is considerate of the challenge presented by severe multi-year droughts, which have a longer return interval. A timeframe shorter than 30 years would not be as likely to have such a severe event that will test the aquifer management and the ability to maintain ecosystem functions through a severe drought.

2. A minimum instantaneous flow of 45 cfs is maintained in the San Marcos River as measured by the San Marcos streamflow gage (USGS 08170500) even in a drought of record.

   Justification: River discharge needs to remain above 45 cfs at all times to maintain habitat and prevent damage and destruction of *Zizania* plants on a finer timescale. The hydrologic drought of record considers the entire period of record for measured flows and that extends back to 1929. Criterion 1 together with Criterion 2 address the flow regime that must be exceeded to avoid widespread losses of *Zizania texana*.

3. Water quality is suitable and supportive by meeting these two requirements:

   a. Turbidity, total dissolved solids (TDS) , and pH of the San Marcos River are consistently within established 25 to 75 percentile range of the earliest published San Marcos River water quality data (USGS data for upper San Marcos River, various stations) over a period of 5 continuous years. In general, suitable lake and river turbidity values (historic reference conditions) are in the low range for nephelometric turbidity units (NTU less than 1.0). Suitable total dissolved solids and pH values are comparable to those reported by Slattery and Fahlquist (1997) and earlier. The assessment of water quality to determine if these criteria are met will be based on the standard protocols and procedures of the USGS's National Field Manual (NFM) for the Collection of Water-Quality Data (USGS 2018). The selection of at least four sampling sites should be representative of the San Marcos River upstream from Cumming's Dam and water quality measurements from all sites must fall within the respective ranges for levels of turbidity, TDS and pH. The frequency of collection of water quality samples shall be a minimum of once per month and water-quality data shall be collected monthly for at least 5 years.

   b. The environmental concentrations of known phytotoxic compounds as surveyed annually in the San Marcos River in *Zizania texana* Segments G through M (see Figure 1) (including dissolved copper, dissolved zinc, and listed U.S. Environmental Protection Agency [EPA] and Texas Department of Agriculture regulated herbicides) are consistently below known adverse effects levels each year for 30 consecutive years.

   Justification: Water quality maintenance is important for the viability of the species because all *Zizania texana* populations are found in a relatively short (less than five river-miles) spring ambient river. Additional published water quality data are included in Ogden et al. (1986), and Guyton and Associates (1979).

4. Healthy, self-sustaining, and reproductive populations are established and maintained throughout the historic range. This criterion will be evaluated based on the presence of *Zizania texana* with more than minimum areal coverage and distribution provided in accompanying table of areal extent objectives (Table 1). Healthy for *Zizania texana* means free from disease, free from adverse biological interactions (e.g., free from detrimental levels of epiphytic algae), and free from limiting physical conditions (e.g., inadequate levels of photosynthetically active radiation as investigated by

Crawford-Reynolds (2018)). To meet this criterion, the areal coverage by *Zizania texana* for each Upper San Marcos River segment must exceed delisting targets for that segment annually for 30 consecutive years. A population of *Zizania texana* in Segment X is not considered necessary for recovery as: (1) this habitat did not exist until Capes Dam and its mill race were constructed, (2) it has never had any significant stands of *Zizania texana* likely due unsuitable substrates, and (3) the mill race is subject to drying if or when Capes Dam is breached.

Justification: This criterion prescribes the areal coverage objectives for ensuring that sexual reproduction occurs, leading to maintenance of genetic variation within and among *Zizania texana* segments. The ability to withstand more localized stochastic disturbances (resiliency) is enhanced by *Zizania texana* occupation of all of its historic range. For example, if a tree fall in the river results in damage to a stand, *Zizania texana* tillers floating downstream may be able to colonize the area affected and eventually fill available habitat to the extent it is not precluded or excluded by other plants or other factors (e.g., a change in river substrate, such as a sand-small gravel scoured to clay).

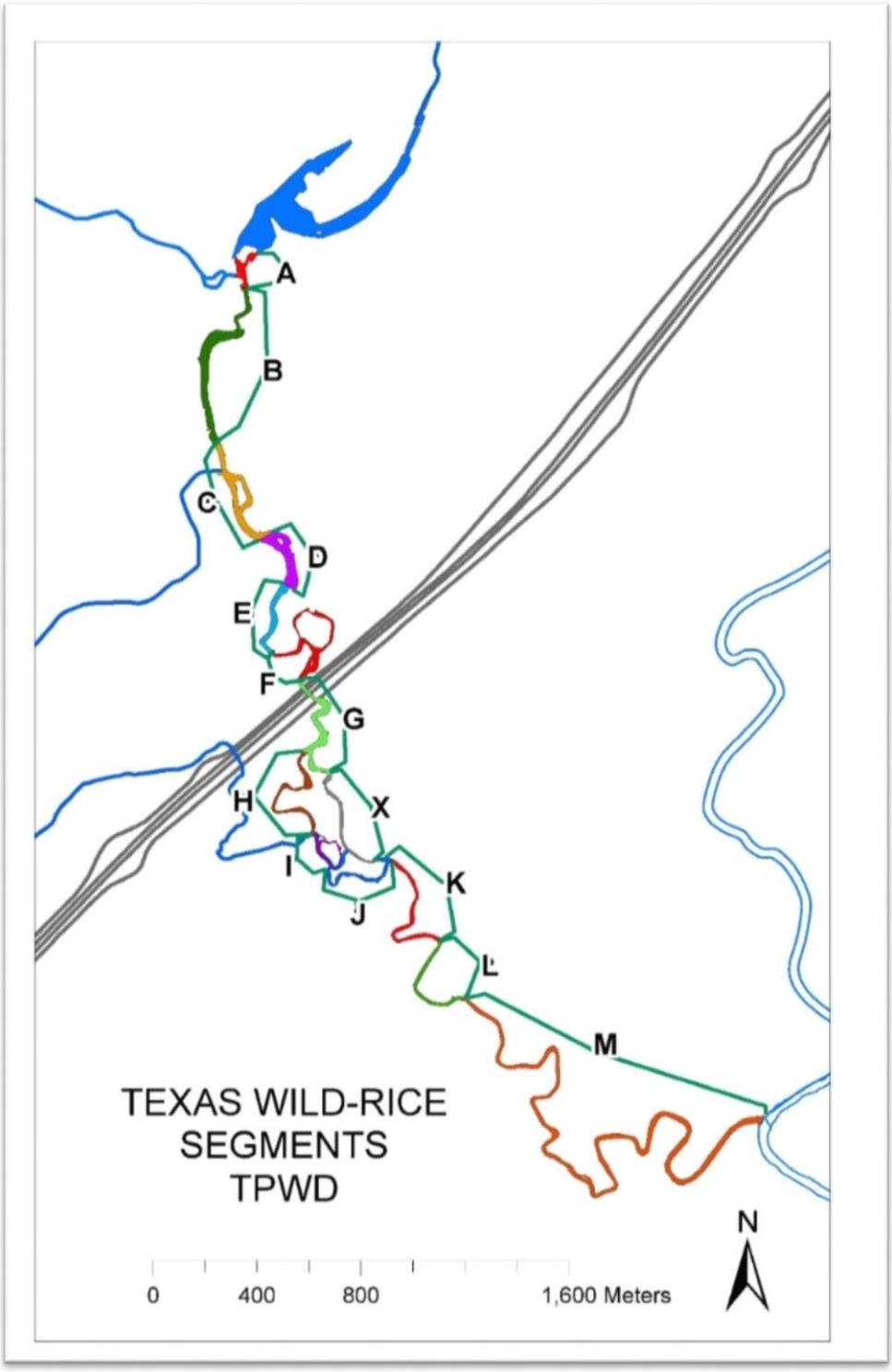
5. A minimum of two captive, reproducing *Zizania texana* stocks are maintained in separate geographic locations.

Justification: Maintaining captive stocks of *Zizania texana* will ensure that genetic integrity of the species (representation) is preserved for reintroductions or supplementations, should a catastrophic event eliminate or drastically reduce numbers in their native ecosystem.

Table 1. Areal coverage objectives for delisting *Zizania texana* for Upper San Marcos River segments shown in Figure 1.

Segment Name	**Delisting Target in m^2**	**Delisting Percent of Segment (Occupied Habitat) Target**
Spring Lake	4,373	5
A	1,679	35
B	7,097	35
C	1,456	10
D	508	5
E	620	10
F	1,695	15
G	576	5
X	n/a	n/a
H	413	5
J	288	5
K	834	10
L	851	15
M	1,472	3
Total in m^2	**21,861**	

Figure 1. *Zizania texana* segments in the Upper San Marcos River. See Table 1 for the areal coverage of *Zizania texana* needed for meeting delisting criteria.



Fountain Darter

The fountain darter will be considered for delisting when the following criteria are met:

1. The mean daily discharge in the Comal River as measured by the New Braunfels streamflow gage (USGS 08169000) is equal to or greater than 100 cfs, 95 percent of the time, over 30 years with no zero flow days. The mean daily discharge in the San Marcos River as measured by the San Marcos streamflow gage (USGS 08170500) is equal to or greater than 50 cfs, 95 percent of the time, over 30 years with no zero flow days. These instream flows are met even in a repeat of the drought of record.

   Justification: The fountain darter occurs only in the Comal River of Comal County, Texas and the upper San Marcos River of Hays County, Texas. Thus, both river systems are considered crucial to the viability of the species. Criterion 1 supports the fullest extent of habitat in both the Comal and upper San Marcos rivers by ensuring the primary determinant of structure and function of this aquatic ecosystem (its flow regime) is continuously supporting the only two populations of fountain darter. Poff et al. (2010) provided a consensus view of the importance of limiting hydrologic alterations. The Service has provided minimum flows needed to avoid jeopardy in the current Recovery Plan (1996) pursuant to litigation (Sierra Club vs. Secretary of the Interior (No. MO-91-CA-069, U.S. Dist Ct., W.D. Texas). Continuous flows above 150 cfs at Comal Springs are needed to prevent jeopardy to the fountain darter. Additionally, continuous flows above 100 cfs at San Marcos Springs are needed to prevent jeopardy to the fountain darter.

2. The populations are equal to or greater than 500,000 individuals in the both the Comal and San Marcos river systems consecutively for 30 years (based on a Service approved sampling design).

   Justification: Larger population sizes are better able to adapt to changing environmental conditions over time, and thus more resilient. Large populations help avoid the myriad of negative effects common to small populations such as loss of genetic variation and increased likelihood that random events may result in loss of one or both populations. A population of greater than or equal to 500,000 individuals at the headwater of each spring ecosystem is considered to be: (1) realistic, assuming aquatic habitats are restored to the carrying capacity of Landa Lake and Spring Lake, (2) sustainable, given a stable spring flow regime with adequate submergent aquatic macrophytes, (3) practical, given the areal extent of suitable habitat in each ecosystem, and (4) a population size large enough to maintain genetic variation and avoid adverse effects related to small population size.

3. The mean weekly water temperature is less than or equal to 76 degrees Fahrenheit for 30 years. Water temperature will be measured at six representative designated sites (three sites in Landa Lake and three sites in Spring Lake) in 15 minute intervals using USGS NFM protocols and procedures.

   Justification: Maintenance of water temperature will help each spring ecosystem realize its maximum potential habitat. When fountain darters are present throughout their lake-

river system's historic range, they are less likely to suffer an extirpation or extinction event. Water quality, (particularly a higher than average spring-ambient water temperature regime due to low springflow) in 1956 is considered to be an important factor in the extirpation of the fountain darter from the Comal River.

The relation of water quality especially water temperature to fountain darter egg production and mortality of larvae has been researched at the San Marcos Aquatic Resources Center and Texas State University (Bonner et al. 1998).

4. Dissolved oxygen measured as the daily minimum at a height of 15 cm above the river bed in six designated sites (three in Landa Lake and three in Spring Lake) exceeds 4.0 mg/L for 95 percent of the time over 30 years. Additionally, dissolved oxygen as measured above must exceed 2.0 mg/L 100 percent of the time.

Justification: Adequate dissolved oxygen is at the critical to the health of fishes and other aquatic organisms. Impairment of dissolved oxygen could lead to morbidity or mortality of fountain darters or their prey items.

Figure 2. Fountain darter segments for the Comal River System. The U.S. Geological Survey station for the Comal River is located at the boundary of sections 10 and 11 (Bartsch et al. 1999).

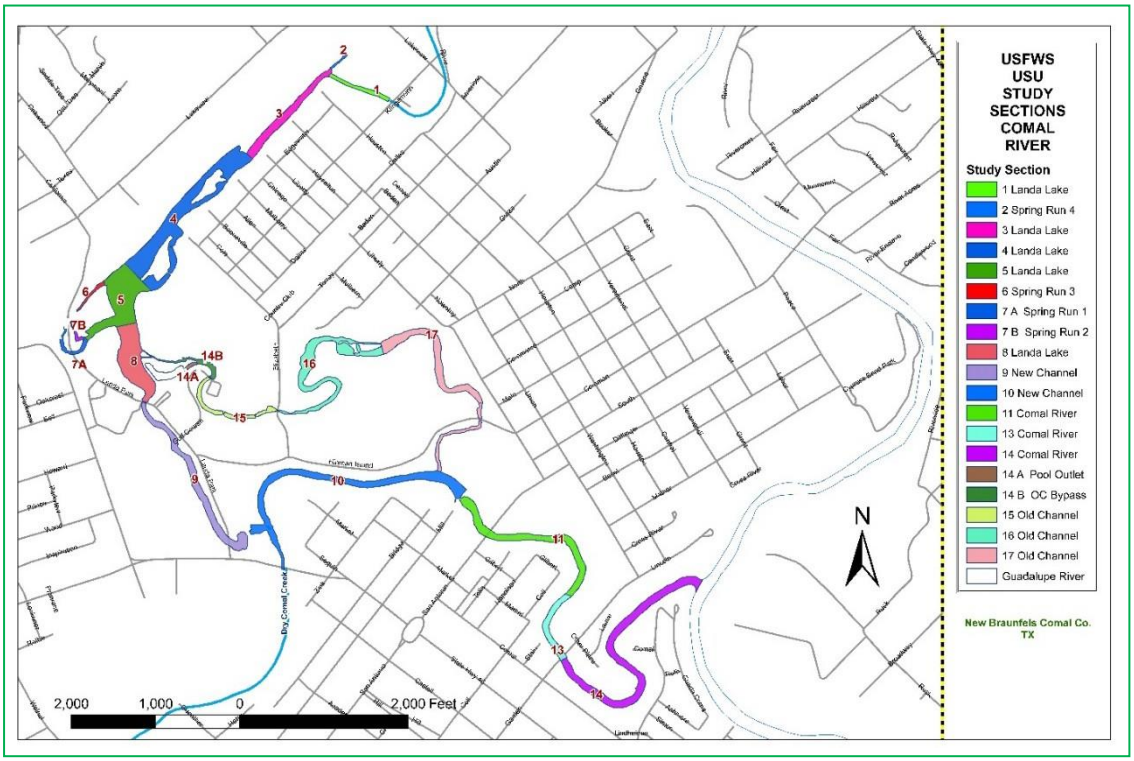
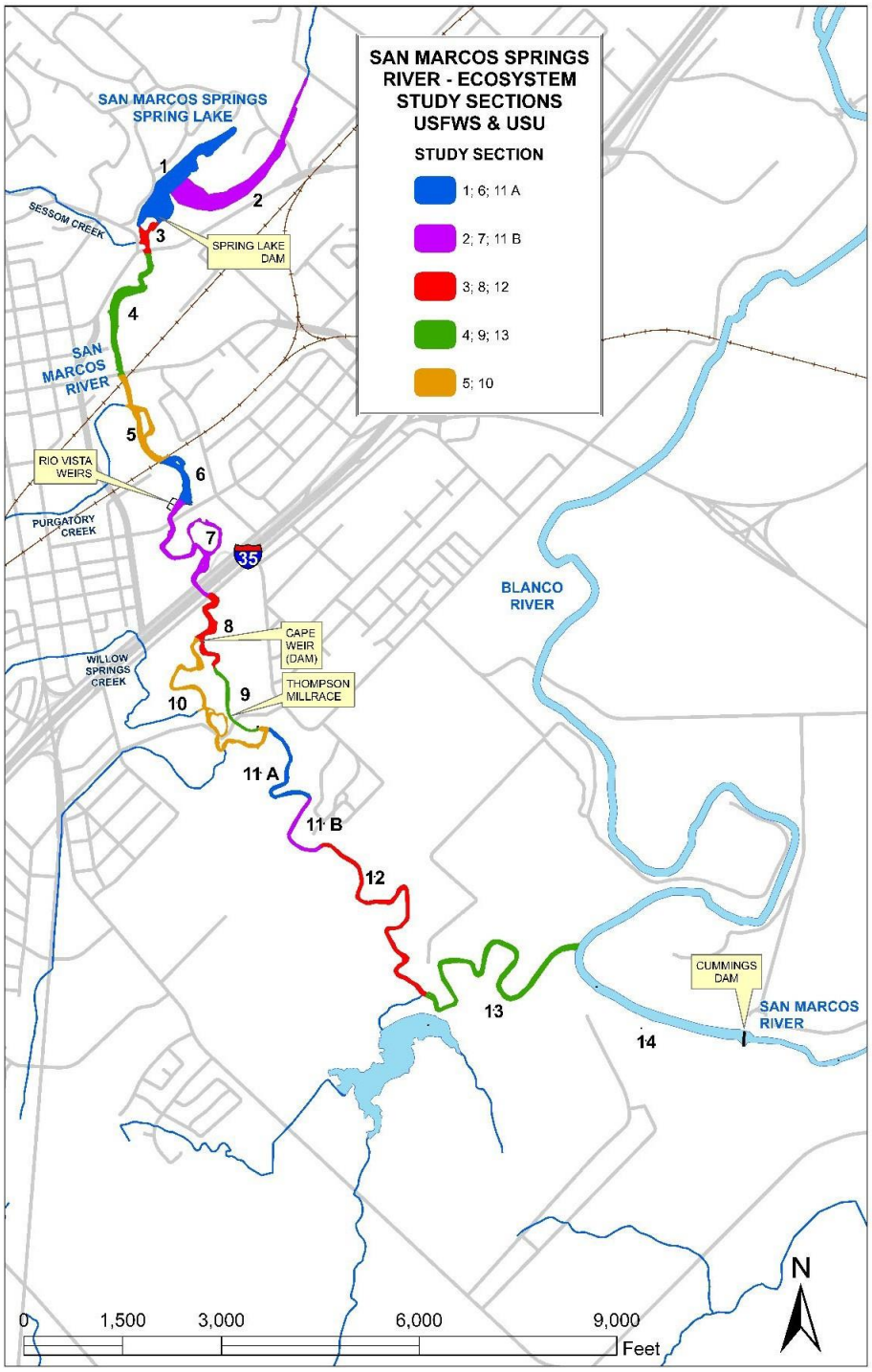


Figure 3. Fountain darter segments for the San Marcos River System. Note the U.S. Geological Survey Station for the upper San Marcos River is at the boundary of sections 3 and 4 just below the confluence of Sessom Creek with the San Marcos River. Segments used in Hardy et al. 2000 and Hardy and Shoemaker 2004.



Texas Blind Salamander

Texas blind salamander will be considered for delisting when the following criteria are met for all three recovery (management) units (Figure 4).

1. The mean daily discharge in the San Marcos River as measured by the San Marcos streamflow gage (USGS 08170500) is equal to or greater than 50 cfs, 99 percent of the time, over 30 years with no zero flow days. Flows must be maintained even in a drought of record.

   Justification: This criterion addresses the maintenance of groundwater flow by using San Marcos springflow regime as a surrogate. Aquifer habitat for the Texas blind salamander is limited in geographic scope and the cessation of flow at San Marcos Springs may result in the encroachment of saline groundwater throughout some or all of its current range.

2. Water quality in the range of the Texas blind salamander consistently meets or exceeds established EPA numeric criteria for protection of aquatic life as measured within three Recovery Units located at: Rattlesnake Cave, Diversion Springs, and Johnson's Well. The water quality standards must be met at all three sites annually for 30 consecutive years. See two links that follow:

https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table

https://www.epa.gov/wqc/aquatic-life-criteria-and-methods-toxics

   Justification: This criterion provides for the abatement of stressors that may reduce the health and population size of this species. The establishment of three recovery units for the Texas blind salamander will help in conservation planning by maintaining any local variation may have resulted from differences among Purgatory Creeks sites compared to Spring Lake sites and Rattlesnake Cave sites. Recovery for the Texas blind salamander would be discernable if local populations in each recovery unit were large enough and all three recovery units are found to be relatively safe from water quality degradation.

3. All measures identified in the Recovery Plan to remove or minimize local threats are completed or are ongoing to adequately address the identified threat. These measure include addressing the entrainment of Texas blind salamanders into wells by groundwater withdrawal, the destruction or pollution of local recharge features and caves, and holistic control of potential local pollution sources.

   Justification: Wells represent a source of mortality that may reduce the population to critically low levels. Wells are present throughout the known range and with the exception of the Texas State University artesian well near the Aquatic Biology building, no monitoring data are available to understand to attrition from this stressor.

4. Healthy populations must exceed 500 individuals annually, for 30 years in all three parts of the species range:

a. Rattlesnake Cave and Rattlesnake Well
b. Spring Lake, Sessom Creek Spring, and Texas State University wells
c. Caves and wells of the Purgatory Creek area

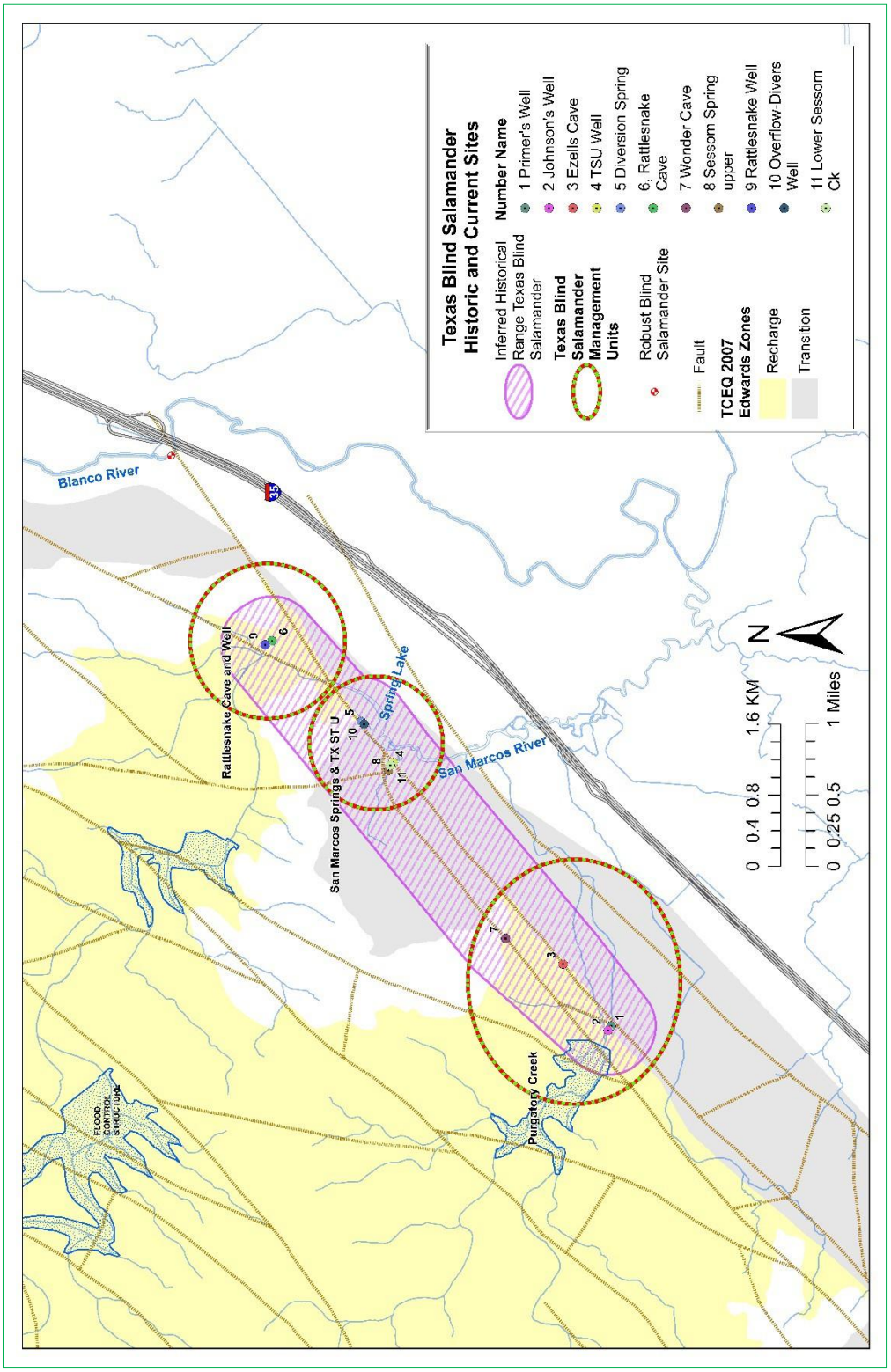
A population is considered healthy if all available information indicates it is free of disease, parasites and other factors that would adversely affect the reproductive and feeding ecology of Texas blind salamanders.

Justification: A population size of 500 or more individuals is adequate to minimize the vulnerabilities common to small populations (Lande and Barrowclough 1987, Lynch and Lande 1998). A population size exceeding 500 is needed to reduce the risks posed by genetic drift, demographic stochasticity and environmental stochasticity.

5. Three captive stocks from Rattlesnake Cave and Well, Spring Lake sites, and Ezells and Purgatory Creek sites (Figure 4) are established and maintained for a minimum of 30 years for threatened Texas blind salamanders.

Justification: This criterion considers the scarcity of Texas blind salamander populations and helps ensure that a range-wide negative stressor such as a groundwater pollution event does not impact the Texas blind salamanders throughout its limited habitat.

Figure 4. Known and Historic Range for Texas Blind Salamander with recommended recovery (management) units.



Rationale for Amended Recovery Criteria

All three of these species (*Zizania texana,* fountain darter, and Texas blind salamander) long term viability depends on continued management. Regarding redundancy, each of these three species is challenged by the fact that only one or a few populations exist. When evaluating species threats and species response to those threats, we must also consider the effect of any existing regulatory mechanisms or conservation effort in ameliorating the impacts of those threats. If long-term management is needed after delisting to ensure that threats are adequately managed into the future, we may not be able to conclude that the threat is adequately addressed until establishment of regulations, continuing management agreements, or some other long-term mechanism to ensure ongoing management and mitigation of the particular threat.

For each of these species, continued management is needed to foster recovery and ensure the likelihood of extinction is reduced such that these species are not likely to become endangered within the foreseeable future. Management efforts on regional and local scales are currently provided by participants in the EAHCP. While the EAHCP participants by themselves are not required to recover these species, they may be able to provide the continued management that leads to recovery goals for one or more of these species.

The recovery criteria need to be objective and measurable. To be objective, criteria must be based on the best available science and free from bias. To be measurable, criteria need to be quantitative or easy to gauge progress and success of conservation efforts. Smith et al. (2018) defined three terms considered important to recovery planning: redundancy, representation, and resiliency (Table 2). Their definitions follow:

Table 2. Select terms related to enhancing recovery chances and decreasing the likelihood of extirpation or extinction. The Three Rs.

Term	Definition	Notes
Redundancy	The ability of a species to withstand catastrophic events by spreading risk among multiple populations or across a large area.	Supported by measures maintaining or increasing large habitat patch size in cases of only one population.
Representation	The ability of a species to adapt to changing environmental conditions over time as characterized by the breadth of genetic and environmental diversity within and among populations.	Positively affected when genetic variation is maintained in the wild. Larger population sizes help protect against loss of genetic diversity.
Resiliency	The ability of a species to withstand stochastic disturbance; resiliency is positively related to population size and growth rate and may be influenced by connectivity among populations.	Supported by a positive intrinsic rate of growth (λ, lambda). In some cases, fragmentation of habitat (e.g., weirs and dams on a river) can adversely affect connectivity particularly in an upstream direction.

Incorporating these criteria in the current Recovery Plan will help municipal, regional, State and Federal entities by emphasizing the measurable habitat and biological attributes that will inform species status assessments and consideration of changes to the federal status for *Zizania texana*, fountain darter, and Texas blind salamander. The recovery actions in the current Recovery Plan are to inform conservation efforts that manage habitat, increase population sizes, and reduce threats.

The recovery strategy for the species associated with the San Antonio segment of the Edwards Aquifer is to work with stakeholders on a comprehensive management plan that addresses regional issues like groundwater withdrawal, and local issues like stormwater pollution and water recreation impacts.

Regional and local efforts are underway to address the potential loss of habitat due to drought and other factors. Meeting the delisting criteria in this amendment would demonstrate that these species: (a) are able to withstand catastrophic events like severe droughts and flooding, (b) will maintain their potential to adapt to changes in environmental conditions such as introduced nonnative species and altered river channels, and (c) survive stochastic environmental disturbances (e.g., sewage line or water main break).

ADDITIONAL SITE SPECIFIC RECOVERY ACTIONS
Not applicable

COSTS, TIMING, PRIORITY OF ADDITIONAL RECOVERY ACTIONS
Not applicable.

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