

**DEPARTMENT OF THE INTERIOR****Fish and Wildlife Service****50 CFR Part 17**

[Docket No. FWS-R2-ES-2019-0061;  
FXES1111090FEDR-245-FF09E21000]

RIN 1018-BD16

**Endangered and Threatened Wildlife and Plants; Endangered Species Status With Critical Habitat for Guadalupe Fatmucket, Texas Fatmucket, Guadalupe Orb, Texas Pimpleback, Balcones Spike, and False Spike, and Threatened Species Status With Section 4(d) Rule and Critical Habitat for Texas Fawnsfoot**

**AGENCY:** Fish and Wildlife Service, Interior.

**ACTION:** Final rule.

**SUMMARY:** We, the U.S. Fish and Wildlife Service (Service), determine endangered species status under the Endangered Species Act of 1973 (Act), as amended, for the Guadalupe fatmucket (*Lampsilis bergmanni*), Texas fatmucket (*Lampsilis bracteata*), Guadalupe orb (*Cyclonaias necki*), Texas pimpleback (*Cyclonaias (=Quadrula) petrina*), Balcones spike (*Fusconaia (=Quincuncina) iheringi*), and false spike (*Fusconaia (=Quincuncina) mitchelli*), and threatened species status for the Texas fawnsfoot (*Truncilla macrodon*), seven species of freshwater mussels from central Texas. We also issue a rule under section 4(d) of the Act for the Texas fawnsfoot that provides measures that are necessary and advisable to provide for the conservation of the Texas fawnsfoot. In addition, we designate critical habitat for all seven species. In total, approximately 1,577.5 river miles (2,538.7 river kilometers) in Blanco, Brown, Caldwell, Coleman, Comal, Concho, DeWitt, Gillespie, Gonzales, Guadalupe, Hays, Kendall, Kerr, Kimble, Lampasas, Llano, Mason, McCulloch, Menard, Mills, Palo Pinto, Parker, Runnels, San Saba, Shackelford, Stephens, Sutton, Throckmorton, Tom Green, Travis, and Victoria Counties, Texas, fall within the boundaries of the critical habitat designation. This rule applies the protections of the Act to these species and their designated critical habitats.

**DATES:** This rule is effective July 5, 2024.

**ADDRESSES:** This final rule is available on the internet at <https://www.regulations.gov>. Comments and materials we received, as well as supporting documentation we used in

preparing this rule, are available for public inspection at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061.

*Availability of supporting materials:* Supporting materials we used in preparing this rule, such as the species status assessment report, are available for public inspection at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061. For the critical habitat designation, the coordinates or plot points or both from which the maps are generated are included in the decision file and are available at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061.

**FOR FURTHER INFORMATION CONTACT:**

Karen Myers, Field Supervisor, U.S. Fish and Wildlife Service, Austin Ecological Services Field Office, 1505 Ferguson Lane, Austin, TX 78754; telephone (512) 937-7371. Individuals in the United States who are deaf, deafblind, hard of hearing, or have a speech disability may dial 711 (TTY, TDD, or TeleBraille) to access telecommunications relay services. Individuals outside the United States should use the relay services offered within their country to make international calls to the point-of-contact in the United States.

**SUPPLEMENTARY INFORMATION:****Executive Summary**

*Why we need to publish a rule.* Under the Act, a species warrants listing if it meets the definition of an endangered species (in danger of extinction throughout all or a significant portion of its range) or a threatened species (likely to become endangered within the foreseeable future throughout all or a significant portion of its range). If we determine that a species warrants listing, we must list the species promptly and designate the species' critical habitat to the maximum extent prudent and determinable. We have determined that the Guadalupe fatmucket (*Lampsilis bergmanni*), Texas fatmucket (*Lampsilis bracteata*), Guadalupe orb (*Cyclonaias necki*), Texas pimpleback (*Cyclonaias (=Quadrula) petrina*), Balcones spike (*Fusconaia (=Quincuncina) iheringi*), and false spike (*Fusconaia (=Quincuncina) mitchelli*) meet the Act's definition of endangered species, and the Texas fawnsfoot (*Truncilla macrodon*) meets the Act's definition of a threatened species; therefore, we are listing them as such, finalizing a rule under section 4(d) of the Act for the Texas fawnsfoot, and designating critical habitat. Both listing a species as an endangered or threatened species

and designating critical habitat can be completed only by issuing a rule through the Administrative Procedure Act rulemaking process (5 U.S.C. 551 *et seq.*).

*What this document does.* This rule makes final the listing of the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike as endangered species, and the Texas fawnsfoot as a threatened species with a rule issued under section 4(d) of the Act (a "4(d) rule"). In addition, this rule designates critical habitat for all seven central Texas mussel species in 20 units (including 32 subunits) totaling 1,577.5 river miles (2,538.7 river kilometers (km)) on private, State, and Federal property within portions of 31 counties in Texas.

*The basis for our action.* Under the Act, we may determine that a species is an endangered or threatened species because of any of five factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence; we also take into account conservation efforts, such as Candidate Conservation Agreements with Assurances (CCAAs). We have determined that increased fine sediment, changes in water quality, and altered hydrology in the form of inundation and loss of flow and scour of substrate (Factor A), collection (Factor B), predation (Factor C), and barriers to fish movement (Factor E) are the primary threats to these species. These factors are all exacerbated by the ongoing and expected effects of climate change.

Section 4(a)(3) of the Act requires the Secretary of the Interior (Secretary), to designate critical habitat, to the maximum extent prudent and determinable, concurrent with listing. Section 3(5)(A) of the Act defines critical habitat as (i) the specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protections; and (ii) specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination by the Secretary that such areas are essential for the conservation of the species. Section 4(b)(2) of the Act states that the Secretary must make the designation on the basis of the best scientific data

available and after taking into consideration the economic impact, the impact on national security, and any other relevant impacts of specifying any particular area as critical habitat.

#### Previous Federal Actions

Please refer to the August 26, 2021, proposed rule (86 FR 47916) for a detailed description of previous Federal actions concerning these species.

#### Peer Review

A species status assessment (SSA) team prepared an SSA report for the Guadalupe fatmucket, Texas fatmucket, Texas fawnsfoot, Guadalupe orb, Texas pimpleback, and false spike. This SSA report was completed prior to the taxonomic divergence of the false spike to reflect the recently described Balcones spike (*Fusconaia iheringi*) (Smith et al. 2020, entire) (see Summary of Changes from the Proposed Rule, below). The SSA team was composed of Service biologists, in consultation with other species experts. The SSA report represents a compilation of the best scientific and commercial data available concerning the status of the species, including the impacts of past, present, and future factors (both negative and beneficial) affecting the species.

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), and our August 22, 2016, memorandum updating and clarifying the role of peer review of listing actions under the Act, we solicited independent scientific review of the information contained in the SSA report. We sent the SSA report to eight independent peer reviewers and received six responses. Results of this structured peer review process can be found at <https://regulations.gov>. In preparing the proposed rule, we incorporated the results of these peer reviews, as appropriate, into version 1.1 of the SSA report, which was the foundation for the proposed rule and this final rule. A summary of the peer review comments and our responses can be found under Summary of Comments and Recommendations, below.

#### Summary of Changes From the Proposed Rule

Based upon our review of the public comments, State agency comments, peer review comments, and relevant information that became available since the August 26, 2021, proposed rule published, we updated information in our SSA report, including:

- Updating the taxonomy of false spike (*Fusconaia mitchelli*) to reflect the divergence from the recently described

Balcones spike (*Fusconaia iheringi*) (Smith et al. 2020, entire).

- Updating text to clearly differentiate between the threat of sedimentation to freshwater mussels and naturally occurring turbidity in a river system; improve consistency in the use of “impaired” when discussing water quality; and further differentiate between the threat of sedimentation within a system and the presence of turbidity associated with fine organic or inorganic matter, soluble organic compounds, algae, or other microscopic organisms.

We made these and other changes as appropriate in this final rule. In addition to minor clarifying edits and incorporation of additional information on the species’ biology, populations, and threats, this final determination differs from the August 26, 2021, proposed rule in the following ways:

(1) We add updated population data for the Texas fatmucket, including survey data made available by the Texas Department of Transportation since the publication of the proposed rule. Based on the presence of Texas fatmucket in Unit TXFM–6b (Upper Onion Creek), this unit has now changed from unoccupied to occupied, so we combine the Upper and Lower Onion Creek critical habitat units (TXFM–6b and TXFM–6a, respectively) into one occupied unit (TXFM–6). Therefore, this rule differs slightly from the proposed critical habitat designation (86 FR 47916; August 26, 2021) by unit numbering and occupancy.

(2) Both the Balcones spike and the false spike are included in this final listing rule because the entity known as false spike in the August 26, 2021, proposed rule was taxonomically divided into the two species. We rename and renumber critical habitat units to reflect the updated taxonomy and range of false spike and Balcones spike. We renumber proposed critical habitat unit FASP–4 (Guadalupe River Unit) as FASP–1; it is now the only critical habitat unit for the false spike. The remaining three proposed critical habitat units for the false spike are renamed and renumbered for the Balcones spike: unit FASP–1 (Little River Unit) is now BASP–1, FASP–2 (San Saba River Unit) is now BASP–2, and FASP–3 (Llano River Unit) is now BASP–3.

(3) For the critical habitat designation, we exclude proposed units TXFF–3, TXFF–4, and BASP–1 (previously FASP–1) based on the implementation of conservation measures completed by the Brazos River Authority (BRA) as part of their candidate conservation agreement with assurances (CCAA) for

the Balcones spike and Texas fawnsfoot in the Brazos River Basin (BRA 2021, pp. 35–51; hereafter, the “BRA Agreement”). We also exclude proposed units TXFF–6 and TXPB–6 based upon the implementation of conservation measures completed by the Lower Colorado River Authority (LCRA) as part of their CCAA for the Texas pimpleback, Texas fawnsfoot, Texas fatmucket, and Balcones spike in the Lower Colorado River Basin below O.H. Ivie Reservoir (LCRA 2023, pp. 45–84; hereafter, the “LCRA Agreement”). In addition, we exclude proposed units TXFF–7 and TXFF–8 based upon the implementation of conservation measures completed by the Trinity River Authority (TRA) as part of their CCAA for six species in the Trinity River Basin (TRA 2023, pp. 47–66; hereafter, the “TRA Agreement”).

(4) We incorporate minor changes in the length of river miles (and kilometers) of occupied stream reaches. We also incorporate minor changes in the length of river miles (and kilometers) from the proposed critical habitat to reflect those included in the final critical habitat unit maps. While we use the same start and end points for all final critical habitat unit designations, these minor changes in critical habitat designation length are the result of geoprocessing tools used in ArcGIS.

(5) We include short textual descriptions of the designated units under Regulation Promulgation in this rule, as under 50 CFR 17.94, general descriptions of the location and boundaries of each area may be provided to clarify or refine what is included within the boundaries depicted on the map, or to explain the exclusion of sites (e.g., paved roads, buildings) within the mapped area. These descriptions mirror information in the preamble of this rule, which reflects the unit description information presented in our August 26, 2021, proposed rule as amended by the changes described in this document.

(6) Based on public comments, we update language in the 4(d) rule for the Texas fawnsfoot to clarify and refine the specific prohibitions and exceptions to those prohibitions to minimize potential ambiguity. Specifically, to qualify for exceptions when conducting channel restoration projects, we clarify that the project must meet all applicable Federal, State, and local permitting requirements. In addition, to allow the Service to make arrangements for surveys and potential relocation of any mussels that might be adversely affected during channel restoration projects, we add that notice must be provided to the Service of the location and nature of the

proposed work at least 30 days prior to commencing actual construction within an area designated as critical habitat for the Texas fawnsfoot. In addition, to qualify for exceptions when conducting streambank stabilization projects, we specify that: (i) native live stakes, native live fascines, or native live brush must be used; (ii) methods that include the use of quarried rock (riprap) for more than 25 percent of the area within the streambanks or include the use of rock baskets or gabion structures do not qualify for this exception; (iii) work using these bioengineering methods must be performed at base flow or low water conditions and when significant rainfall likely to result in significant runoff is not predicted at or upstream of the area where work is proposed for a period of at least 3 days after the work is scheduled to be undertaken, in order to reduce streambank erosion and sedimentation; and (iv) the project must meet all applicable Federal, State, and local permitting requirements. Further, to qualify for exceptions when conducting soil and water conservation practices, and riparian and adjacent upland habitat management activities, we add that, to allow the Service to make arrangements for surveys and potential relocation of any mussels that might be adversely affected during channel restoration projects, notice must be provided to the Service of the location and nature of the proposed work at least 30 days prior to commencing actual construction within an area designated as critical habitat for Texas fawnsfoot.

(7) Based on public comments, we update language to include examples of discretionary actions for the central Texas mussels that may be subject to consultation procedures under section 7, and more clearly define the standards for avoiding jeopardizing the continued existence of the species for future section 7 conferences/consultations (see Available Conservation Measures, below). In addition, we update language to include protective regulations to address the threats to the Texas fawnsfoot under section 9, as well as what activities would and would not be likely to constitute a violation of section 9 take prohibition (see Provisions of the 4(d) Rule, below).

(8) Based on a public comments, we also make minor, nonsubstantive changes and corrections throughout this rule in response to public comments. However, the information we received during the public comment period on the proposed rule did not change our determination that the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike,

and false spike meet the Act's definition of endangered species, and the Texas fawnsfoot meets the Act's definition of a threatened species.

### Summary of Comments and Recommendations

In the proposed rule published on August 26, 2021 (86 FR 47916), we requested that all interested parties submit written comments on the proposal by October 25, 2021. We also contacted appropriate Federal and State agencies, scientific experts and organizations, and other interested parties and invited them to comment on the proposal. Newspaper notices inviting general public comment were published in the Austin Statesman, and we held public hearings on September 14 and September 16, 2021. All substantive information we received during the comment period has either been incorporated directly into this final determination or is addressed below.

### Peer Reviewer Comments

As discussed in Peer Review above, we received comments from six peer reviewers on the draft SSA report. We reviewed all comments we received from the peer reviewers for substantive issues and new information regarding the contents of the SSA report. Peer reviewer comments are addressed in the following summary. As discussed above, because we conducted this peer review prior to the publication of our proposed rule, we had already incorporated all applicable peer review comments into version 2.1 of the SSA report, which was the foundation for the proposed rule. The peer reviewers generally concurred with our methods and conclusions, and provided additional information, clarifications, and suggestions to improve the SSA report (Service 2019b, entire). Peer reviewer comments are addressed in the following summary and are incorporated into the SSA report as appropriate.

(1) *Comment:* One peer reviewer suggested that, in addition to the value limited by the population abundance factor in the overall current condition, the ranges used to assign values to the six condition factors after averaging should be included in the SSA report.

*Our response:* The overall average current condition of the populations, not limited by the abundance condition, is not reflective of population condition. We chose to limit the overall current conditions so they could not exceed abundance because our information regarding habitat is not robust enough to outweigh abundance (*i.e.*, a mussel population with low abundance but

indications of moderate or high habitat factors should not be rated to be in moderate or high condition). Therefore, reporting the unlimited averages would only cause reader confusion that could be derived from presenting multiple "overall condition" values for each population.

(2) *Comment:* One peer reviewer suggested, particularly for false spike, that the lack of knowledge of host fish could be a factor influencing central Texas mussel distribution and abundance if the host fish is in fact not a common species.

*Our response:* Following the submission of the draft SSA for peer review, studies were completed identifying the red shiner (*Cyprinella lutrensis*) and blacktail shiner (*Cyprinella venusta*) as host fish for false spike, and both are common fish species in this area (Dudding et al. 2019, p. 16). Host fish for congeners of the mussel species that are the subjects of this rule are a suite of typically common fish species, and therefore it is unlikely that these mussel species rely exclusively on rare fish species to serve as the sole or primary fish hosts for reproduction.

(3) *Comment:* One peer reviewer and one State commenter stated concerns of using 35-millimeter (mm) length to define juveniles, especially the use of the threshold for the generally smaller Texas fawnsfoot, and they requested that the Service revisit the evidence of reproduction criteria, in particular for smaller species.

*Our response:* We consulted with regional and national freshwater mussel experts from around the United States, and the 35-mm length was considered to be an appropriate delineating threshold to use when differentiating between adult and juvenile mussels. This conclusion was made based on the general consensus amongst those asked that individuals below 35 mm in length are not readily detectable during field surveys. Without species-specific data identifying the known size at age of sexual maturity for the subject species, we found it appropriate to consistently use the same cutoff for multiple species if no species-specific data were available. As these data become available, we will update these criteria as appropriate.

### Comments From States

(4) *Comment:* One commenter requested that the Service emphasize desiccation study data completed at the San Marcos Aquatic Resources Center that demonstrate that Texas pimpleback is able to tolerate 32 days without water and the Texas fatmucket can tolerate about 3 days without water.

*Our response:* The desiccation trials mentioned by the commenter were conducted in a laboratory growth chamber at 25 degrees Celsius (°C) (77 degrees Fahrenheit (°F)) and the relative humidity is not reported (Bonner et al. 2018, p. 193). Presumably, live freshwater mussels experiencing dewatering occurring in the natural environment would be exposed to temperatures greater than 25 °C (77 °F), especially during summer, when drying events are most likely to occur. Additionally, exposed animals would be susceptible to predation. Therefore, while we report the results of the desiccation study, emphasizing them could erroneously create an inaccurate representation of the conditions that exposed mussels would experience and artificially inflate the exposure time during which mussels could be expected to survive in the wild.

(5) *Comment:* The State of Texas disagrees with the finding that there are no federalism implications for the designation of critical habitat.

*Our response:* Federalism is the division and sharing of power between the Federal Government and the individual State governments. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of, the proposed critical habitat designation with appropriate State resource agencies throughout central Texas. From a federalism perspective, the designation of critical habitat directly affects only the responsibilities of Federal agencies. The Act imposes no other duties with respect to critical habitat, either for States and local governments, or for anyone else. As a result, this final rule does not have substantial direct effects either on the States, or on the relationship between the national government and the States, or on the distribution of powers and responsibilities among the various levels of government. In accordance with Executive Order 13132 (Federalism), this rule does not have significant federalism effects, and a federalism summary impact statement is not required.

(6) *Comment:* The State of Texas requested clarification on whether the completion of an approved freshwater mussel identification and sampling course and proficiency testing will be required for scientists with a permit issued under section 10(a)(1)(a) of the Act (a “10(a)(1)(a) permit”), and whether the 4(d) rule will allow qualified individuals to relocate Texas fawnsfoot.

*Our response:* The provision of the 4(d) rule that allows for Texas fawnsfoot surveys to be conducted by those who pass an approved Texas mussel identification and sampling course is intended for those who are sampling for freshwater mussels, in which mussels are collected, identified, and returned to the mussel bed from which they came. Surveyors who are trained in survey techniques and how to identify the various species that occur in Texas will not need a 10(a)(1)(a) permit because we expect the effects to the species to be negligible. This provision in the 4(d) rule is not intended to replace the 10(a)(1)(a) permit process, and those with a 10(a)(1)(a) permit will not be required to complete the course. Furthermore, relocation of Texas fawnsfoot from one mussel bed to another is not an excepted form of take under this 4(d) rule.

(7) *Comment:* The State of Texas suggested that naturally occurring ambient water quality should be considered in the context of historical water quality, and laboratory thresholds reported for temperature, salinity, chlorides, and dissolved oxygen should be considered when identifying essential water quality thresholds as components of critical habitat.

*Our response:* The objective use of laboratory-based studies, in addition to in situ monitoring, is critical to the understanding of physiological and toxicological thresholds for freshwater mussels. Even though certain ambient water quality parameters are currently occurring in the presence of live freshwater mussels, there is no clear indication that these parameters are protective of freshwater mussels, as different life stages of the species are more sensitive to water quality changes than others (*i.e.*, glochidia and juveniles are more sensitive than adults). Freshwater mussel populations throughout the State of Texas have declined in recent decades, and the presence of reduced or restricted mussel populations should not be used as an indicator that instream conditions are adequate for the long-term persistence of the population. The completion of laboratory studies can provide objective thresholds for individual chemicals, temperatures, or other water quality parameters for both lethal and sublethal effects on individual freshwater mussel species. When identifying the physical or biological features related to water quality for the mussels, we set the thresholds at levels that have been objectively identified as protective of the mussels. Therefore, laboratory-derived values were selected when identifying these components rather

than utilizing observed ambient values, which, as described above, may not be protective of all the covered species life stages.

(8) *Comment:* The State of Texas requested clarification on how increased extreme precipitation is projected to have divergent effects on future high stream flows in different rivers, as the Service has predicted for the Llano River and Middle Trinity River.

*Our response:* Different river basins experience different conditions that affect the future of flows within those basins. For the Llano River, while there have been recent significant high flow events, recent trends in stream flows in the river have shown an overall reduction in flows in the basin. These reductions are expected to continue in response to climate change (reduced projected rainfall) and expanding development in Texas (groundwater pumping). Conversely, the Trinity River is anticipated to experience increases in flows in the future due to the growth of the Dallas-Fort Worth metroplex and its reliance on surface waters. Water resources that historically would have been distributed across the landscape in north Texas have been consolidated into an assortment of wastewater treatment and water supply system with many return flows feeding into the Trinity River. These return flows combine to elevate the baseflows of the Trinity River at all times (TRA 2023, pp. 23, 25–27) and can combine with rain events, leading to higher high flow events.

(9) *Comment:* The State of Texas provided recommendations for clarification of the physical or biological features (PBFs) essential to the conservation of the central Texas mussels, particularly the PBFs concerning the identification of specific elements of the flow regimes considered essential, adaptive flexibility in defining host fish for the subject mussel species, and the number of sample events required (single or multiple) to evaluate the ranges of water quality parameters.

*Our response:* For the flowing water PBF, we welcome additional research on the identification of specific flow regime elements needed for the long-term conservation of these mussel species. However, this information does not currently exist, and so we could not use specific flow rates when developing the PBFs for the species. We are actively working with external partners who are researching the role of stream flows on Texas fatmucket growth and survival in the Colorado River Basin, and we will use these findings as we develop recovery plans for the species.

For the host fish PBF, we must use the best available information when

identifying essential PBFs, and the current science indicates that sunfishes (including bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), Guadalupe bass (*Micropterus treculii*), and largemouth bass (*M. salmoides*)), freshwater drum (*Aplodinotus grunniens*), catfish (channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivarius*), and tadpole madtom (*Noturus gyrinus*)), minnows (family Cyprinidae), and shiners (blacktail shiner (*Cyprinella venusta*) and red shiner (*C. lutrensis*)) are hosts for the central Texas mussel species. Additional host fish species identified for these mussels will be incorporated into the recovery planning process.

Finally, for the PBF that relates to water quality, it can be challenging to provide specific thresholds for water quality parameters because effects to freshwater mussels can range from sublethal to lethal depending on the duration of the exposure to conditions as well as the time of year, flow rates, and other factors. Currently, species-specific toxicology studies have not been completed for the species included in this rule. Therefore, currently, the Service is using surrogate acute water quality standards from other freshwater mussel species in the United States to identify physical features for designated critical habitat. As the species-specific acute and chronic standards are developed for the covered species, the Service will revisit and refine the characteristics of these water quality features. Once these standards are developed, the Service will work with subject matter experts to identify the appropriate sampling techniques to evaluate the acceptable thresholds for water quality parameters, and work with project proponents to ensure that the most appropriate methods will be used to determine effects on listed freshwater mussels on a project-by-project basis.

(10) *Comment:* The State of Texas and several commenters requested that the Service more clearly identify the estimated probability of persistence (threshold) that would preclude a listing decision.

*Our response:* The “probability of persistence” is just one small part of our SSA report that informed our analysis and listing decision, which also considered the factors identified by the Act (such as a species’ life history, generation time, current and future threats, and trajectory of those threats). There is not a strict probability above which we would not list and below which we would list, particularly because the information we use to assess the species’ persistence is of a

general nature and does not pinpoint the likelihood of persistence to the degree we would require to provide certainty that that the species persistence was above or below such a threshold. Therefore, “probability of persistence” alone is not going to result in a decision that a species meets the definition of threatened or endangered.

(11) *Comment:* The State of Texas and several commenters are concerned about the economic impact that proposed critical habitat would have on private landowners, private property values, and wastewater treatment plants (WWTPs), suggesting that the incremental effects memo (IEM) only captures baseline costs, and not the total costs associated with critical habitat designation. The commenters requested that prior to publishing a final rule, the Service conduct a new economic analysis, using the coextensive approach.

*Our response:* As stated in the economic analysis of the designation of critical habitat for the Central Texas mussels, guidelines issued by the U.S. Office of Management and Budget (OMB) for the economic analysis of regulations direct Federal agencies to measure the costs and benefits of a regulatory action against a baseline (*i.e.*, costs and benefits that are “incremental” to the baseline). The OMB defines the baseline as the “best assessment of the way the world would look absent the proposed action.” (Circular A–4, 2003). In other words, the baseline includes any existing regulatory and socio-economic burden imposed on landowners, managers, or other resource users affected by the designation of critical habitat. The baseline includes the economic impacts of listing the species under the Act, even if the listing occurs concurrently with critical habitat designation. Impacts that are incremental to the baseline (*i.e.*, occurring over and above existing constraints) are those that are solely attributable to the designation of critical habitat and are the focus of the economic analysis.

The Service acknowledges that significant debate has occurred regarding whether assessing the impact of critical habitat designations using the incremental approach is appropriate, with several courts issuing divergent opinions. Most recently, the U.S. Ninth Circuit Court of Appeals concluded that the incremental approach is appropriate, and the U.S. Supreme Court declined to hear the case (*Home Builders Association of Northern California v. United States Fish and Wildlife Service*, 616 F.3d 983 (9th Cir. 2010), cert. denied, 179 L. Ed 2d 301,

2011 U.S. Lexis 1392, 79 U.S.L.W. 3475 (2011); *Arizona Cattle Growers v. Salazar*, 606 F.3d 1160 (9th Cir. 2010), cert. denied, 179 L. Ed. 2d 300, 2011 U.S. Lexis 1362, 79 U.S. L.W. 3475 (2011)). Subsequently, on August 28, 2013, the Service revised its approach to conducting impact analyses for designations of critical habitat, specifying that the incremental approach should be used (78 FR 53062).

#### Public Comments

(12) *Comment:* A commenter suggested that the reliance on data regarding recently dead shell material that are up to 21 years old, combined with the difficulty to detect mussels at sites that are not visited multiple times, is insufficient to define areas occupied at the time of listing and designate those areas as critical habitat for the Texas fatmucket, Texas fawnsfoot, and Texas pimpleback.

*Our response:* While the Service used the year 2000 as the oldest year for “recent” survey data, much of the survey data used during the review of the species that are the subjects of this rule were collected during the increase in sampling efforts following the 2010 State listing of these species as threatened by the Texas Parks and Wildlife Department (TPWD). Therefore, much of the data used for the SSA were closer to 10 years old when we were developing the August 26, 2021, proposed rule. However, in instances in which the data were in fact collected approximately 20 years ago, the time gap between the data collection and proposed rule would be between 1 and 3 generations for these species. Because the Service has not been notified of or witnessed rapid, substantial, permanent habitat changes or been provided evidence of recent mussel die-offs through the collection of large numbers of fresh-dead (shells still attached to soft tissue) or recent dead (shells lacking connection to soft tissue but still containing a shiny inner shell layer), it is reasonable to conclude that these occupied areas would still be occupied by the species at some level.

Much of the freshwater mussel sampling that has been completed in Texas to date has consisted of single, opportunistic surveys as part of larger research projects or environmental compliance surveys completed prior to some form of instream construction rather than monitoring events that would require multiple visits to individual sites. While multiple visits to a site will provide a clearer picture of population abundance and extent, a single visit is often sufficient to

determine occupancy if the species is present at that time.

(13) *Comment:* A commenter stated that the proposed critical habitat designation does not include an initial regulatory flexibility analysis to satisfy the requirements of the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 *et seq.*), and the Service has not prepared an environmental impact statement to satisfy the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*).

*Our response:* When a species is proposed for listing, the Act's section 4(a)(3) requires the Secretary of the Interior (Secretary), to the maximum extent prudent and determinable, to designate critical habitat for that species. For more information about the considerations we must undertake when designating critical habitat, see and Consideration of Impacts under Section 4(b)(2) of the Act and *Regulatory Flexibility Act (5 U.S.C. 601 et seq.)*, below.

Under the Regulatory Flexibility Act (RFA), Federal agencies are only required to evaluate the potential incremental impacts of a rulemaking on directly regulated entities. The regulatory mechanism through which critical habitat protections are realized is section 7 of the Act, which requires Federal agencies, in consultation with the Service, to ensure that any action authorized, funded, or carried by the Agency is not likely to adversely modify critical habitat. Therefore, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) imposed by critical habitat designation. Under these circumstances, it is the Service's position that only Federal action agencies will be directly regulated by this designation. Therefore, because Federal agencies are not small entities, the Service may certify that the proposed critical habitat rule will not have a significant economic impact on a substantial number of small entities. Because certification is possible, no regulatory flexibility analysis is required.

Upon recommendation of the Council on Environmental Quality (CEQ), the Service determined that NEPA documents need not be prepared in connection with regulations finalizing the listing status for species pursuant to section 4(a) of the Act. This critical habitat designation is issued concurrently with the listing of the species under section 4(a). On October 25, 1983, the Service published in the **Federal Register** a notice explaining this decision (48 FR 49244). The Service

subsequently interpreted this 1983 determination to apply to critical habitat designations, based on the decision delivered in a Sixth Circuit Court of Appeals case (*Pacific Legal Foundation v. Andrus*, 657 F. 2d 829 (1981)) and CEQ's recommendation.

Based on this interpretation, the Service did not conduct NEPA analyses on critical habitat designations between 1983 and 1998. However, since the mid-1990s, the question of whether NEPA applies to the Federal action of designating critical habitat under the Act has been the subject of multiple lawsuits. In *Douglas County v. Babbitt*, 48 F.3d 1495 (9th Cir. 1995), the U.S. Court of Appeals for the Ninth Circuit upheld the Service's conclusion that critical habitat actions are exempt from NEPA compliance. The Service was again challenged on this conclusion in *Catron County Board of Commissioners v. U.S. Fish and Wildlife Service*, 75 F.3d 1429 (10th Cir. 1996) (*Catron County*); the U.S. Court of Appeals for the Tenth Circuit ordered the Secretary to comply with NEPA when completing critical habitat determinations. The DC District Court in *Cape Hatteras Access Pres. All. v. U.S. Dep't of Interior*, 344 F. Supp. 2d 108 (D.D.C. 2004) similarly held that NEPA applied to critical habitat designations. However, more recently, the Fifth Circuit Court of Appeals agreed with the Ninth Circuit and held that NEPA does not apply to critical habitat designations under the Act (*Markle Interests v. FWS*, 827 F.3d 452 (5th Cir. 2016), *rev'd on other grounds sub nom. Weyerhaeuser v. U.S. Fish and Wildlife Service*, 139 S. Ct. 361 (2018)). Other district courts have applied this reasoning as well (*e.g., Otay Mesa Property, LP v. U.S. Department of the Interior*, 144 F. Supp. 3d 35 (D.D.C. 2015)).

While the Service does not concede that NEPA applies to critical habitat designations or revisions under the Act, we agreed to address NEPA compliance for critical habitat designations when the range of the species occurs within the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, which includes the following States: Colorado, Kansas, New Mexico, Oklahoma, Utah, and Wyoming. The central Texas mussels' critical habitat designations do not occur within the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, so we did not prepare an environmental assessment under NEPA for this designation.

(14) *Comment:* A commenter requested that proposed critical habitat unit TXFM-2 (San Saba River) for the Texas fatmucket be limited to the upper section of the San Saba River, as it is the

only segment of the river that has the PBFs essential to the conservation of the species. Because the middle reach of this critical habitat unit lacks an adequate hydrologic flow regime, which is an essential PBF, and this flow regime is not expected to improve under current predictions of increasing periods of drought, and the species does not currently exist in the lower reach of the San Saba River, they requested these middle and lower reaches of the San Saba River be removed from final critical habitat designation.

*Our response:* Based on recent survey data, we consider this reach to be currently occupied by the species. Despite the anticipated future threats to water levels in the middle San Saba River and the Hill Country as a whole, live Texas fatmucket have been observed at multiple locations in the middle reach of the San Saba River in the last 10 years. Historical collection records provide evidence that the species has also occurred in the past in the lower reach of the San Saba River near San Saba, Texas. We acknowledge that the unique geology of the middle reach of the San Saba River presents conservation challenges concerning flowing water (an essential PBF) in the lower reach of the river, but this unit currently contains adequate flowing water, suitable substrate, appropriate host fish, and adequate water quality, and recovery will entail restoring the species to reaches of habitat long enough such that stochastic events do not eliminate the entire population. The lower reach of the San Saba does not present these geological challenges and contains the essential PBFs needed to support the species in this portion of the San Saba River. The middle and lower reaches of the San Saba River add approximately 69 river miles (mi) (111 river kilometers (km)) of habitat to the population, they would increase the overall resiliency of the population.

(15) *Comment:* A commenter stated that the Service lacks enough species-specific information to designate critical habitat, particularly in unoccupied areas, and that the proposed rule fails to show that designated critical habitat is determinable.

*Our response:* We are required to designate critical habitat based on the best scientific data available at the time of designation. We considered the best scientific data available regarding the central Texas mussels to evaluate potential critical habitat under the Act. We have sufficient information to understand the habitat these species need and where the species occur, and we solicited peer review on our evaluation of that information. The

listing and critical habitat process does not require perfect information; it requires that we use the best available information to make our determinations. Therefore, we found that critical habitat was determinable in both occupied and unoccupied areas.

(16) *Comment:* Several commenters requested that critical habitat designation for endangered species be limited to occupied reaches.

*Our response:* The Act defines critical habitat under section 3(5)(A) and allows for the designation of areas within and outside the geographical areas occupied by the species at the time of listing. There is no statutory requirement to limit critical habitat areas to only occupied areas. The Act requires that areas outside the geographical area occupied by the species be essential for the conservation of the species.

We have determined that unoccupied units are essential for the conservation of the Texas fatmucket and Texas pimpleback because they provide for the growth and expansion of the species within portions of their historical ranges. We identified areas outside the geographical areas currently occupied by the Texas fatmucket and Texas pimpleback as critical habitat in order to increase the stream length of critical habitat designations adjacent to existing small populations. These unoccupied areas are located immediately adjacent to currently occupied stream reaches, include one or more of the essential PBFs, and allow for expansion of existing populations necessary to improve population resiliency, extend physiographic representation, and reduce the risk of extinction for the species. The establishment of additional moderately healthy to healthy populations across the range of these species would reduce their risk of extinction. Improving the resiliency of populations in the currently occupied streams, and into identified unoccupied areas, will increase species viability. See Criteria Used to Identify Critical Habitat, below.

(17) *Comment:* Commenters requested that additional unoccupied areas be designated as critical habitat. These areas included the upstream portions of the Llano River in Edwards County, Texas, lower reaches of the Llano River, downstream of the City of Llano in Llano County, Texas, and Johnson Creek, which flows into the Guadalupe River in Kerr County, Texas.

*Our response:* After identifying areas occupied by the species at the time of listing, we will identify specific areas outside the geographical area occupied by the species at the time of listing that the Secretary determines are essential

for the conservation of the species. We evaluated the upstream portions of the South Llano River located in Edwards County and found that this reach of the river does not consistently remain wetted and does not provide suitable habitat through large portions of the stream in Edwards County and is not essential for the conservation of the species. Therefore, we did not designate the area as critical habitat. We evaluated the lower reaches of the Llano River near the river's confluence with the Little Llano River; these reaches are bookended by a dam in the City of Llano used for drinking water and a low-head dam which impounds Robinson Lake. Any suitable habitat between the two structures would be isolated from other existing populations due to stretches of unsuitable habitat and impairment of fish passage and therefore is not essential for the conservation of either Texas pimpleback or Texas fatmucket. Therefore, for the central Texas mussels, other than the unoccupied areas noted in this rule (TXFM-1c, TXFF-1b, TXPB-1a, and TXPB-5b), we are not designating additional areas outside the geographical area occupied by the species because we have not identified any additional unoccupied areas that meet the definition of critical habitat at this time.

(18) *Comment:* One commenter stated that proposed critical habitat unit TXFM-1 does not meet the criteria established for critical habitat since it does not contain all the PBFs described in the proposed rule as essential to the conservation of the species.

*Our response:* In areas occupied at the time of listing a species as endangered or threatened, critical habitat is the specific areas on which are found the physical or biological features (PBFs) that are essential to the conservation of the species and that may require special management considerations or protection. It is not required that an area contain all PBFs in order to qualify as critical habitat. Unit TXFM-1 contains multiple PBFs (e.g., presence of suitable substrates, connected instream habitats, and presence of host fish), and while the unit may need special management considerations to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity, it meets the definition of critical habitat for the Texas fatmucket.

(19) *Comment:* A commenter requested that the Service revise its discussion of water quality in the lower Colorado River mainstem below Austin to state that, according to the Texas Commission on Environmental Quality's (TCEQ's) 2020 Integrated Report (TCEQ 2020; entire), all water

quality parameters being monitored are meeting the Texas Surface Water Quality Standards, and there are no impairments.

*Our response:* Impairment, as defined through the Texas Surface Water Quality Standards, can differ from biological requirements for individual species. Because a stream reach meets legal standards for water quality parameters does not mean that the water quality meets the needs of the species. While we understand that the entire lower Colorado River mainstem below Austin may not experience conditions that are impacting freshwater mussel growth and survival, we feel that it is important to acknowledge that these conditions can exist at times in the reach of the river. For example, TCEQ produces an integrated report every 2 years that sets the ammonia criterion to denote impairment in segments of the Colorado River and includes any exceedances of this criteria (TCEQ 2022, entire). Chronic ammonia toxicity studies have shown that juvenile freshwater mussel species experience significant reductions in growth and survival when exposed to ammonia concentrations below these levels (Wang et al. 2007, p. 2054). Data presented in the TCEQ 2022 report would place the observed significant reductions in growth below the exceedance threshold of 0.33 milligrams per liter (mg/L) and reductions in survival near the observed exceedance mean value of 0.45 mg/L.

(20) *Comment:* Commenters requested more discussion of the threat of extended low-flow conditions in the lower Colorado River Basin.

*Our response:* There are threats of extended low-flow conditions in the lower reaches of the lower Colorado River Basin, and we are actively working with the LCRA on the implementation of the LCRA Agreement, which includes conservation measures that would help further understand, avoid, and minimize the threat of low-flow conditions to freshwater mussels in this river basin.

The 2020 LCRA Water Management Plan (WMP) allocates a portion of its "firm water" supply to meet environmental flow needs within the lower Colorado River Basin (LCRA 2020, pp. ES-2-ES-3). These needs are determined through calculated monthly subsistence flow values and are based on results of an instream flow study in 2008 (Bio-West 2008, pp. 69-90) that investigated the flow relationships to aquatic habitat and the State-threatened blue sucker (*Cycleptus elongatus*), and they are consistent with the Texas Instream Flow Program methodology



(LCRA 2020, p. 2–2). While this 2008 study did not specifically focus on the habitat needs of freshwater mussels, a subsequent study in 2018 determined that the subsistence flows standards set by the WMP were adequate to protect instream freshwater mussel habitat during the periods expected to receive the lowest flow conditions (August; 107 cubic feet per second at the Wharton U.S. Geological Survey (USGS) gauge) (Bonner et al. 2018; entire). The LCRA Agreement states that an amendment to the 2020 WMP, which will consider additional information regarding flow or temperature needed for freshwater mussels or host fish, if available during that amendment process, is expected to occur not later than March 1, 2025 (LCRA 2023, pp. 60–63). While these flow assurances cannot entirely remove the threat of low flow conditions in the lower Colorado River, they can reduce the threat and ameliorate the instream conditions during these periods.

(21) *Comment:* A commenter stated that candidate conservation agreements with assurances (CCAAs) do not provide sufficient certainty of benefits to the species because they have limited authority, focus on a subset of the threats, allow permittees to withdraw at any time, and do not ensure future conditions. The commenter, therefore, requests that CCAAs not be used as a basis for critical habitat exclusions in the final rule.

*Our response:* We evaluate whether an area should be excluded from critical habitat based on whether the benefits of exclusion outweigh the benefits of inclusion. As outlined in our Policy Regarding Implementation of Section 4(b)(2) of the Endangered Species Act (81 FR 7226), when we undertake a discretionary 4(b)(2) exclusion analysis, we will always consider areas covered by a permitted candidate conservation agreement with assurances (CCAA) and anticipate consistently excluding those areas from a critical habitat designation if incidental take caused by the activities in those areas is covered by the permit under section 10 of the Act and the CCAA meets all of the following conditions: the permittee is properly implementing the agreement and is expected to do so for the term of the agreement; the species for which critical habitat is being designated is a covered species in the agreement; and the agreement specifically addresses the habitat of the species for which critical habitat is being designated and meets the conservation needs of the species in the planning area.

We have determined that the BRA Agreement (BRA 2021, entire), LCRA Agreement (LCRA 2023, entire), and

TRA Agreement (TRA 2023, entire) fulfill the above criteria, and we are excluding from this critical habitat designation some non-Federal lands covered by these three CCAAs that provide for the conservation of the Texas fawnsfoot, Texas pimpleback, and Balcones spike. The LCRA Agreement also provides for the conservation of Texas fatmucket. However, because no critical habitat units for the Texas fatmucket fall within reaches where the LCRA Agreement can directly reduce the primary threat of low water quantity, we have not excluded any proposed critical habitat for the Texas fatmucket based on the LCRA Agreement. Additionally, within the BRA and LCRA CCAAs, some non-Federal lands are included in the CCAAs' Covered Areas that we did not exclude from designated critical habitat (*i.e.*, river miles above Possum Kingdom Reservoir and river miles above the Highland lakes in the BRA and LCRA CCAAs respectively). These areas were not excluded because while the BRA and LCRA CCAAs provide overall net conservation benefits for the covered species, threat reduction efforts included as conservation measures within the agreements target other locations of their respective basins.

Possum Kingdom Reservoir represents the most upstream BRA-operated infrastructure in the Brazos River Basin. The BRA has no infrastructure and limited interests above Possum Kingdom reservoir, and therefore, has no way to directly influence freshwater mussel populations or their habitats in this portion of the basin (BRA 2021, p. 15). Regarding the LCRA CCAA, with the exception of two reservoirs LCRA owns and operates for purposes of power plant cooling which are not included in the critical habitat designation, LCRA does not own or operate any other water infrastructure on any tributaries or on the main stem of the Colorado River upstream of Lake Buchanan or on other tributaries or river segments that contribute flow to the Highland Lakes or the Colorado River within LCRA's broader service area.

The development and maintenance of effective working partnerships with non-Federal partners for the conservation of at-risk species is particularly important in areas such as Texas, a State with relatively little Federal landownership and many species of conservation concern. We find that excluding areas from critical habitat that are receiving long-term conservation and management for the purpose of protecting the habitat that supports the Texas fawnsfoot, Texas pimpleback, and Balcones spike will

preserve our external partnerships in Texas and will encourage future collaboration towards conservation and recovery of listed species.

Because the agreements are voluntary, they demonstrate the commitment of the partners to the conservation actions; the CCAA process takes time and effort to put in place, and the agreement must result in a net conservation benefit to the species. The partnership benefits are significant and outweigh the potential regulatory, educational, and ancillary benefits of including the land in the final critical habitat designation for these three species; in addition, the subject areas are occupied by the species, so there is less incremental benefit to the unit being included in the critical habitat designation. Therefore, the BRA Agreement, LCRA Agreement, and TRA Agreement provide greater protection of habitat for the Texas fawnsfoot, Texas pimpleback, and Balcones spike than could be gained through the project-by-project analysis under a critical habitat designation.

(22) *Comment:* A commenter claimed that our proposed 4(d) rule was arbitrary and capricious because we did not assess the costs and benefits of the rule and therefore did not establish that the proposed 4(d) rule was necessary and advisable.

*Our response:* The Act clearly prohibits the Service from considering economic or similar information when making listing, delisting, or reclassification decisions. Congress added this prohibition in the 1982 amendments to the Act when it introduced into section 4(b)(1) an explicit requirement that all decisions under section 4(a)(1) of the Act be based “solely on the basis of the best scientific and commercial data available.” Congress further explained this prohibition in the Conference Report accompanying the 1982 Amendments: “The principal purpose of these amendments is to ensure that decisions in every phase of the process pertaining to the listing or delisting of species are based solely upon biological criteria and to prevent non-biological considerations from affecting such decisions. These amendments are intended to expedite the decision-making process and to ensure prompt action in determining the status of the many species which may require the protections of the Act.” (H.R. Conf. Rep. No. 97–835, at 19 (1982).)

Therefore, following statutory framework and congressional intent, we do not conduct or develop economic impact analyses for classification decisions. Additionally, 4(d) rules concurrently issued with a classification rule are inherently a part of a



classification decision for a threatened species and therefore, a consideration of economic impacts does not apply. If we determine that a species meets the Act's definition of a threatened species, part of our consideration for completing the listing process is to consider what measures are necessary and advisable to provide for the conservation of the species under section 4(d) of the Act. We, therefore, consider a 4(d) rule to be a necessary phase of the listing process to put in place protections for threatened species.

(23) *Comment:* Commenters expressed concerns that threatened status may be insufficient for the Texas fawnsfoot and recommended it be assigned endangered status.

*Our response:* The Act defines "endangered species" and "threatened species" and mandates five factors for consideration when determining a species' status under the Act. We have determined that endangered species status under the Act is not appropriate for the Texas fawnsfoot because the species maintains multiple, moderately resilient populations across its historical range with low risk of significant decline in the near term. Further, given its distribution and the health of its populations, the Texas fawnsfoot has sufficient redundancy and representation to withstand catastrophic events and novel changes in its environment in the near term. For these reasons, the Texas fawnsfoot is not currently in danger of extinction; it is, however, at risk of extinction in the foreseeable future because even under the best conditions, and with additional conservation efforts undertaken, given the ongoing effects of climate change and human activities on altered hydrology and habitat degradation, within 25 to 50 years, we expect only one population to be in healthy condition, one population to remain in moderately healthy condition, four populations to be in unhealthy condition, and one population to become functionally extirpated. Given the likelihood of increased climate and anthropogenic effects in the foreseeable future, as many as three populations are expected to become functionally extirpated, leaving no more than four unhealthy populations remaining after 25 years. See *Determination of Status: Texas Fawnsfoot*, below.

(24) *Comment:* A commenter requested that all species be listed as threatened to better promote voluntary habitat conservation.

*Our response:* The Act requires us to make a listing determination using the best available scientific and commercial data after conducting a review of the

status of the species. The primary difference between an endangered species and a threatened species is the timing of the risk of extinction. An "endangered species" is one that is in danger of extinction throughout all or a significant portion of its range. A "threatened species" is one that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range; therefore, it is not currently in danger of extinction. After evaluating threats to the central Texas mussel species and assessing the cumulative effect of the threats under the Act's section 4(a)(1) factors, we found that Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike have declined significantly in overall distribution and abundance. At present, most of their known populations exist in very low abundances and show limited evidence of recruitment. Furthermore, existing available habitats are reduced in quality and quantity, relative to historical conditions. We found that, for these six species, the threats are currently occurring and result in the species being in danger of extinction now. Therefore, a threatened status determination for these species would not be appropriate. The difference between endangered and threatened does not affect our ability to encourage voluntary conservation.

The listing of a species does not obstruct the development of conservation agreements or partnerships to conserve the species. Once a species is listed as either endangered or threatened, the Act provides many tools to advance the conservation of listed species. Conservation of listed species in many parts of the United States is dependent upon working partnerships with a wide variety of entities, including the voluntary cooperation of non-Federal landowners. Building partnerships and promoting cooperation with landowners are essential to understanding the status of species on non-Federal lands and may be necessary to implement recovery actions, such as reintroduction of listed species, habitat restoration, and habitat protection. Once a species is listed, for private or other non-Federal property owners, we offer voluntary safe harbor agreements that can contribute to the recovery of species, habitat conservation plans that allow activities (e.g., grazing) to proceed while minimizing effects to species, funding through the Partners for Fish and Wildlife Program to help promote conservation actions, and grants to the States under section 6 of the Act.

(25) *Comment:* A commenter stated concerns that the Service focused on

recent trends when modeling the impacts of climate change and disagreed that climate change will exacerbate identified threats in central Texas.

*Our response:* Experts anticipate that climate change will lead to decreased water availability in Texas due to increased frequency and intensity of drought conditions in the State. During drought periods, pressure on freshwater resources, particularly increased evaporation in reservoirs and higher demands on groundwater pumping, in the State will lead to a decline in instream flows. Decreased instream flows correlate with increases in instream temperatures. In the SSA report, we relied upon numerous studies that have identified the effects of increased temperature on the growth, fitness, and survival of freshwater mussels (Bonner et al. 2018, p. 6; Ganser et al. 2015, p. 1712; Spooner and Vaughn 2008, pp. 312–313; Service 2022, p. 10). The combination of declines in instream flows and increasing temperatures of the remaining flows are anticipated to have a negative impact on remaining freshwater mussel populations.

(26) *Comment:* A commenter questioned whether mussels are actually declining due to human development and suggests that declines may have been occurring prior to human contact.

*Our response:* While mussel populations surely ebbed and flowed prior to human development, it is well established that widespread declines of freshwater mussels have occurred in the last 50 to 75 years (Haag 2019, p. 43; Haag 2012, pp. 316–390). Through a combination of long-term monitoring and evidence in the historical record, it is clear that the decline of freshwater mussels is closely tied to advances in human infrastructure development (Haag 2012, pp. 316–390). In some cases, the ties can be closely pinpointed to the construction of a single structure (e.g., large, power-generating hydrodam) and a resulting decline and eventual extirpation of an upstream freshwater mussel population (e.g., extirpation of the elephant ear (*Elliptio crassidens*) population in the Upper Tennessee Basin following habitat fragmentation in tributaries of the Tennessee River (Johnson et al. 2012a, p. 89)). Regardless of whether declines occurred prior to human development, the declines of the central Texas mussel species in the recent past are well documented.

(27) *Comment:* A commenter requested clarification on whether the artificially sustained wastewater effluent flows are beneficial or detrimental to the central Texas mussels.

*Our response:* Artificially sustained effluent flows can be beneficial to freshwater mussels by providing flow in low-flow and drying areas where mussels might otherwise desiccate. However, effluent flows can also be detrimental to freshwater mussels if the effluent water quality is poor. We consider both water quantity and quality when evaluating effluent and its impact on mussels. Parameters for healthy water quality and water quantity are defined in the SSA report (Service 2022, pp. 6–10), and we use these benchmarks as we evaluate the species' status now and in the future.

(28) *Comment:* A commenter disagreed that pesticides originating from agricultural sources are a pollutant of concern at levels experienced in the natural environment.

*Our response:* Pesticides have been demonstrated to have both lethal and non-lethal effects on freshwater organisms, including freshwater mussels around the world (Milam et al. 2005, pp. 169–172; Bringolf et al. 2007a, p. 2099, 2007b, pp. 2105–2106, 2007c, p. 2092; Chmist et al. 2019, pp. 439–440). These studies have been completed for multiple, freshwater mussel life stages, including glochidia, juveniles, and adults, and have documented the harmful effects of a variety of herbicides, pesticides, and other chemical compounds. While we support and applaud agricultural producers' efforts to target applications and reduce run-off into adjacent waterways, it is still necessary to acknowledge the threat of the compounds to these mussels, as the specific lethal and non-lethal effects are not known for all mussel species, and

spills, unregulated discharges, and errant applications are possible and would have significant negative effects on populations.

(29) *Comment:* A commenter claimed that the proposed listings are unnecessary as Texas already protects the central Texas mussels.

*Our response:* In 2007 and 2008, we received petitions requesting that we list as endangered or threatened species and designate critical habitat for the Texas fatmucket, Texas fawnsfoot, Texas pimpleback, and false spike. (See Previous Federal Actions in the August 26, 2021, proposed rule (86 FR 47918–47919) for more information.) In 2009, the State of Texas listed the Texas fatmucket, Texas fawnsfoot, Texas pimpleback, and the false spike as threatened, launching an era of freshwater mussel conservation Statewide and bringing attention to this faunal group. However, once the Service is petitioned to list a species, we are required to complete our regulatory process which takes into account conservation efforts and State regulatory efforts in our listing determination. Under the requirements of the Act, we must conduct the required analysis and list the species if it is found to be warranted, and we cannot defer to any State listing. This rule codifies our listing determinations for the central Texas mussels.

**I. Final Listing Determination**

**Background**

A thorough review of the taxonomy, life history, and ecology of the Guadalupe fatmucket, Texas fatmucket, Texas fawnsfoot, Guadalupe orb, Texas

pimpleback, Balcones spike, and false spike, referred to as the central Texas mussels, is presented in the SSA report (Service 2022, pp. 4–44).

*Guadalupe Fatmucket*

The Guadalupe fatmucket (*Lampsilis bergmanni*) was recently discovered to be a separate and distinct species from Texas fatmucket (Inoue et al. 2018, pp. 5–6; Inoue et al. 2020, entire), and the Service now recognizes the Guadalupe fatmucket as a new species that occurs only in the Guadalupe River Basin. Because the Guadalupe fatmucket is so similar to the Texas fatmucket and better information is not yet available, we conclude the Guadalupe fatmucket has similar habitat needs (headwater habitats in gravel or bedrock fissures) and host fish (sunfishes) as the Texas fatmucket, below.

The Guadalupe fatmucket is a small to medium-sized freshwater mussel (to 4 inches (in) (100 millimeters (mm))) that exhibits sexual dimorphism and has a yellow-green-tan shell; it is similar in appearance to the Texas fatmucket (a more detailed description of the Texas fatmucket is found in Howells et al. 2011, pp. 14–16). Related species in the genus *Lampsilis* from the southeast United States reach a maximum age of 13 to 25 years (Haag and Rypel 2010, pp. 4–6), and we expect Guadalupe fatmucket to have a similar lifespan.

Guadalupe fatmucket is currently found in one population, which occurs in 52 miles (84 km) of the Guadalupe River Basin in Kendall and Kerr Counties, Texas (Randklev et al. 2017c, p. 4) (see table 1, below; see also figure 5.11 in Service 2022, p. 118).

TABLE 1—CURRENT GUADALUPE FATMUCKET POPULATION

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (numbers)
Guadalupe River .....	Guadalupe River; North Fork, Guadalupe River; Johnson Creek.	Kendall and Kerr Co., TX ....	52 (84)	2018 (22) 2019 (shells)

*Texas Fatmucket*

Texas fatmucket has been characterized as a rare Texas endemic (Burlakova et al. 2011a, p. 158) and was originally described as the species *Unio bracteatus* by A.A. Gould in 1855 (p. 228) from the “Llanos River” in “Upper” Texas. The species is currently recognized as *Lampsilis bracteata* (Williams et al. 2017, pp. 35, 39). Recently, individuals that had been known as Texas fatmucket in the Guadalupe River Basin were found to be a new species (Inoue et al. 2020, pp. 93–

111); therefore, we now know the Texas fatmucket to only occur in the Colorado River Basin.

The Texas fatmucket is a small to medium-sized freshwater mussel (to 4 in (100 mm)) that exhibits sexual dimorphism (males and females have different shapes) and has a yellow-green-tan shell (Howells et al. 2011, pp. 14–16). For a detailed morphological description see Howells et al. 1996 (p. 61) and Howells 2014 (p. 41).

Host fishes for Texas fatmucket are members of the Family Centrarchidae

(sunfishes) including bluegill (*Lepomis macrochirus*), green sunfish (*L. cyanellus*), Guadalupe bass (*Micropterus treculii*), and largemouth bass (*M. salmoides*) (Howells 1997, p. 257; Johnson et al. 2012b, p. 148; Howells 2014, p. 41; Ford and Oliver 2015, p. 4; Bonner et al. 2018, p. 9).

Related species can expel conglomerates (packets of glochidia) and are known to use mantle lures (Barnhart et al. 2008, pp. 377, 380) to attract sight-feeding fishes that attack and rupture the marsupium where the glochidia are

held, thereby becoming infested by glochidia. These species are long-term brooders (bradytic), spawning and becoming gravid in the fall and releasing glochidia in the spring (Barnhart et al. 2008, p. 384).

We expect Texas fatmucket has a similar lifespan to related species in the genus *Lampsilis* from the southeast United States, which reach a maximum age of 13 to 25 years (Haag and Rypel 2010, pp. 4–6). Texas fatmucket occur in

firm mud, stable sand, and gravel bottoms, in shallow waters, sometimes in bedrock fissures or among roots of bald cypress (*Taxodium distichum*) and other aquatic vegetation (Howells 2014, p. 41). The species typically occurs in free-flowing rivers but can survive in backwater areas, such as in areas upstream of lowhead dams (e.g., Llano Park Lake (BioWest, Inc. 2018, pp. 2–3)).

Texas fatmucket currently occur only in the upper reaches of major tributaries

within the Colorado River Basin (Randklev et al. 2017c, p. 4) in five populations: lower Elm Creek, upper/middle San Saba River, Llano River, Pedernales River, and Onion Creek (see table 2, below; see also figure 5.5 in Service 2022, p. 91). Isolated individuals not considered part of larger functioning populations have been found in Cherokee Creek, Bluff Creek, and the North Llano River.

TABLE 2—CURRENT TEXAS FATMCKET POPULATIONS

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (number collected)
Lower Elm Creek .....	Elm Creek .....	Runnels Co., TX .....	12 (19)	2005 (no live animals) 2008 (1) 2019 (1)
Upper/Middle San Saba River.	San Saba River .....	Mason, McCulloch, Menard, and San Saba Co., TX.	62 (100)	2005 (2) 2012 (8) 2013 (5) 2016 (29) 2017 (87) 2017 (71)
Llano River .....	Llano River, South Llano River.	Kimble, Llano, and Mason Co., TX .....	127 (204)	2016 (72) 2017 (47) 2017 (5) 2018 (635) 2019 (6) 2019 (18) 2021 (99)
Pedernales River .....	Pedernales River, Live Oak Creek.	Blanco, Gillespie, and Hays Co., TX .....	79 (127)	2011 (1) 2012 (1) 2017 (18)
Onion Creek .....	Onion Creek .....	Travis Co., TX .....	24 (38)	2010 (3) 2018 (1) 2021 (5)

*Texas Fawnsfoot*

The Texas fawnsfoot was originally described as *Unio macrodon* 1859 from a location near Rutersville, Fayette County, Texas (Lea 1859, pp. 154–155). Texas fawnsfoot is recognized by the scientific community as *Truncilla macrodon* (Williams et al. 2017, pp. 35, 44).

Texas fawnsfoot is a small- to medium-sized (2.4 in (60 mm)) mussel with an elongate oval shell (Howells 2014, p. 111). For a detailed description, see Howells et al. 1996 (p. 143) and Howells 2014 (p. 111).

Host fish species are not confirmed for the Texas fawnsfoot, but we expect they use freshwater drum (*Aplodinotus grunniens*; Howells 2014, p. 111), like other *Truncilla* species occurring in Texas and elsewhere (Ford and Oliver 2015, p. 8). Freshwater drum are molluscivorous (mollusk-eating) and become infested with glochidia when they consume gravid female mussels (Barnhart et al. 2008, p. 373). This strategy of host infestation may limit

population size, as reproductively successful females are sacrificed (i.e., eaten by freshwater drum). Related species are bradytic, brooding larvae over the winter instead of releasing them immediately (Barnhart et al. 2008, p. 384). Other species in the genus *Truncilla* from the Southeast and Midwest reach a maximum age ranging from 8 to 18 years (Haag and Rypel 2010, pp. 4–6), and we expect the lifespan of Texas fawnsfoot to be similar.

Texas fawnsfoot are found in medium- to large-sized streams and rivers with flowing waters and mud, sand, and gravel substrates (Howells 2014, p. 111). Adults are most often found in bank habitats and occasionally in backwater, riffle, and point bar habitats, with low to moderate velocities that appear to function as flow refuges during high flow events (Randklev et al. 2017c, p. 137).

Texas fawnsfoot occur in the lower reaches of the Colorado and Brazos Rivers, and in the Trinity River

(Randklev et al. 2017b, p. 4) in seven populations: East Fork Trinity River, Middle Trinity River, Clear Fork Brazos River, Upper Brazos River, Middle/Lower Brazos River, San Saba/Colorado Rivers, and Lower Colorado River (see table 3, below; see also figure 5.7 in Service 2022, p. 101). Texas fawnsfoot was historically distributed throughout the Colorado and Brazos River basins (Howells 2014, pp. 111–112; reviewed in Randklev et al. 2017c, pp. 136–137) and in the Trinity River Basin (Randklev et al. 2017b, p. 11). Texas fawnsfoot historically occurred in the Leon River, but they are currently extirpated (Popejoy et al. 2016, p. 477). Randklev et al. (2017c, p. 135) surveyed the Llano, San Saba, and Pedernales Rivers and found neither live individuals nor dead shells of Texas fawnsfoot. Isolated individuals not considered part of functioning populations have been found in the Little River.

TABLE 3—CURRENT TEXAS FAWNSFOOT POPULATIONS

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (numbers)
East Fork Trinity River .....	East Fork Trinity River .....	Kaufman Co., TX .....	12 (19)	2017 (40) 2018 (12)
Middle Trinity River .....	Trinity River .....	Anderson, Houston, Leon, Madison, and Navarro Co., TX.	140 (225)	2016–2017 (59)
Clear Fork Brazos River .....	Clear Fork Brazos River .....	Shackelford and Throckmorton Co., TX .....	13 (21)	2010 (1) 2018 (0)
Upper Brazos River .....	Brazos River .....	Palo Pinto and Parker Co., TX .....	62 (100)	2017 (23)
Middle/Lower Brazos River ..	Brazos River .....	Austin, Brazos, Burleson, Falls, Fort Bend, Grimes, McLennan, Milam, Robertson, Waller, and Washington Co., TX.	346 (557)	2014 (188) 2017 (28) 2021 (1)
San Saba/Colorado Rivers ..	San Saba River, Colorado River.	Mills and San Saba Co., TX .....	43 (69)	2017 (0) 2018 (2)
Lower Colorado River .....	Colorado River .....	Colorado, Matagorda, and Wharton Co., TX.	109 (175)	2010 (52) 2015 (10) 2017 (9)

*Guadalupe Orb*

Burlakova et al. (2018, entire) recently described the Guadalupe orb (*Cyclonaias necki*) from the Guadalupe River Basin as a separate species distinct from Texas pimpleback. The Guadalupe orb occurs only in the Guadalupe Basin and is a small-sized mussel with a shell length that reaches up to 2.5 in (63 mm) (Burlakova et al. 2018, p. 48). Guadalupe orb shells are thinner and more compressed but otherwise morphologically similar to the closely related Texas pimpleback. The posterior ridge is more distinct and prominent, and the umbo is more

compressed than in Texas pimpleback (Burlakova et al. 2018, p. 48). Individuals collected from the upper Guadalupe River (near Comfort, Texas) averaged 1.9 in (48 mm) (Bonner et al. 2018, p. 221). Channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivarius*), and tadpole madtom (*Noturus gyrinus*) are host fish for the Guadalupe orb (Dudding et al. 2019, p. 15). Dudding et al. (2019, p. 16) cautioned that the apparent clumped distribution of Guadalupe orb (and closely related species) in “strongholds” could be related to observed ongoing declines in native catfishes, including the small and rare tadpole madtom, a riffle specialist.

The best available information leads us to believe that the reproduction, ecological interactions, and habitat requirements of Guadalupe orb are similar to those of the closely related Texas pimpleback.

The Guadalupe orb is only known to occur in the Guadalupe River Basin in two separate and isolated populations: the upper Guadalupe River and the lower Guadalupe River (see table 4, below; see also figure 5.13 in Service 2022, p. 125). An isolated individual not considered part of a functioning population has been found in the Blanco River, a tributary to the San Marcos River (Johnson et al. 2018, p. 7).

TABLE 4—CURRENT GUADALUPE ORB POPULATIONS

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (numbers)
Upper Guadalupe River .....	Guadalupe River .....	Comal, Kendall, and Kerr Co., TX .....	95 (153)	2013 (1) 2017 (10) 2018 (2)
Lower Guadalupe River .....	Guadalupe River, San Marcos River.	Caldwell, DeWitt, Gonzales, Guadalupe, and Victoria Co., TX.	181 (291)	2014–2015 (893) 2017 (41)

*Texas Pimpleback*

The Texas pimpleback was originally described as *Unio petrinus* from the “Llanos River” in “Upper” Texas (Gould 1855, p. 228). The species is now recognized as *Cyclonaias petrina* by the scientific community (Williams et al. 2017, pp. 35, 37). Burlakova et al. (2018, entire) recently described the Guadalupe orb (*C. necki*) from the Guadalupe River Basin as a separate species distinct from Texas pimpleback. Texas pimpleback are now considered to occur only in the Colorado River Basin of Texas. The Texas pimpleback is a small- to medium-sized (up to 4 in

(103 mm)) mussel with a moderately inflated, yellow, brown, or black shell, occasionally with vague green rays or concentric blotches (Howells 2014, p. 93).

Recent laboratory studies of the closely related Guadalupe orb suggest that channel catfish, flathead catfish, and tadpole madtom are host fish for the Texas pimpleback (Dudding et al. 2019, p. 2). Related species have miniature glochidia and also use catfish as hosts (Barnhart et al. 2008, pp. 373, 379). Additionally, related species can also produce conglutinates (Barnhart et al. 2008, p. 376) and tend to exhibit short-term brooding (tachytictia; releasing

glochidia soon after the larvae mature) (Barnhart et al. 2008, p. 384). Texas pimpleback are reproductively active between April and August (Randklev et al. 2017c, p. 110). Related species live as long as 15 to 72 years (Haag and Rypel 2010, p. 10).

Texas pimpleback are known to occur in the Colorado River Basin in five isolated populations: Concho River, Upper San Saba River, Lower San Saba River/Colorado River, Llano River, and the Lower Colorado River (see table 5, below; see also figure 5.9 in Service 2022, p. 110). Only the Lower San Saba and Llano River populations are known to be successfully reproducing. Texas

pimpleback was historically distributed throughout the Colorado River Basin (Howells 2014, pp. 93–94; reviewed in Randklev et al. 2017c, pp. 109–110).

TABLE 5—CURRENT TEXAS PIMPLEBACK POPULATIONS

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (numbers)
Concho River .....	Concho River .....	Concho Co., TX .....	14 (23)	2008 (47) 2012 (1)
Upper San Saba River .....	San Saba River .....	Menard Co., TX .....	30 (48)	2017 (1)
Lower San Saba/Colorado Rivers.	San Saba River, Colorado River.	Brown, Coleman, McCulloch, Mills, and San Saba Co., TX.	178 (286)	2012 (247) 2014 (481) 2017 (20) 2017 (97) 2018 (42) 2019 (23)
Llano River .....	Llano River .....	Mason Co., TX .....	5 (8)	2012 (10) 2016 (1) 2017 (23) 2018 (1)
Lower Colorado River .....	Colorado River .....	Colorado and Wharton Co., TX .....	98 (158)	2021 (46) 2014 (49) 2017 (8) 2018 (30)

*Balcones Spike*

The Balcones spike (*Fusconaia iheringi*) was recently discovered to be a separate and distinct species from false spike (Smith et al. 2020, entire), and the Service now recognizes the Balcones spike as a new species that occurs in the Brazos and Colorado River basins. Because the Balcones spike has recently been split from false spike, species-specific data are not yet available, and so we expect the Balcones spike has similar habitat needs (larger creeks and rivers with sand, gravel, or cobble substrates, slow to moderate flows) and host fish (red shiner

(*Cyprinella lutrensis*) and blacktail shiner (*Cyprinella venusta*) as the false spike.

The Balcones spike is a small to medium-sized freshwater mussel (to approximately 3.8 inches (in) (96 millimeters (mm))) with a yellow-green to brown elongate shell, sometimes with greenish rays. While similar in appearance to false spike, Balcones spike usually has a sharper posterior ridge and shinier periostracum when compared to false spike. For a more detailed description, see Smith et al. 2020 (entire). Related species in the genus *Fusconaia* from the southeast

United States reach a maximum age of 15 to 51 years (Haag and Rypel 2010, pp. 4–6). The closely related congener species, false spike, is thought to have a maximum age of 15 years (Dudding et al. 2019, p. 167) and to reach sexual maturity around 5 years of age (Dudding et al. 2019, p. 167).

Balcones spike is currently found in three populations in the Little River and some tributaries (Brazos River Basin), the lower San Saba River (Colorado River Basin), and the Llano River (Colorado River Basin) (see table 6, below; see also figure 5.3 in Service 2022, p. 85).

TABLE 6—CURRENT BALCONES SPIKE POPULATIONS

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (numbers collected)
Little River and tributaries ....	Little River, Brushy Creek, San Gabriel River.	Milam and Williamson Co., TX .....	41 (66)	2015 (29) 2021 (13) 2021 (1)
Lower San Saba River .....	San Saba River .....	San Saba Co., TX .....	42 (67)	2012 (3)
Llano River .....	Llano River .....	Mason Co., TX .....	<1 (~1)	2017 (1) 2021 (14)

*False Spike*

The false spike is native to the Guadalupe Basin in central Texas (Howells 2010, p. 4; Randklev et al. 2017c, p. 12). It was thought to have historically occurred in the Rio Grande based on the presence of fossil and subfossil shells there (Howells 2010, p. 4), but those specimens have now been attributed to *Sphenonaias taumilapana* Conrad 1855 (no common name; Randklev et al. 2017c, p. 12; Graf and

Cummings 2007, p. 309). Recently, individuals that had been known as false spike in the Brazos and Colorado River basins were found to be a new species (Smith et al. 2020, entire); therefore, the false spike occurs only in the Guadalupe River Basin.

The false spike was originally described as *Unio mitchelli* by Charles T. Simpson in 1895 from the Guadalupe River in Victoria County, Texas (Dall 1896, pp. 5–6). The species was

assigned as *Quincuncina mitchelli* by Turgeon et al. (1988, p. 33) and was recognized as such by Howells et al. (1996, p. 127), and it was referenced as *Quadrula mitchelli* by Haag (2012, p. 71). Finally, it was recognized as *Fusconaia mitchelli*, its current nomenclature, by Pfeiffer et al. (2016, p. 289). False spike is considered a valid taxon by the scientific community (Williams et al. 2017, pp. 35, 39).

The false spike is a medium-sized freshwater mussel (to 5.2 in (132 mm)) with a yellow-green to brown or black elongate shell, sometimes with greenish rays. For a detailed description, see Howells et al. 1996 (pp. 127–128) and Howells 2014 (p. 85).

Based on closely related species, false spike likely brood eggs and larvae from early spring to late summer and host fish are expected to be minnows (family Cyprinidae) (Pfeiffer et al. 2016, p. 287). Confirmed host fish for false spike include blacktail shiner and red shiner (Dudding et al. 2019, p. 16).

Related species in the genus *Fusconaia* from the southeast United States reach a maximum age of 15 to 51 years (Haag and Rypel 2010, pp. 4–6). False spike is thought to have a maximum age of 15 years (Dudding et al. 2019, p. 167) and to reach sexual

maturity around 5 years of age (Dudding et al. 2019, p. 167).

False spike occur in larger creeks and rivers with sand, gravel, or cobble substrates, and in areas with slow to moderate flows. The species is not known from impoundments, nor from deep waters (Howells 2014, p. 85).

False spike was once considered common wherever it was found; however, beginning in the early 1970s, the species began to be regarded as rare throughout its range, based on collection information (Strecker 1931, pp. 18–19; Randklev et al. 2017c, p. 13). It was considered to be extinct until 2011, when the discovery of seven live false spike in the Guadalupe River, near Gonzales, Texas, was the first report of living individuals in nearly four decades (Howells 2010, p. 4; Randklev et al. 2011, p. 17). The patchy

distribution of false spike could be related to host fish relationships (Dudding et al. (2019, pp. 16–17); that is, because their host fish have a small home range, have limited dispersal ability, and are sensitive to human impacts, distribution of false spike could be limited by access to, and movement of, host fish.

Currently, there is only one known population of false spike in the lower Guadalupe River (Guadalupe River Basin) (see table 7, below; see also figure 5.2 in Service 2022, p. 81). For more information on this population, see the SSA report (Service 2022, pp. 75–82). False spike is estimated to have been extirpated from the remainder of its historical range throughout the Guadalupe Basin of central Texas (reviewed in Randklev et al. 2017c, pp. 12–13).

TABLE 7—CURRENT FALSE SPIKE POPULATION

Population	Streams included	Counties	Occupied reach length (mi (km))	Recent collection years (number collected)
Lower Guadalupe River .....	Guadalupe River .....	DeWitt, Gonzales, and Victoria Co., TX .....	102 (164)	2014–2015 (652)

**Regulatory and Analytical Framework**

*Regulatory Framework*

Section 4 of the Act (16 U.S.C. 1533) and the implementing regulations in title 50 of the Code of Federal Regulations set forth the procedures for determining whether a species is an endangered species or a threatened species, issuing protective regulations for threatened species, and designating critical habitat for endangered and species. On April 5, 2024, jointly with the National Marine Fisheries Service, the Service issued a final rule that revised the regulations in 50 CFR 424 regarding how we add, remove, and reclassify endangered and threatened species to the lists and the criteria for designating listed species’ critical habitat (89 FR 24300). On the same day, the Service published a final rule revising our protections for endangered species and threatened species at 50 CFR 17 (89 FR 23919). These final rules are now in effect and are incorporated into the current regulations. Our analysis for this decision applied our current regulations. Given that we proposed listing and critical habitat for these species under our prior regulations (revised in 2019), we have also undertaken an analysis of whether our decision would be different if we had continued to apply the 2019 regulations and we concluded that the decision would be the same. The

analyses under both the regulations currently in effect and the 2019 regulations are available on <https://www.regulations.gov>.

The Act defines an “endangered species” as a species that is in danger of extinction throughout all or a significant portion of its range, and a “threatened species” as a species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether any species is an endangered species or a threatened species because of any of the following factors:

- (A) The present or threatened destruction, modification, or curtailment of its habitat or range;
- (B) Overutilization for commercial, recreational, scientific, or educational purposes;
- (C) Disease or predation;
- (D) The inadequacy of existing regulatory mechanisms; or
- (E) Other natural or manmade factors affecting its continued existence.

These factors represent broad categories of natural or human-caused actions or conditions that could have an effect on a species’ continued existence. In evaluating these actions and conditions, we look for those that may have a negative effect on individuals of the species, as well as other actions or conditions that may ameliorate any

negative effects or may have positive effects.

We use the term “threat” to refer in general to actions or conditions that are known to or are reasonably likely to negatively affect individuals of a species. The term “threat” includes actions or conditions that have a direct impact on individuals (direct impacts), as well as those that affect individuals through alteration of their habitat or required resources (stressors). The term “threat” may encompass—either together or separately—the source of the action or condition or the action or condition itself.

However, the mere identification of any threat(s) does not necessarily mean that the species meets the statutory definition of an “endangered species” or a “threatened species.” In determining whether a species meets either definition, we must evaluate all identified threats by considering the species’ expected response and the effects of the threats—in light of those actions and conditions that will ameliorate the threats—on an individual, population, and species level. We evaluate each threat and its expected effects on the species, then analyze the cumulative effect of all of the threats on the species as a whole. We also consider the cumulative effect of the threats in light of those actions and conditions that will have positive effects on the species, such as any

existing regulatory mechanisms or conservation efforts. The Secretary determines whether the species meets the definition of an “endangered species” or a “threatened species” only after conducting this cumulative analysis and describing the expected effect on the species now and in the foreseeable future.

The Act does not define the term “foreseeable future,” which appears in the statutory definition of “threatened species.” Our implementing regulations at 50 CFR 424.11(d) set forth a framework for evaluating the foreseeable future on a case-by-case basis which is further described in the 2009 Memorandum Opinion on the foreseeable future from the Department of the Interior, Office of the Solicitor (M–37021, January 16, 2009; “M-Opinion,” available online at <https://www.doi.gov/sites/doi.opengov.ibmcloud.com/files/uploads/M-37021.pdf>). The foreseeable future extends as far into the future as the U.S. Fish and Wildlife Service and National Marine Fisheries Service (hereafter, the Services) can make reasonably reliable predictions about the threats to the species and the species’ responses to those threats. We need not identify the foreseeable future in terms of a specific period of time. We will describe the foreseeable future on a case-by-case basis, using the best available data and taking into account considerations such as the species’ life-history characteristics, threat-projection timeframes, and environmental variability. In other words, the foreseeable future is the period of time over which we can make reasonably reliable predictions. “Reliable” does not mean “certain”; it means sufficient to provide a reasonable degree of confidence in the prediction, in light of the conservation purposes of the Act.

#### *Analytical Framework*

The SSA report documents the results of our comprehensive biological review of the best scientific and commercial data regarding the status of the species, including an assessment of the potential threats to the species. The SSA report does not represent our decision on whether the species should be listed as endangered or threatened species under the Act. However, it does provide the scientific basis that informs our regulatory decisions, which involve the further application of standards within the Act and its implementing regulations and policies.

To assess the viability of the seven central Texas mussels, we used the three conservation biology principles of resiliency, redundancy, and

representation (Shaffer and Stein 2000, pp. 306–310). Briefly, resiliency is the ability of the species to withstand environmental and demographic stochasticity (for example, wet or dry, warm or cold years), redundancy is the ability of the species to withstand catastrophic events (for example, droughts, large pollution events), and representation is the ability of the species to adapt to both near-term and long-term changes in its physical and biological environment (for example, climate conditions, pathogens). In general, species viability will increase with increases in resiliency, redundancy, and representation (Smith et al. 2018, p. 306). Using these principles, we identified the species’ ecological requirements for survival and reproduction at the individual, population, and species levels, and described the beneficial and risk factors influencing the species’ viability.

The SSA process can be categorized into three sequential stages. During the first stage, we evaluated each individual species’ life-history needs. The next stage involved an assessment of the historical and current condition of the species’ demographics and habitat characteristics, including an explanation of how the species arrived at its current condition. The final stage of the SSA involved making predictions about the species’ responses to positive and negative environmental and anthropogenic influences. Throughout all of these stages, we used the best available information to characterize viability as the ability of a species to sustain populations in the wild over time. We use this information to inform our regulatory decision.

The following is a summary of the key results and conclusions from the SSA report; the full SSA report can be found at Docket FWS–R2–ES–2019–0061 on <https://www.regulations.gov> and at <https://www.fws.gov/office/austin-ecological-services>.

#### **Summary of Biological Status and Threats**

In this discussion, we review the biological condition of the species and its resources, and the threats that influence the species’ current and future condition, in order to assess the species’ overall viability and the risks to that viability.

Using various timeframes and the current and projected future resiliency, redundancy, and representation, we describe the species’ levels of viability over time. For the central Texas mussels to maintain viability, their populations or some portion thereof must be sufficiently resilient. A number of

factors influence the resiliency of central Texas mussel populations, including occupied stream length, abundance, and recruitment. While some of the seven species have life-history adaptations that help them tolerate dewatering and other stressors to some extent, each of these stressors diminishes the resiliency of populations to some degree and especially in combination. Elements of the species’ habitat that determine whether central Texas mussel populations can grow to maximize habitat occupancy influence those factors, thereby increasing the resiliency of populations. These resiliency factors and habitat elements are discussed in detail in the SSA report and are summarized here.

#### *Species Needs*

##### **Occupied Stream Length**

Most freshwater mussels, including the central Texas mussel species, are found in aggregations, called mussel beds, that vary in size from about 50 to more than 5,000 square meters (m<sup>2</sup>), separated by stream reaches in which mussels are absent or rare (Vaughn 2012, p. 2). We define a mussel population at a larger scale than a single mussel bed; it is the collection of mussel beds within a stream reach between which infested host fish may travel, allowing for ebbs and flows in mussel bed density and abundance over time throughout the entirety of the population’s occupied reach. Therefore, sufficiently resilient mussel populations must occupy stream reaches long enough such that stochastic events that affect individual mussel beds do not eliminate the entire population, and repopulation by infested fish from other mussel beds within the reach can allow the population to recover from these events. We consider populations extending more than 50 miles (80 kilometers (km)) to be highly resilient to stochastic events because a single event is unlikely to affect the entire population. Populations occupying reaches between 20 and 49 river mi (32 and 79 river km) have some resiliency to stochastic events, and populations occupying reaches less than 20 miles (32 km) have little resiliency.

##### **Abundance**

Mussel abundance in a given stream reach is a product of the number of mussel beds and the density of mussels within those beds. For populations of the central Texas mussel species to be healthy (*i.e.*, sufficiently resilient), there must be many mussel beds of sufficient density such that local stochastic events do not necessarily eliminate the bed(s),



allowing the mussel bed and the overall local population within a stream reach to recover from any single event. Mussel abundance is indicated by the number of individuals found during a sampling event; mussel surveys rarely represent a complete census of the population. Instead, density is estimated by the number found during a survey event using various statistical techniques. Because we do not have population estimates for most populations of the central Texas mussels, nor are the techniques directly comparable (*i.e.*, same area size searched, similar search time, etc.), we used the number of individuals captured as an index over time, presuming relatively similar levels of effort. While we cannot precisely determine population abundance at the sites using these numbers, we are able to determine if the species is dominant at the site or rare and examine this over time if those data are available.

#### Reproduction

Adequately resilient central Texas mussel populations must also be reproducing and recruiting young individuals into the population. Population size and abundance reflects previous influences on the population and habitat, while reproduction and recruitment reflect population trends that may be stable, increasing, or decreasing over time. For example, a large, dense mussel population that contains mostly old individuals is not likely to remain large and dense into the future, as there are few young individuals to sustain the population over time (*i.e.*, death rates exceed birth rates and subsequent recruitment of reproductive adults resulting in negative population growth). Conversely, a population that is less dense but has many young and/or gravid individuals may likely grow to a higher density in the future (*i.e.*, birth rates and subsequent recruitment of reproductive adults exceeds death rates, resulting in positive population growth). Detection rates of very young juvenile mussels during routine abundance and distribution surveys are extremely low due to sampling bias, as sampling for these species involves tactile searches and mussels smaller than 35 mm are very difficult to detect (Strayer and Smith 2003, pp. 47–48).

Evidence of reproduction is demonstrated by repeated captures of small-sized individuals (juveniles and subadults near the low end of the detectable range size (about 35 mm); Randklev et al. 2013, p. 9) over time and by observing gravid (with eggs in the marsupium, gills, or gill pouches) females during the reproductively active

time of year. While small-sized mussels and gravid females can be difficult to detect, it is important that surveyors attempt to detect them, as reproduction and subsequent recruitment are important demographic parameters that affect growth rates in mussel populations (Berg et al. 2008, pp. 396, 398–399; Matter et al. 2013, pp. 122–123, 134–135).

#### *Risk Factors for the Central Texas Mussels*

We reviewed the potential risk factors (*i.e.*, threats, stressors) that could be affecting the seven central Texas mussels now and in the future. In this rule, we will discuss only those factors in detail that could meaningfully impact the status of the species. Those risks that are not known to have effects on central Texas mussel populations, such as disease, are not discussed here but are evaluated in the SSA report. Many of the threats and risk factors are the same or similar for each of the seven species. Where the effects are expected to be similar, we present one discussion that applies to all seven species. Where the effects may be unique or different to one species, we will address that specifically. The primary risk factors (*i.e.*, threats) affecting the status of the central Texas mussels are: (1) Increased fine sediment (Factor A from the Act), (2) changes in water quality (Factor A), (3) altered hydrology in the form of inundation (Factor A), (4) altered hydrology in the form of loss of flow and scour of substrate (Factor A), (5) predation and collection (Factor B), and (6) barriers to fish movement (Factor E). These factors are all exacerbated by the ongoing and expected effects of climate change. Finally, we also reviewed the conservation efforts being undertaken for the species.

#### Increased Fine Sediment

Juvenile and adult central Texas mussels inhabit microsites that have abundant interstitial spaces, or small openings in an otherwise closed matrix of substrate, created by gravel, cobble, boulders, bedrock crevices, tree roots, and other vegetation. Inhabited interstitial spaces have some amount of fine sediment (*i.e.*, clay and silt) necessary to provide appropriate shelter. However, excessive amounts of fine sediments can reduce the number of appropriate microsites in an otherwise suitable mussel bed by filling in these interstitial spaces and can smother mussels in place. All seven species of the central Texas mussels generally require stable substrates, and loose silt deposits do not generally provide for substrate stability that can

support mussels. Interstitial spaces provide essential habitat for juvenile mussels. Juvenile freshwater mussels burrow into interstitial substrates, making them particularly susceptible to degradation of this habitat feature. When clogged with sand or silt, interstitial flow may become reduced (Brim Box and Mossa 1999, p. 100), thus reducing juvenile habitat availability and quality. While adult mussels can be physically buried by excessive sediment, the main impacts of excess sedimentation on unionids (freshwater mussels) are often sublethal and include interference with feeding mediated by valve closure (Brim Box and Mossa 1999, p. 101). Many land use activities can result in excessive erosion, sediment production, and channel instability, including, but not limited to, logging, crop farming, ranching, mining, and urbanization (Brim Box and Mossa 1999, p. 102).

Under a natural flow regime, a stream's sediment load is in equilibrium such that as sediments are naturally moved downstream from one microsite to another, the amount of sediment in the substrate is relatively stable, given that different reaches within a river or stream may be aggrading (gaining) or degrading (losing) sediment (Poff et al. 1997, pp. 770–772). In this context, sedimentation explicitly is restricted to increased fine sediments entering a stream system at a rate beyond the naturally occurring losing rate and does not replace the use of the broader term of turbidity. In addition to increased levels of fine sediment, turbidity is also influenced by concentrations of fine organic and inorganic matter, soluble organic compounds, algae, and other microscopic organisms. Changes in stream turbidity are not inherently an indicator of increased sedimentation as turbidity can naturally vary from stream to stream in Texas due to unrelated factors (*e.g.*, stream primary productivity). Current and past human activities result in enhanced sedimentation in river systems, and legacy sediment, resulting from past land disturbance and reservoir construction, continues to persist and influence river processes and sediment dynamics (Wohl 2015, p. 31). These legacy effects can degrade mussel habitats. Fine sediments collect on the streambed and in crevices during low flow events, and much of the sediment is washed downstream during high flow events (also known as cleansing flows) and deposited elsewhere. However, increased frequency of low flow events (from groundwater extraction, instream surface flow diversions, and drought)

combined with a decrease in cleansing flows (from reservoir management and drought) causes sediment to accumulate. Sediments deposited by large-scale flooding or other disturbance may persist for several years until adequate cleansing flows can redistribute that sediment downstream. When water velocity decreases, which can occur from reduced streamflow or inundation, water loses its ability to carry sediment in suspension, and sediment falls to the substrate, eventually smothering mussels not adapted to soft substrates (Watters 2000, p. 263). Sediment accumulation can be exacerbated when there is a simultaneous increase in the sources of fine sediments in a watershed.

In the range of the central Texas mussels, these sources include streambank erosion from development, agricultural activities, livestock and wildlife grazing and browsing, in-channel disturbances, roads, and crossings, among others (Poff et al. 1997, p. 773). In areas with ongoing development, runoff can transport substantial amounts of sediment from ground disturbance related to construction activities with inadequate or absent sedimentation controls. While these construction impacts can be transient (lasting only during the construction phase), the long-term effects of development are long lasting and can result in hydrological alterations as increased impervious cover increases runoff and resulting shear stress causes streambank instability and additional sedimentation.

All populations of the central Texas mussels face the risk of fine sediment accumulation to varying degrees. Multiple populations of the seven central Texas mussel species are experiencing increased sedimentation, including, in particular, the Clear Fork Brazos River (Texas fawnsfoot), middle and lower Brazos River (Balcones spike and Texas fawnsfoot), and lower Colorado River (Texas pimpleback and Texas fawnsfoot). In the future, we expect sediment deposition to continue to increase across the range of all seven species due to low water levels and decreasing frequency of cleansing flows at all populations and for longer periods due to climate change and additional human development in the watershed.

#### Changes in Water Quality

Freshwater mussels and their host fish require water in sufficient quantity and quality on a consistent basis to complete their life cycles. Urban growth and other anthropogenic activities across Texas are placing increased

demands on limited freshwater resources that, in turn, can have deleterious effects on water quality. Water quality can be degraded through contamination or alteration of water chemistry. Chemical contaminants are ubiquitous throughout the environment and are a major reason for the current declining status of freshwater mussel species nationwide (Augsburger et al. 2007, p. 2025). Immature mussels (*i.e.*, juveniles and glochidia) are especially sensitive to water quality degradation and contaminants (Cope et al. 2008, p. 456; Wang et al. 2017, pp. 791–792; Wang et al. 2018, p. 3041).

Chemicals enter the environment through both point and nonpoint source discharges, including hazardous spills, industrial wastewater, municipal effluents, and agricultural runoff. These sources contribute organic compounds, trace metals, pesticides, and a wide variety of newly emerging contaminants (*e.g.*, pharmaceuticals) that comprise some 85,000 chemicals in commerce today that are released into the aquatic environment (EPA 2018, p. 1). The extent to which environmental contaminants adversely affect aquatic biota can vary depending on many variables such as concentration, volume, and timing of the release. Species diversity and abundance consistently rank lower in waters that are polluted or otherwise degraded by contaminants. Freshwater mussels are not generally found for many miles downstream of municipal WWTPs (Gillis et al. 2017, p. 460; Goudreau et al. 1993, p. 211; Horne and McIntosh 1979, p. 119). For example, transplanted common freshwater mussels (including threeridge (*Amblema plicata*) and the nonnative Asian clam (*Corbicula fluminea*)) showed reduced growth and survival below a WWTP outfall relative to sites located upstream of the WWTP in Wilbarger Creek (a tributary to the Colorado River in Travis County, Texas); water chemistry was altered by the wastewater flows at downstream sites, with elevated constituents in the water column that included copper, potassium, magnesium, and zinc (Duncan and Nobles 2012, p. 8; Nobles and Zhang 2015, p. 11). Contaminants released during hazardous spills are also of concern. Although spills are relatively short-term localized events, depending on the types of substances and volume released, water resources nearby can be severely impacted and degraded for years following an incident.

Ammonia is of particular concern below WWTPs because freshwater mussels are particularly sensitive to increased ammonia levels (Augsburger

et al. 2003, p. 2569). Elevated concentrations (greater than 0.2 parts per billion) of un-ionized ammonia ( $\text{NH}_3$ ) in the interstitial spaces of benthic habitats have been implicated in the reproductive failure of other freshwater mussel populations (Strayer and Malcom 2012, pp. 1787–1788), and sublethal effects (valve closures) have recently been described as total ammonia nitrogen approaches 2.0 milligrams per liter ( $\text{mg/L} = \text{parts per million (ppm)}$ ); Bonner et al. 2018, p. 186). Immature mussels (*i.e.*, juveniles and glochidia) are especially sensitive to water quality degradation and contaminants, including ammonia (Wang et al. 2007, p. 2055). For pimpleback (*Cyclonaias pustulosa*, a species native to central Texas but not included in this listing), the revised Environmental Protection Agency ammonia benchmarks are sufficient to protect from short-term effects of ammonia on the species' physiological processes (Bonner et al. 2018, p. 151). However, the long-term effects of chronic exposure (*i.e.*, years or decades) to freshwater mussels have yet to be experimentally investigated.

Municipal wastewater contains both ionized and un-ionized ammonia, and wastewater discharge permits issued by the Texas Commission on Environmental Quality (TCEQ) do not always impose limits on ammonia, particularly for smaller volume dischargers. Therefore, at a minimum, concentrations of ammonia are likely to be elevated in the immediate mixing zone of some WWTP outfalls. Approximately 480 discharge permits have been issued for the Brazos River watershed alone from its headwaters above Possum Kingdom Lake down to the Gulf of Mexico (TCEQ 2018, entire), and WWTP outfalls are numerous in other basins throughout the ranges of the central Texas mussels. In addition, some industrial permits, such as animal processing facilities, have ammonia limits in the range of 3 to 4  $\text{mg/L}$  or higher, which exceeds levels that inhibited growth in juvenile fatmucket (*Lampsilis siliquoidea*) and rainbow mussel (*Villosa iris*) (Wang et al. 2007, entire).

An additional type of water quality degradation that affects the central Texas mussels is alteration of water quality parameters such as dissolved oxygen, temperature, and salinity levels. Dissolved oxygen levels may be reduced from increased nutrient inputs or other sources of organic matter that increase the biochemical oxygen demand in the water column as microorganisms decompose waste. Organic waste can originate from storm water or irrigation

runoff or wastewater effluent, and juvenile mussels seem to be particularly sensitive to low dissolved oxygen (with sublethal effects evident at 2 ppm and lethal effects evident at 1.3 ppm; Sparks and Strayer 1998, pp. 132–133). Increased water temperature (over 30 °C (86 °F) and approaching 40 °C (104 °F)) from climate change and from low flows during drought can exacerbate low dissolved oxygen levels in addition to other drought-related effects on both juvenile and adult mussels (Sparks and Strayer 1998, pp. 132–133). Finally, high salinity concentrations are an additional concern in certain watersheds, where dissolved salts can be particularly limiting to the central Texas mussels. Upper portions of the Brazos and Colorado Rivers, originating from the Texas High Plains, contain saline water, sourced from both natural geological formations and from oil and gas development. Salinity in river water is diluted by surface flow, and as surface flow decreases, salt concentrations increase, resulting in adverse effects to freshwater mussels. Even low levels of salinity (2 to 4 parts per thousand (ppt)) have been demonstrated to have substantial negative effects on reproductive success, metabolic rates, and survival of freshwater mussels (Blakeslee et al. 2013, p. 2853). The behavioral response of valve closure to high salinity concentrations (greater than 2 ppt) is the likely mechanism for reduced metabolic rates, reduced feeding, and reduced reproductive success based on reported sublethal effects of salinity of more than 2 ppt for the Texas pimpleback (Bonner et al. 2018, pp. 155–156).

Water quality and quantity are interdependent, so reductions in surface flow from drought, instream diversion, and groundwater extraction serve to concentrate contaminants by reducing flows that would otherwise dilute point and non-point source pollution. For example, salinity inherently poses a greater risk to aquatic biota under low flow conditions as salinity concentrations and water temperatures increase. Drought conditions can place additional stressors on stream systems beyond reduced flow by exacerbating contaminant-related effects to aquatic biota, including the central Texas mussels. Not only can temperature be a biological, physical, and chemical stressor, the toxicity of many pollutants (e.g., ammonia, mercury) to aquatic organisms increases at higher temperatures. We foresee threats to water quality increasing into the future as demand and competition for limited water resources grows.

#### Altered Hydrology—Inundation

All seven central Texas mussels are adapted to flowing water (lotic habitats) rather than standing water (lentic habitats) and require free-flowing water to survive. Low flow events (including stream drying) and inundation can eliminate habitat appropriate for the central Texas mussels, and while these species can survive these events for a short duration, populations that experience prolonged drying events or repeated drying events will not persist over time.

Inundation has primarily occurred upstream of dams, both large (such as the Highland Lakes on the Colorado River and other major flood control and water supply reservoirs) and small (low water crossings and diversion dams typical of the tributaries and occurring usually on privately owned lands throughout central Texas). Inundation causes an increase in sediment deposition, eliminating the crevices that many of the central Texas mussel species inhabit. Inundation also includes the effects of reservoir releases where frequent variation in surface water elevation acts to make habitats unsuitable for the central Texas mussels. In large reservoirs, deep water is very cold and often devoid of oxygen and necessary nutrients. Cold water (less than 11 °C (52 °F)) stunts mussel growth and delays or hinders spawning. The central Texas mussels do not tolerate inundation under large reservoirs. Further, deep-water reservoirs with bottom release (like Canyon Reservoir) can affect water temperatures several miles downriver. The water temperature remains below 21.1 °C for the first 3.9 miles (6.3 km) of the 13.8-mile (22.2-km) Canyon Reservoir tailrace (TPWD 2007, p. ii), and are cold enough to support a recreational nonnative rainbow and brown trout fishery.

The construction of dams, inundation of reservoirs, and management of water releases have significant effects on the natural hydrology of a river or stream. For example, dams trap sediment in reservoirs, and managed releases typically do not conform to the natural flow regime (i.e., higher baseflows, and peak flows of reduced intensity but longer duration). Rivers transport not only water but also sediment, which is transported mostly as suspended load (held by the water column), and most sediment transport occurs during floods as sediment transport increases as a power function (greater than linear) of flow (Kondolf 1997, p. 533). It follows that increased severity of flooding would result in greater sediment

transport, with important effects on substrate stability and benthic habitats for freshwater mussels and other organisms dependent on stable benthic habitats. Further, water released by dams is usually clear and does not carry a sediment load and is considered “hungry water because the excess energy is typically expended on erosion of the channel bed and banks . . . resulting in incision (downcutting of the bed) and coarsening of the bed material until a new equilibrium is reached” (Kondolf 1997, p. 535). Conversely, depending on how dam releases are conducted, reduced flood peaks can lead to accumulations of fine sediment in the riverbed (i.e., loss of flushing flows) (Kondolf 1997, pp. 535, 548).

Operation of flood-control, water-supply, and recreation reservoirs results in altered hydrologic regimes, including an attenuation of both high- and low-flow events. Flood-control dams store floodwaters and then release them in a controlled manner; this extended release of flood waters can result in significant scour and loss of substrates that provide mussel habitat. Along with this change in the flow of water, sediment dynamics are affected as sediment is trapped above and scoured below major impoundments. These changes in water and sediment transport have negatively affected freshwater mussels and their habitats.

There are numerous dams throughout the range of the central Texas mussels. There are now 27 major reservoirs, 16 of which have more than 50,000 acre-feet of storage, in the Brazos River Basin (BBEST 2012, p. 33); 31 major reservoirs in the Colorado River Basin, including the Highland Lakes (TWDB 2018, p. 1); 9 major reservoirs on the Guadalupe River (BBEST 2011, p. 2.2); and 31 major reservoirs in the Trinity River Basin (BBEST 2009, p. 10). These reservoirs, subsequent inundation, and resulting fragmentation of mussel populations has been the primary driver of the current distribution of the central Texas mussels. Additional reservoirs are planned for the future, including the Cedar Ridge Reservoir, proposed by the City of Abilene on the Clear Fork of the Brazos River near the town of Lueders, Texas (see 83 FR 16061; April 13, 2018), and more than one reservoir is proposed to be built off the main channel of the Lower Colorado River in Wharton and Colorado Counties, Texas (LCRA 2018, p. 1). The Allens Creek Reservoir is proposed for construction on Allens Creek near the City of Wallis, to provide water supply and storage for the City of Houston (BRA 2018a, p. 1). Water that is planned to be pumped from the Brazos River during high flows will be

stored and released back into the river to meet downstream needs during periods of low flow.

#### Altered Hydrology—Flow Loss and Scour

Extreme water levels—both low flows and high flows—are threats to population persistence of the central Texas mussels. The effects of population losses associated with excessively low flows are compounded by population losses associated with excessively high flows. Whereas persistent low flow during times of drought results in drying of mussel habitats and desiccation of exposed mussels, rapid increases in flows associated with large-scale rain events and subsequent flooding results in scour of the streambed and physical displacement of mussels and appropriate substrates. Appropriately sized substrates are moved during scouring high flow events, and mussels are transported downstream to inappropriate sites or are buried by inappropriately sized materials. The central Texas mussels are experiencing a repeating cycle of alternating droughts and flooding that, in combination with hydrological alterations, impacts population persistence.

Droughts that have occurred in the recent past have led to extremely low flows in several central Texas rivers. Many of these rivers have some resiliency to drought because they are spring-fed (Colorado River tributaries, Guadalupe River), are very large (lower Brazos and Colorado Rivers), or have significant return flows (Trinity River), but drought in combination with increased groundwater pumping may lead to lower river flows of longer duration than have been recorded in the past. Reservoir releases can be managed to some extent during drought conditions to prevent complete dewatering below many major reservoirs. During the months of July and August 2018, the Clear Fork Brazos, Concho, San Saba, Llano, Pedernales, and upper Colorado and upper Guadalupe Rivers all had very low flows (USGS 2019, unpaginated).

Streamflow in the Colorado River above the Highland Lakes and downstream of the confluence with Concho River has been declining since the 1960s as evidenced by annual daily mean streamflow (USGS 2008, pp. 812, 814, 848, 870, 878, 880), and overall river discharge for the Colorado River can be expected to continue to decline due to increased drought as a result of climate change, absent significant return flows. There are a few exceptions including the Llano River at Llano

(USGS 2008, p. 892), Pedernales River at Fredericksburg (USGS 2008, p. 896), Onion Creek near Driftwood, and Onion Creek at Highway 183 (flows appear to become more erratic, characteristic of a developing watershed) (USGS 2008, pp. 930, 946). In the San Saba River, continuing or increasing surface and alluvial aquifer groundwater withdrawals in combination with drought are likely to result in reduced streamflow, affecting mussels in the future (Randklev et al. 2017c, pp. 10–11).

Flows have declined due to drought in the Brazos River in recent years upstream of Lake Whitney (USGS 2008, pp. 578, 600, 626, 638; BRA 2018b, p. 6), although baseflows are maintained somewhat due to releases from Lake Granbury and other reservoirs in the upper basin (USGS 2008, p. 644; BRA 2018b, p. 6). In the middle Brazos, U.S. Army Corps of Engineers (USACE) dams have reduced the magnitude of floods on the mainstem of the Brazos River downstream of Lake Whitney (USGS 2008, pp. 652, 676, 766, 776; BRA 2018b, p. 6), while flows in the lower Brazos and Navasota Rivers appear to have higher baseflows due to water supply operations in the upper basin that deliver to downstream users (USGS 2008, pp. 754, 766, 776; BRA 2018b, p. 6). Lake Limestone releases also appear to be contributing to higher base flows in the Lower Brazos (BRA 2018b, p. 6). Flows have declined in the upper Guadalupe River (USGS 2008, pp. 992, 994, 1000, 1018) but appear relatively unchanged at Comfort and Spring Branch and in the San Marcos River (USGS 2008, pp. 1004, 1006, 1022), and in the lower Guadalupe River (USGS 2008, pp. 1036, 1040). In the lower sections of the Colorado River, lower flows and reduced high flow events are more common now decades after major reservoirs were constructed (USGS 2008, pp. 964, 966). In the Trinity River, low flows are higher (elevated baseflows) than they were in the past (USGS 2008, pp. 370, 398, 400, 430) because of substantial return flows from Dallas area wastewater treatment plants.

Many of the tributary streams (*i.e.*, Concho, San Saba, Llano, and Pedernales Rivers) historically received significant groundwater inputs from multiple springs associated with the Edwards and other aquifers. As spring flows decline due to drought or groundwater lowering from pumping, habitat for the central Texas mussels in the tributary streams is reduced and could eventually cease to exist (Randklev et al. 2018, pp. 13–14). While the central Texas mussels may survive short periods of low flow, as low flows

persist, mussels face oxygen deprivation, increased water temperature, increased predation risk, and ultimately stranding, all reducing survivorship, reproduction, and recruitment in the population.

Low-flow events lead to increased risk of desiccation (physical stranding and drying) and exposure to elevated water temperature and other water quality degradations, such as contaminants, as well as to predation. For example, sections of the San Saba River, downstream of Menard, Texas, experienced very low flows during the summer of 2015, which led to dewatering of occupied habitats as evidenced by observations of recent dead shell material of Texas pimpleback and Texas fatmucket (TPWD 2015, pp. 2–3; described in detail by Randklev et al. 2018, entire). Several USGS stream gauges reported very low flows during the 2017–2018 water year, including the Clear Fork of the Brazos River, Elm Creek, Concho River at Paint Rock, San Saba River, Colorado River at San Saba, Llano River, Pedernales River, and upper Guadalupe River (USGS 2018, entire). In 2017, Service, TPWD, and Texas Department of Transportation (TxDOT) biologists noted at one site on the Brazos River near Highbank, Texas, the presence of 42 dead to fresh dead (with tissue intact) Texas fawnsfoot that likely died as a result of recent drought or scouring events (Tidwell 2017, entire).

High flow events lead to increased risk of physical removal, transport, and burial (entrapment) of mussels as unstable substrates are transported downstream by floodwaters and later redeposited in locations that may not be suitable. A site in the lower Colorado River near Altair, Texas, suffered significant changes in both mussel community structure and bathymetry (measurement of water depths) during extensive flooding (and resulting high flows) in August 2017, as a result of Hurricane Harvey (Bonner et al. 2018, p. 266). Prior to the flooding events, this site held the highest mussel abundance (Bonner et al. 2018, pp. 242–243) and represented high-quality habitat within the Colorado River Basin. After the flooding events, mussel abundance significantly decreased by nearly two orders of magnitude (Bonner et al. 2018, p. 266). This location had two of the central Texas mussel species (Texas fawnsfoot and Texas pimpleback) present during initial surveys in 2017 (Bonner et al. 2018, p. 242). Widespread flooding was reported in the Colorado and Guadalupe River Basins of central Texas in October 2018.

The distribution of mussel beds and their habitats is affected by large floods returning at least once during the typical life span of an individual mussel (generally from 3 to 30 years). The presence of flow refuges mediates the effects of these floods, as shear stress is relatively low in flow refuges and where sediments are relatively stable, and individual mussels “must either tolerate high-frequency disturbances or be eliminated, and can colonize areas that are infrequently disturbed between events” (Strayer 1999, pp. 468–469). Shear stress and relative substrate stability are limiting to mussel abundance and species richness (Randklev et al. 2017a, p. 7), and riffle habitats may be more resilient to high flow events than littoral (bank) habitats.

The central Texas mussels have historically been, and currently remain, exposed to extreme hydrological conditions, including severe drought leading to dewatering, and heavy rains leading to damaging scour events with movement of mussels and substrate (*i.e.*, “flash flooding”). For example, in 2018, over the span of 69 days, the Llano River near Llano, Texas, experienced extreme low flows (0.08 cubic feet per second (cfs) on August 8, 2018), and extreme high flows leading to severe flooding, which resulted in substantial scour of streambed and riparian area habitats (278,000 cfs on October 16, 2018) (LRWA 2019, entire). Prolonged drought followed by severe flooding can result in failure and collapse of river banks and subsequent sedimentation, as demonstrated by slumping and undercutting on the lower Guadalupe River (near Cuero, Texas), which is occupied by the false spike and Guadalupe orb, in 2015 (Giardino and Rowley 2016, pp. 70–72). The usual drought/flood cycle in central Texas can be characterized by long periods of time without rain interrupted by short periods of heavy rain, resulting in often severe flooding. These same patterns led to the development of flood control and storage reservoirs throughout Texas in the 20th century. It follows that, given the extreme and variable climate of central Texas, mussels must have life-history strategies and other adaptations that allow them to persist by withstanding severe conditions and repopulating during more favorable conditions. However, it is also likely that there is a limit to how the mussels might respond to increasing variability, frequency, and severity of extreme weather events, combined with habitat fragmentation and population isolation.

Sediment deposition may arise from human activities, as well. Sand and gravel can be mined from rivers or from

adjacent alluvial deposits, and instream gravels often require less processing and are thus more attractive from a business perspective (Kondolf 1997, p. 541). Instream mining directly affects river habitats, and can indirectly affect river habitats through channel incision, bed coarsening, and lateral channel instability (Kondolf 1997, p. 541). Excavation of pits in or near to the channel can create a nickpoint, which can contribute to erosion (and mobilization of substrate) associated with head cutting (Kondolf 1997, p. 541). Off-channel mining of floodplain pits can become involved during floods, such that the pits become hydrologically connected and thus can affect sediment dynamics in the stream (Kondolf 1997, p. 545).

#### Predation and Collection

Predation on freshwater mussels is a natural phenomenon. Raccoons, muskrats, snapping turtles, wading birds, and fish are known to prey upon the central Texas mussels. Under natural conditions, the level of predation occurring within central Texas mussel populations is not likely to pose a significant risk to any given population. However, during periods of low flow, terrestrial predators and wading birds have increased access to portions of the river that are otherwise too deep under normal flow conditions. High levels of predation during drought have been observed on the Llano and San Saba Rivers. As drought and low flow are predicted to occur more often and for longer periods due to the effects of future climate change, the Hill Country tributaries (of the Colorado River) in particular are expected to experience additional predation pressure into the future, and this may become especially problematic in the Llano and San Saba Rivers. Predation is expected to be less of a problem for the lower portions of the mainstem river populations because the rivers are significantly larger than the tributary streams and the central Texas mussels are less likely to be found by predators in exposed or very shallow habitats.

Certain mussel beds within some populations, due to ease of access, are vulnerable to overcollection and vandalism. These areas, primarily on the Llano and San Saba Rivers, have well-known and well-documented mussel beds that have been sampled repeatedly over the past few years by multiple researchers and others for a variety of projects (Robertson 2023, entire).

Repeated collections and handling can cause disturbance to the growth of individual mussels. Freshwater mussels

close their shell in response to handling, which can lead to the production of a disturbance ring in the shell. When closing its shell, it is possible for the mussel’s mantle-shell margin connection to be disrupted as the mantle tissue is retracted. This can result in the production of a growth disturbance ring when this mantle-shell connection is re-established in a slightly differing location than the original collection causing a misalignment of the prismatic layer and periostracum (Haag 2012, p. 11). Additionally, the closure of the shell during handling can prevent feeding (Haag 2012, p. 29), alter respiration rate and heart patterns (Haag 2012, pp. 29–30), and require additional energy expenditure to retract and then re-establish the foot in substrate to prevent dislodgment when returned to stream substrates.

Handling of freshwater mussels can also have a detrimental impact on the reproductive efforts of individual mussels and possibly the overall population. It is commonly observed that short-term brooders will abort their glochidia due to disturbances or handling (Haag 2012, p. 199). In species or individuals that are not able to successfully produce multiple broods within a single breeding season, the abortion of these glochidia can cause the loss of reproductive output for that individual for the year. If many animals have their reproductive output curtailed at a single location due to widespread sampling of a site, the abortion of glochidia by multiple animals in response to handling can lead to an overall reduced reproductive output at a site. If this sampling effort is repeated multiple times during a breeding season and across multiple years, there is potential for the disturbance of multiple years of breeding efforts for many animals at a single location. This extended disturbance can lead to multiple years of failed recruitment and potentially the loss of multiple age-class cohorts within a population at the site.

Loss of reproductive effort due to handling could be compounded by the intentional collection of gravid individuals, especially the potential effects on the native populations if an excessive number of females are removed, for use as broodstock for propagation or research purposes (Jones et al. 2006, p. 531). For example, pulling many gravid females from a site may prevent in-situ reproduction from occurring due to essentially removing a large percentage of that year’s reproducing portion of the population from the site.

### Barriers to Fish Movement

The central Texas mussels historically colonized new areas through movement of infested host fish, as newly metamorphosed juveniles would excyst from host fish in new locations. Today, the remaining central Texas mussel populations are significantly isolated due to habitat fragmentation by major reservoirs such that recolonization of areas previously extirpated is extremely unlikely, if not impossible, due to existing dams creating permanent barriers to host fish movement. There is currently no opportunity for interaction among any of the extant central Texas mussel populations, as they are isolated from one another by major reservoirs.

The overall distribution of mussels is, in part, a function of host fish dispersal (Smith 1985, p. 105). There is limited potential for immigration and emigration between populations other than through the movement of infected host fish between mussel populations. Small populations are more affected by this limited immigration potential because they are susceptible to genetic drift, resulting from random loss of genetic diversity, and inbreeding depression. At the species level, isolated populations that are eliminated due to stochastic events cannot be recolonized naturally due to barriers to host fish movement, leading to reduced overall redundancy and representation.

Many of the central Texas mussels' known or assumed primary host fish species are common, widespread species in central Texas river basins. We know that populations of mussels and their host fish have become fragmented and isolated over time following the construction of major dams and reservoirs throughout central Texas. We do not currently have information demonstrating that the distribution of host fish is a factor currently limiting the central Texas mussels' distribution. However, a recent study suggested that the currently restricted distribution of false spike, Guadalupe orb, and other related species could be related to declining abundance of their host fish, particularly those fish having small home ranges and specialized habitat affinities (Dudding et al. 2019, entire). Further research into the relationships between each of the central Texas mussel species and their host fish is needed to more fully examine the possible role of declining host fish abundance in declining mussel populations.

### Effects of Climate Change

Climate change is already taking place, and continued greenhouse gas

emissions at or above current rates will cause further warming (Intergovernmental Panel on Climate Change (IPCC) 2013, pp. 11–12). Warming in Texas is expected to be greatest in the summer (Maloney et al. 2014, p. 2236). The number of extremely hot days (high temperatures exceeding 95 °F) is expected to double by around 2050 (Kinniburgh et al. 2015, p. 83). Western Texas, including portions of the ranges of the central Texas mussels, is an area expected to show greater responsiveness to the effects of climate change (Diftenbaugh et al. 2008, p. 3). Changes in stream temperatures are expected to reflect changes in air temperature, at a rate of approximately 0.6–0.8 °C increase in stream water temperature for every 1 °C increase in air temperature (Morrill et al. 2005, pp. 1–2, 15) and with implications for temperature-dependent water quality parameters such as dissolved oxygen and ammonia toxicity. The central Texas mussels exist at or near a climate and habitat gradient in North America, with the eastern United States having more rainfall and higher freshwater mussel diversity, and the western United States receiving less rainfall and having fewer species of freshwater mussels. As such, it is likely that the central Texas mussels may be particularly vulnerable to future climate changes in combination with current and future stressors (Burlakova et al. 2011a, pp. 156, 161, 163; Burlakova et al. 2011b, pp. 395, 403).

While projected changes to rainfall in Texas are small (U.S. Global Change Research Program (USGCRP) 2017, p. 217), higher temperatures caused by anthropogenic factors lead to increased soil water deficits because of higher rates of evapotranspiration. This is likely to result in increasing drought severity in future climate scenarios just as “extreme precipitation, one of the controlling factors in flood statistics, is observed to have generally increased and is projected to continue to do so across the United States in a warming atmosphere” (USGCRP 2017, p. 231). Even if precipitation and groundwater recharge remain at current levels, increased groundwater pumping and resultant aquifer shortages due to increased temperatures are nearly certain (Loaiciga et al. 2000, p. 193; Mace and Wade 2008, pp. 662, 664–665; Taylor et al. 2013, p. 325). Higher temperatures are also expected to lead to increased evaporative losses from reservoirs, which could negatively affect downstream releases and flows (Friedrich et al. 2018, p. 167). Effects of climate change, such as air temperature

increases and an increase in drought frequency and intensity, have been shown to be occurring throughout the range of the central Texas mussels (USGCRP 2017, p. 188; Andreadis and Lettenmaier 2006, p. 3), and these effects are expected to exacerbate several of the stressors discussed above, such as water temperature and flow loss (Wuebbles et al. 2013, p. 16).

A recent review of future climate projections for Texas concludes that both droughts and floods could become more common in central Texas and projects that years like 2011 (the warmest on record) could be commonplace by the year 2100 (Mullens and McPherson 2017, pp. 3, 6). This trend toward more frequent drought is attributed to increases in hot temperatures, and the number of days at or above 100 °F are projected to “increase in both consecutive events and the total number of days” (Mullens and McPherson 2017, pp. 14–15). Similarly, floods are projected to become more common and severe because of increases in the magnitude of extreme precipitation (Mullens and McPherson 2017, p. 20). Recent ‘historic’ flooding of the Llano River resulted in the transport of high levels of silt and debris to Lake Travis, so much so that the City of Austin’s ability to treat raw water was affected, and the City issued a boil water notice and call for water conservation (City of Austin 2018, p. 3).

In the analysis of the future condition of the central Texas mussels, we considered climate change to be an exacerbating factor, contributing to the increase of fine sediments, changes in water quality, loss of flowing water, and predation. Due to the effects of ongoing climate change (represented by representative concentration pathway (RCP) 4.5), we expect the frequency and duration of cleansing flows to decrease, leading to the increase in fine sediments at all populations. Many populations will experience increased frequency of low flows. More extreme climate change projections (RCP 8.5 and beyond) lead to further increases in fine sediment within the populations. Similarly, as lower water levels concentrate contaminants and cause unsuitable temperature and dissolved oxygen levels, we expect water quality to decline to some degree in the future. The SSA report includes a detailed analysis of the species’ responses to both RCP 4.5 and 8.5 (Service 2022, pp. 142–145, 149, and appendix C).

### *Species Current Condition*

Here we discuss the current condition of each known population, taking into

account the risks to those populations that are currently occurring, as well as management actions that are currently occurring to address those risks. We consider climate change to be currently occurring, resulting in changes to the timing and amount of rainfall affecting streamflow, increased stream temperatures, and increased accumulation of fine sediments. In the SSA report, for each species and population, we developed and assigned condition categories for three population factors (occupied stream length, abundance, and reproduction) and three habitat factors (substrate, flowing water, and water quality) that are important for viability of each species. The condition scores for each factor were then used to determine an overall condition of each population: healthy, moderately healthy, unhealthy, or functionally extirpated. These overall conditions translate to our estimated probability of persistence of each population, with healthy populations having the highest probability of persistence over 20 years (greater than 90 percent), moderately healthy populations having a probability of persistence that falls between 60 and 90 percent, and unhealthy populations having the lowest probability of persistence (between 10 and 60 percent). Functionally extirpated populations are not expected to persist over 20 years or are already extirpated.

#### Guadalupe Fatmucket

Overall, there is one known remaining population of Guadalupe fatmucket, in the Guadalupe River. Historically, Guadalupe fatmucket likely occurred through the Guadalupe River Basin, but it currently only occurs in the upper Guadalupe River in an unhealthy population with low abundance and little evidence of reproduction or recruitment. Very few individuals have been found in recent years. The upper Guadalupe River in this reach already experiences very low water levels, and these low water events are expected to continue into the future; the population is unlikely to rebound from any degraded habitat conditions.

#### Texas Fatmucket

Overall, there are five known remaining populations of Texas fatmucket, all limited to the headwater reaches of the Colorado River and its tributaries. Historically, most Texas fatmucket populations were likely connected by fish migration throughout the Colorado River Basin, but due to impoundments and low water conditions in the Colorado River and tributaries, they are currently isolated

from one another, and repopulation of extirpated locations is unlikely to occur without human assistance. Two of the current populations are moderately healthy, two are unhealthy, and one is functionally extirpated.

*Lower Elm Creek:* The Elm Creek population of Texas fatmucket is extremely small and isolated. This population will continue to face threats from excessive sedimentation and deterioration of substrate, altered hydrology associated with anthropogenic activities and the effects of climate change, and water quality degradation. The poor habitat conditions and only a single individual found at this site more than a decade ago indicate a population that is unlikely to persist and may already be extirpated.

*Upper/Middle San Saba River:* The population of Texas fatmucket in the upper/middle San Saba River is currently moderately healthy. Most of the flows in the Upper San Saba River (in Menard County, Texas) are from Edwards Formation springs, where the river gains streamflow from groundwater except for a reach that loses flow to the aquifer (called a losing reach) near the Menard/Mason County line (LBG-Guyton 2002, p. 3). It is in this losing reach where drought effects are especially noticeable, as some flows may percolate downward to the aquifer. Much of the middle San Saba River below Menard is reported to have gone dry for 10 of the last 16 years by landowners downstream of Menard (Carollo Engineers 2015, p. 2). Regardless of the cause, low flows in the San Saba River have resulted in significant stream drying, and stranded central Texas mussels, including Texas fatmucket and Texas pimpleback, have been identified following dewatering as recently as 2015 near and below the losing reach (TPWD 2015, p. 3). During the 2011–2013 drought, stream flows in the San Saba River were critically low, such that several water rights in Schleicher, Menard, and McCulloch Counties were suspended by the Texas Commission on Environmental Quality (TCEQ; TCEQ 2013, entire). These very low flow events are expected to continue into the future and put the upper/middle San Saba River population of Texas fatmucket at risk of extirpation. Even if the locations of Texas fatmucket do not become dry, water quality degradation and increased sedimentation associated with low flows is expected.

*Llano River:* The Llano River population of Texas fatmucket is currently moderately healthy, and collection of the species is frequent at

this location, although there has been limited evidence that the population is successfully reproducing. We expect flows to continue to decline and the frequency of extreme flow events to increase, leading to increased sedimentation, decreased water quality, and scour. As a result, the population of Texas fatmucket is expected to decline.

*Pedernales River:* The population of Texas fatmucket in the Pedernales River is very small and isolated. The Pedernales River is a flashy system, which experiences extreme high flow events, especially in the lower reaches in the vicinity of Pedernales Falls State Park and below. Occasional, intense thunderstorms can dramatically increase streamflow and mobilize large amounts of silt and organic debris (LCRA 2017, p. 82). The continued increasing frequency of high flow events combined with very low Texas fatmucket abundance in the river result in a population that is likely to be extirpated and currently is unhealthy.

*Onion Creek:* Few live individuals of Texas fatmucket have been found in Onion Creek since 2010, and we consider this population to be functionally extirpated with little chance of persistence. The upper reaches of Onion Creek frequently go dry, and several privately owned low-head in-channel dams currently exist along upper and lower Onion Creek, which further provide barriers to fish passage and mussel dispersal, preventing recolonization after low water events. Onion Creek is in close proximity to the City of Austin, and continued development in the watershed is expected to continue to degrade habitat conditions.

#### Guadalupe Orb

There are two known remaining populations of the Guadalupe orb, all in the Guadalupe River Basin. Historically, Guadalupe orb likely occurred throughout the basin with populations connected by fish migration, but due to impoundments and low water conditions, they are currently isolated from one another, and repopulation of extirpated locations is unlikely to occur without human assistance. Both Guadalupe orb populations are moderately healthy.

*Upper Guadalupe River:* The Guadalupe orb population in the upper Guadalupe River occurs over approximately 95 river mi (153 river km), and water quantity and quality are in moderate condition. However, the population occurs in low numbers, with limited reproduction; this population is unhealthy and is expected to become functionally extirpated in the near



future. This stream reach is expected to be sensitive to potential changes in groundwater inputs to stream flow. Thus, the stream reach is vulnerable to ongoing and future hydrological alterations that reduce flows, and thereby result in substrate and water quality degradations, during critical conditions.

*San Marcos/Lower Guadalupe Rivers:* In the San Marcos and Lower Guadalupe River, the Guadalupe orb population currently occupies a relatively long stream length, is observed in relatively high abundances, and exhibits evidence of reproduction. Significant spring complexes contribute substantially to baseflow during dry periods in this system and are expected to continue to contribute to baseflows for the next 50 years due to conservation measures implemented by the Edwards Aquifer Habitat Conservation Plan's partners. These measures bolster the resiliency of this population. However, this population is subject to extreme high flow events that scour and mobilize the substrate, and water quality degradation and sedimentation are threats, putting the population at risk of decline.

#### Texas Pimpleback

There are five known remaining Texas pimpleback populations, all in the Colorado River Basin. Historically, Texas pimpleback likely occurred throughout the basin with populations connected by fish migration, but due to impoundments and low water conditions, they are currently fragmented and isolated from one another, and repopulation of extirpated locations is unlikely to occur without human assistance. Three of the remaining Texas pimpleback populations are unhealthy and are not reproducing, and two of the populations are in moderate condition.

*Concho River:* The Texas pimpleback population in the Concho River is limited by very low levels of flowing water (including periods of almost complete dewatering), poor water quality, and poor substrate quality associated with excessive sedimentation. The drought of 2011–2013 resulted in extremely low flows in this river, and only one live adult has been found since that time. This population may currently be functionally extirpated.

*Middle Colorado/Lower San Saba Rivers:* The population of Texas pimpleback in the middle Colorado and lower San Saba River is the largest known. This population has relatively high abundance but little evidence of reproduction, so we expect this

population to decline as old individuals die and very few young individuals are recruited into the reproducing population. The combination of reduced flows, degraded water quality, and substrate degradation will reduce the resiliency of this population and may cause it to become extirpated. Therefore, this population is moderately healthy.

*Upper San Saba River:* Similar to other populations of Texas pimpleback, the population in the Upper San Saba River is currently unhealthy and does not appear to be reproducing. Regardless of the high risk of low water levels, the very small population size and lack of reproduction will likely result in the extirpation of this population. Because of the losing reach near Hext, Texas, that serves to separate the upper and lower San Saba River populations, along with differences in substrate, this population is isolated and no longer connected to the lower San Saba River population.

*Llano River:* The population of Texas pimpleback in the Llano River occupies a very short stream length, and the population is negatively affected by substrate degradation during periods of low flows. This population, due to ease of access to the location, is especially vulnerable to the threat of overcollection and vandalism. The small population size and frequency of low water levels, and flooding with scour, cause this population to be unhealthy.

*Lower Colorado River:* Currently, the population of Texas pimpleback in the lower Colorado River is relatively abundant over a long stream length. However, because the species is a riffle specialist, the Texas pimpleback is especially sensitive to hydrological alterations leading to both extreme drying (dewatering) during low flow events, and to extreme high flow events leading to scouring of substrate and movement of mature individuals to sites that may or may not be appropriate, as evidenced by the August 2017 scouring flood event that substantially degraded the quality of the Altair Riffle in the lower Colorado River, a formerly robust mussel bed. While this population is in moderate condition, we expect this population to be at risk of extirpation due to these extreme flow events.

#### Balcones Spike

Overall, there are three known remaining populations of Balcones spike, comprising less than 3 percent of the species' known historical range. Historically, most Balcones spike populations were likely connected by fish migration throughout each of the Brazos and Colorado River basins, but

due to impoundments they are currently fragmented and isolated from one another, and repopulation of extirpated locations is unlikely to occur without human assistance. Based on our analysis as described in the SSA report, the three populations are unhealthy.

*Little River and tributaries:* The Little River population is considered to have low resiliency currently due to the small size of the population. Development in the watershed has reduced water quality and substrate conditions currently, and habitat factors are expected to continue to decline because of alterations to flows and water quality associated primarily with increasing development in the watershed as the Austin-Round Rock (Texas) metropolitan area continues to expand. Low water levels remain a concern that is mediated somewhat by the likelihood that enhanced return flows associated with the development and use of alternative water supplies will bolster base flows somewhat. The small size of the population combined with continued habitat degradation put this population at high risk of extirpation; this population is unhealthy.

*Lower San Saba River:* The lower San Saba River population is currently small and isolated, and therefore has low resiliency and is considered unhealthy. The population has low abundance, and a lack of reproduction and subsequent recruitment, and we expect it to become functionally extirpated in the next 10 years. Future degradation of habitat factors is expected as flows continue to be diminished, most notably by altered precipitation patterns (that result in dewatering droughts and scouring floods) combined with enhanced evaporative demands and anthropogenic withdrawals to support existing and future demands for municipal and agricultural water.

*Llano River:* The Llano River population is currently very small and isolated, and therefore has low resiliency. The population occupies an extremely small area, and degradation of habitat is expected to continue as flows continue to decline due to altered precipitation patterns (dewatering droughts and scouring floods) combined with enhanced evaporative demands and anthropogenic withdrawals to support existing and future demands for municipal and agricultural water. Further, this population is well known and easy to access, has experienced high collection pressure in recent years, and has not shown recent evidence of reproduction. Therefore, this population is unhealthy, and we expect the population to become extirpated.

### False Spike

Overall, there is one known remaining population of false spike, comprising approximately 20 percent of the species' known historical range. Historically, most false spike populations were likely connected by fish migration throughout the Guadalupe River Basin, but due to impoundments, the false spike is currently isolated in the lower portion of the Guadalupe River and repopulation of extirpated locations is unlikely to occur without human assistance. Based on our analysis as described in the SSA report, the population is moderately healthy.

*Lower Guadalupe River:* The lower Guadalupe River population of false spike is the only remaining population of the species and considered to have low resiliency. The population has fairly high abundance over a long reach, and flow protections afforded by the Edwards Aquifer Habitat Conservation Plan have contributed substantially to the resiliency of this population by sustaining base flows above critical levels. However, despite these base flow protections, this population remains vulnerable to changes in water quality, sedimentation, and extreme high flow events, such as from hurricanes or other strong storms, which scour and deplete mussel beds (Strayer 1999, pp. 468–469). Overall, this population is moderately healthy.

### Texas Fawnsfoot

There are seven known remaining populations of Texas fawnsfoot, in the Trinity, Brazos, and Colorado River basins. Historically, Texas fawnsfoot occurred throughout each basin with populations connected by fish migration within each basin, but due to impoundments and low water conditions, they are currently isolated from one another, and repopulation of extirpated locations is unlikely to occur without human assistance. Four Texas fawnsfoot populations are moderately healthy, and three are unhealthy.

*East Fork Trinity River:* The Texas fawnsfoot population in the East Fork Trinity River occupies a small stream reach (12 mi (19 km)), making it especially vulnerable to a single stochastic event such as a spill or flood and changes to water quality. Further, no observations of recent reproduction exist for this population; all observed Texas fawnsfoot individuals are adults, greater than 35 mm. This population is small and isolated from the middle and lower Trinity River population by habitat that is unsuitable primarily because of altered hydrology, as flows from the Dallas-Fort Worth metro area

are too flashy to provide suitable habitat for Texas fawnsfoot. Therefore, this population is moderately healthy.

*Middle Trinity River:* Texas fawnsfoot in the Trinity River have experienced improved water quality over the past 30 years due to advancements in wastewater treatment technology and facilities, and streamflow has been subsidized by return flows originating in part from other basins, although water quality degradation and sedimentation are still affecting Texas fawnsfoot in this reach. Additionally, the middle Trinity River is a relatively long and unobstructed reach of river. While habitat may decline, this population is in moderate condition, and, therefore, we expect the population of Texas fawnsfoot to persist in the middle Trinity River, as we expect that flows will remain within a normal range of environmental variation in this reach. Therefore, this population is moderately healthy.

*Clear Fork Brazos River:* The Texas fawnsfoot population in the Clear Fork of the Brazos River is very small and isolated. This population likely experienced extensive mortality associated with prolonged dewatering during the 2011–2013 drought, combined with ambient water quality degradation associated with naturally occurring elevated salinity levels from the upper reaches of the river. This population is likely functionally extirpated, although more survey effort is needed to reach a definitive conclusion. Further, the proposed Cedar Ridge Reservoir, if constructed, would result in significant hydrologic alterations, which would further degrade the overall condition of this population of Texas fawnsfoot. Therefore, this population is unhealthy.

*Upper Brazos River:* The population of Texas fawnsfoot in the Upper Brazos River is characterized by low abundance and lack of evidence of reproduction. This reach of the river experiences reduced flows associated with continued drought and upstream dam operations. Further, water quality degradation associated with naturally occurring salinity is expected to continue. This population is at risk of extirpation due to its small population size and continued poor habitat conditions. Therefore, this population is unhealthy.

*Middle/Lower Brazos River:* The population of Texas fawnsfoot in the middle and lower Brazos River occupies a fairly long reach of river (346 mi (557 km)) and exhibits evidence of reproduction. The lack of major impoundments and diversions in the Brazos River below Waco, Texas, results

in the maintenance of a relatively natural hydrological regime. Even so, Texas fawnsfoot surveys have yet to yield the species in numbers that would indicate a healthy population, and future habitat degradation from reduced flows, increased temperatures, and decreased water quality will likely reduce the resiliency of this population. Therefore, this population is moderately healthy.

*Lower San Saba River:* Texas fawnsfoot in the lower San Saba River are found in low abundance with little evidence of reproductive success and subsequent recruitment of new individuals to the population. Sedimentation is high, due in part to reductions in flowing water over time due to a combination of increased water withdrawals and drought. We expect this population to become functionally extirpated due to lack of water and increased sedimentation. Therefore, this population is unhealthy.

*Lower Colorado River:* The Texas fawnsfoot population in the lower Colorado River is expected to remain extant under current conditions, as this reach is expected to remain wetted, although with reduced flow. Despite increasing demands for municipal water, we expect that the lower Colorado River will continue to flow due to priority downstream agricultural and industrial water rights. Similar to the lower Brazos River population, Texas fawnsfoot in the Lower Colorado River are vulnerable to reduced flows and associated habitat degradation due to reductions in flow from upstream tributaries; because the species occurs in bank habitats that are likely to become exposed, the species will be subjected to desiccation, predation, and increased water temperatures as river elevations decline while the river still flows in its main channel. Currently, the Lower Colorado River Authority is implementing a water management plan that is alleviating this threat by providing consistent subsistence flows to the lower Colorado River Basin. Therefore, this population is moderately healthy.

### Future-Condition Scenarios for the Texas Fawnsfoot

Because of significant uncertainty regarding if and when flow loss, water quality degradations, extreme flooding and scour/substrate mobilizing events, or impoundment construction may occur, we have forecasted future viability for the Texas fawnsfoot in terms of resiliency, redundancy, and representation under four plausible future scenarios. Each scenario is projected across up to three time steps

and considers the biological status of this species' populations and habitats in ten, twenty-five, and fifty years. Ten years represents one to two generations of mussels, assuming an average reproductive life span of five to ten years. Twenty-five years similarly represents two to four mussel generations. Fifty years represents five or more generations of mussels and corresponds with the current planning horizon of the State Water Plans (from 2020 to 2070), a period of time for which the human population of the State of Texas is expected to grow 88% from 27 million to 51 million (TWDB 2017, p. 3) with much of the growth of human population occurring in the watersheds these seven species of mussels currently occupy (TWDB 2017, pp. 50–51). Below, we provide a brief summary of each plausible future scenario; for more detailed information on these models and their projections, please see the SSA report (Service 2022, chapter 7).

Under Scenario 1, which considers a future where the current levels of existing degradation as well as existing conservation, current as of the preparation of the SSA report, continue for the next 50 years, a loss of resiliency, representation, and redundancy is expected. Under this scenario, we predicted that the effects of current levels of climate change continue to result in low streamflow, which lead to increased sedimentation, reduced water quality, and occasional desiccation. One population of Texas fawnsfoot remains in moderate condition, three populations are considered unhealthy, and three populations are functionally extirpated. Those populations in unhealthy condition are particularly vulnerable to extirpation.

Under Scenario 2, which considers a future where "feasible and appropriate conservation plans" are implemented over the next 50 years, including Candidate Conservation Agreements with Assurances in the Brazos and Colorado River basins that provide coverage for the species, Texas fawnsfoot populations generally maintain, or slightly improve, resiliency, redundancy, and representation over time as conservation measures are implemented to counteract existing stressors. Under this scenario, we predict that the effects of current levels of climate change continue to result in low stream flows, which lead to increased sedimentation, reduced water quality, and occasional desiccation, but water conservation measures and riparian improvements aid some populations. One population of Texas fawnsfoot is considered

healthy, three are in moderate condition, two populations are considered unhealthy, and one population is functionally extirpated. Those populations in unhealthy condition are particularly vulnerable to extirpation.

Under Scenario 3, which considers a future where conditions are no better for the species than the status quo Current Conditions, a loss of resiliency, representation, and redundancy is expected for the Texas fawnsfoot. Under this scenario we predict that intermediate climate effects, including more frequent and intense droughts, combined with increased ground- and surface-water demands associated with increased human demand, reductions in streamflow are expected to occur in all streams and rivers, and those effects will be more pronounced in the upper basins. Scenario 3 considers additional water projects, such as wastewater treatment plant outfalls, only if currently proposed or planned. Four populations of Texas fawnsfoot are considered unhealthy, three are in moderate condition, two populations are considered unhealthy, and three populations are functionally extirpated. Those populations in unhealthy condition are particularly vulnerable to extirpation.

Under Scenario 4, which considers a future where conditions are not better for the species than the status quo Current Conditions under severe climate effects. This scenario considers severe climate effects, and we predict more frequent and intense droughts, increased ground- and surface-water demands associated with increased human demand, additional water projects, like wastewater treatment plant outfalls, as well as possible new reservoirs and other construction projects. The effects of strong levels of climate change result in even lower stream flows, which lead to increased sedimentation, reduced water quality, and desiccation. Three populations of Texas fawnsfoot are considered unhealthy, and four populations are considered functionally extirpated. Those populations in unhealthy condition are particularly vulnerable to extirpation.

As part of the SSA, we also developed three future-condition scenarios to capture the range of uncertainties regarding future threats and the projected responses by the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike. Our scenarios assumed a moderate or enhanced probability of severe drought, and either propagation or no propagation of the species.

Because we determined that the current condition of these six central Texas mussels is consistent with an endangered species (see Determination of Status, below), we are not presenting the results of the future scenarios in this final rule. Please refer to the SSA report (Service 2022) for the full analysis of future scenarios for these six species.

We note that, by using the SSA framework to guide our analysis of the scientific information documented in the SSA report, we have analyzed the cumulative effects of identified threats and conservation actions on the species. To assess the current and future condition of the species, we evaluate the effects of all the relevant factors that may be influencing the species, including threats and conservation efforts. Because the SSA framework considers not just the presence of the factors, but to what degree they collectively influence risk to each entire species, our assessment integrates the cumulative effects of the factors and replaces a standalone cumulative effects analysis.

#### *Conservation Efforts and Regulatory Mechanisms*

Since 2011, when three of the central Texas mussel species became candidates for listing under the Act, many agencies, nongovernmental organizations, and other interested parties have been working to develop voluntary agreements with private landowners to restore or enhance habitats for fish and wildlife in the region, including in the watersheds where the central Texas mussels occur. These agreements provide voluntary conservation including upland habitat enhancements that will, if executed properly, reduce threats to the species while improving instream physical habitat and water quality, as well as adjacent riparian and upland habitats. Additionally, the Brazos, Lower Colorado, and Trinity river authorities have each developed and implemented candidate conservation agreements with assurances to benefit one or more species of candidate mussels, including the Texas fatmucket, Texas fawnsfoot, Texas pimpleback, and Balcones spike in their basins (see *Private or Other Non-Federal Conservation Plans Related to Permits Under Section 10 of the Act*, below). Some publicly and privately owned lands in the watersheds occupied by the central Texas mussels are protected with conservation easements or are otherwise managed to support populations of native fish, wildlife, and plant populations. The U.S. Department of Agriculture's Natural Resources Conservation Service

(NRCS), along with the Service and State and local partners, is working with private landowners to develop and implement comprehensive conservation plans to address soil, water, and wildlife resource concerns in the lower Colorado River Basin through a Working Lands for Wildlife project (NRCS no date, entire).

There are active efforts to protect, maintain, and improve existing water quantity in waters known to be important for mussel populations and to reduce threats of flow loss. These efforts include the establishment of the Texas Instream Flow Program by the Texas Legislature as part of Senate Bill 2 in 2001, and the creation of a “comprehensive, statewide process to protect environmental flows” in Senate Bill 3 (SB3) in 2007. Senate Bill 3 also directs the Environmental Flows Advisory Group (EFAG) to develop a schedule for development of environmental flow regime recommendations and the adoption of environmental flow standards within the State. This process allows for other groups to develop information on environmental flow needs and ways in which those needs can be met for basins for which the EFAG has not yet established environmental flow standard schedules (Loeffler 2015, entire). The Hydrology-based Environmental Flow Regime (HEFR; Opdyke et al. 2014, entire) tool was developed during the SB3 process and describes flow regimes in terms of subsistence flows, base flows, pulse flows, and overbank floods, and it applies the “indicators of hydrologic assessment” (IHA; TNC 2009, entire) to determine hydrologic separation and then inform an environmental flow recommendation. Environmental flow recommendations have been set for each of the river basins occupied by the species that are the subjects of this rule.

The Service has been hosting annual mussel research and coordination meetings to help manage and monitor scientific collection of mussel populations and encourage collaboration among researchers and other conservation partners since 2018 (Service 2018, p. 1; Service 2019a, p. 1). Additionally, work is under way to evaluate methods of captive propagation for the central Texas mussel species at the Service’s hatchery and research facilities (San Marcos Aquatic Research Center, Inks Dam National Fish Hatchery, and Uvalde National Fish Hatchery), including efforts to collect gravid females from the wild to infest host fish (Bonner et al. 2018, pp. 8, 9, 11).

### Determination of Status

Section 4 of the Act (16 U.S.C. 1533) and its implementing regulations (50 CFR part 424) set forth the procedures for determining whether a species meets the definition of an endangered species or a threatened species. The Act defines an “endangered species” as a species in danger of extinction throughout all or a significant portion of its range, and a “threatened species” as a species likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act requires that we determine whether a species meets the definition of endangered species or threatened species because of any of the following factors: (A) The present or threatened destruction, modification, or curtailment of its habitat or range; (B) overutilization for commercial, recreational, scientific, or educational purposes; (C) disease or predation; (D) the inadequacy of existing regulatory mechanisms; or (E) other natural or manmade factors affecting its continued existence.

### Status Throughout All of Its Range

After evaluating threats to these seven species and assessing the cumulative effect of the threats under the Act’s section 4(a)(1) factors, we found that all seven species of the central Texas mussels have declined significantly in overall distribution and abundance. At present, most of the known populations exist in very low abundances and show limited evidence of recruitment. Furthermore, existing available habitats are reduced in quality and quantity, relative to historical conditions. Our analysis revealed five primary threats that caused these declines and pose a meaningful risk to the viability of the species. These threats are primarily related to habitat changes (Factor A from the Act): the accumulation of fine sediments, altered hydrology, and impairment of water quality, all of which are exacerbated by the effects of climate change. Collection (Factor B), and predation (Factor C) are also affecting those populations already experiencing low stream flow, and barriers to fish movement (Factor E) limit dispersal and prevent recolonization after stochastic events.

Because of historical and ongoing habitat destruction and fragmentation, remaining central Texas mussel populations are now fragmented and isolated from one another, interrupting the once functional metapopulation dynamic that historically made mussel populations robust and very resilient to change. The existing fragmented and

isolated mussel populations are largely in a state of chronic degradation due to a number of historical and ongoing stressors affecting flows, water quality, sedimentation, and substrate quality. Given the high risk of catastrophic events including droughts and floods, both of which are exacerbated by climate change, many central Texas mussel populations are at a high risk of extirpation.

Beginning around the turn of the 20th century until 1970, more than 100 major dams were constructed, creating reservoirs across Texas, including several reservoirs in the Brazos and Trinity basins, the chain of Highland Lakes on the Lower Colorado River, the Guadalupe Valley Hydroelectric Project, and the Canyon Reservoir on the Guadalupe River (Dowell 1964, pp. 3–8). The inundation and subsequent altered hydrology and sediment dynamics associated with operation of these flood-control, hydropower, and municipal water supply reservoirs have resulted in irreversible changes to the natural flow regime of these rivers. These changes have re-shaped and fragmented these aquatic ecosystems and fish and invertebrate communities, including populations of the seven species of central Texas mussels, which all depend on natural river flows.

Water quality has benefited from dramatically improved wastewater treatment technology in recent years, such that fish populations have rebounded but not completely recovered (Perkin and Bonner 2016, p. 97). However, water quality degradation continues to affect mussels and their habitats, especially as low flow conditions and excessive sedimentation interact to diminish instream habitats, and substrate-mobilizing and mussel-scouring flood events have become more extreme and perhaps more frequent.

Additionally, while host fish may still be adequately represented in contemporary fish assemblages, access to fish hosts can be reduced during critical reproductive times by barriers such as the many low-water crossings and low-head dams that now exist and fragment the landscape. Diminished access to host fish leads to reduced reproductive success just as barriers to fish passage impede the movement of fish, and thus compromise the ability of mussels to disperse and colonize new habitats following a disturbance (Schwalb et al. 2013, p. 447).

Populations of each of the seven central Texas mussels face risks from declining water quantity in both large and small river segments. Low flows lead to dewatering of habitats and desiccation of individuals, elevated

water temperatures, other quality degradations, and increased exposure to predation. Finally, direct mortality due to predation and collection further limits population sizes of those populations, which are already experiencing the stressors discussed above.

These threats, alone or in combination, are expected to cause the extirpation of additional mussel populations, further reducing the overall redundancy and representation of each of the seven species of central Texas mussels. Historically, each species, with a large range of interconnected populations (*i.e.*, having metapopulation dynamics), would have been resilient to stochastic events such as drought, excessive sedimentation, and scouring floods because even if some locations were extirpated by such events, they could be recolonized over time by dispersal from nearby survivors and facilitated by movements by “affiliate species” of host fish (Douda et al. 2012, p. 536). This connectivity across potential habitats would have made for highly resilient species overall, as evidenced by the long and successful evolutionary history of freshwater mussels as a taxonomic group, and in North America in particular. However, under present circumstances, restoration of that connectivity on a regional scale is not feasible. As a consequence of these current conditions, the viability of the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike now primarily depends on maintaining and improving the remaining isolated populations and potentially restoring new populations where feasible. Additionally, the viability of the Texas fawnsfoot into the future depends on maintaining connectivity of populations and access to fish hosts within the Brazos, Colorado, and Trinity basins.

#### *Guadalupe Fatmucket*

The Guadalupe fatmucket has only one remaining population, and very few individuals have been detected and reported in recent years. The upper Guadalupe River in this reach already experiences very low water levels, putting this population at high risk of extirpation. The species has very low viability, with a single population at high risk of extirpation, and no additional representation or redundancy. Our analysis of the species’ current condition, as well as the conservation efforts discussed above, shows that the Guadalupe fatmucket is currently in danger of extinction throughout all of its range due to the

severity and immediacy of threats currently impacting the species.

#### *Texas Fatmucket*

Of the five remaining fragmented and isolated populations of Texas fatmucket, two are small in abundance and occupied stream length and have low to no resiliency (*i.e.*, they are unhealthy), and one population is functionally extirpated. The other two current populations are moderately healthy. The upper/middle San Saba and Llano River populations are larger, with increased abundance and occupied stream length, but these populations are vulnerable to stream drying and overcollection. These very low flow events are expected to continue into the future, and both of these populations of Texas fatmucket are at risk of extirpation. Even if the locations of Texas fatmucket do not become dry, water quality degradation and increased sedimentation associated with low flows is expected. Additionally, the Llano River population does not appear to be successfully reproducing, further increasing the species’ risk of extirpation at this location. The Texas fatmucket has no populations that are currently considered healthy. Loss of populations at high risk of extirpation leads to low levels of redundancy and representation. Overall, these low levels of resiliency, redundancy, and representation result in the Texas fatmucket having low viability, and the species currently faces a high risk of extinction. Our analysis of the species’ current condition shows that the Texas fatmucket is currently in danger of extinction throughout all of its range due to the severity and immediacy of threats currently impacting the species.

#### *Guadalupe Orb*

Only two fragmented and isolated populations of Guadalupe orb remain, and one of these populations is functionally extirpated. The San Marcos/Lower Guadalupe River population is more resilient but is at risk of catastrophic events, such as hurricane flooding, that can scour and reduce the abundance and distribution of this population. The Guadalupe orb has no populations that are considered healthy. Loss of populations at high risk of extirpation leads to low levels of redundancy and representation, and results in overall low viability. The Guadalupe orb currently faces a high risk of extinction. Our analysis of the species’ current condition, as well as the conservation efforts discussed above, shows that the Guadalupe orb is currently in danger of extinction throughout all of its range due to the

severity and immediacy of threats currently impacting the species.

#### *Texas Pimpleback*

Of the five remaining Texas pimpleback populations, three are unhealthy and are not reproducing, and two are moderately healthy. The populations that are not reproducing are considered functionally extirpated, and the two moderately healthy populations are expected to continue to decline. The population in the middle Colorado and lower San Saba Rivers has very little evidence of reproduction and is therefore likely to decline due to a lack of young individuals joining the population as the population ages. The lower Colorado River population has very recently experienced an extreme high flow event (*i.e.*, associated with Hurricane Harvey flooding in August and September of 2017) that vastly changed the substrate and mussel composition of much of its length, putting this population at high risk of extirpation. The Texas pimpleback has no healthy populations, and all populations are expected to continue to decline. Loss of populations at high risk of extirpation leads to low levels of redundancy and representation. Overall, these low levels of resiliency, redundancy, and representation result in the Texas pimpleback having low viability, and the species currently faces a high risk of extinction. Our analysis of the species’ current condition, as well as the conservation efforts discussed above, shows that the Texas pimpleback is currently in danger of extinction throughout all of its range due to the severity and immediacy of threats currently impacting the species.

#### *Balcones Spike*

The three remaining fragmented and isolated populations of Balcones spike are small in abundance and occupied stream length, having low to no resiliency. Therefore, the Balcones spike has no populations that are currently considered healthy. Loss of populations at high risk of extirpation leads to low levels of redundancy and representation. The threats identified above are occurring now and are expected to continue into the future. Overall, these low levels of resiliency, redundancy, and representation result in the Balcones spike having low viability, and the species currently faces a high risk of extinction. Our analysis of the species’ current condition demonstrates that the Balcones spike is currently in danger of extinction throughout all of its range due to the severity and immediacy of threats currently impacting the species.

### False Spike

The false spike has only one remaining population that is currently in moderately healthy condition. Due to the species having a single population remaining that is at high risk of extirpation, the false spike is considered to have very low viability and no additional representation or redundancy. Our analysis of the species' current condition, as well as the conservation efforts discussed above, shows that the false spike is currently in danger of extinction throughout all of its range due to the severity and immediacy of threats currently impacting the species.

Our analysis of the species' current conditions, as well as the conservation efforts discussed above, show that the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, false spike, and Balcones spike are currently in danger of extinction throughout all their ranges due to the severity and immediacy of threats currently impacting their populations. The risk of extinction is high because the remaining fragmented populations have a high risk of extirpation, are isolated, and have limited potential for recolonization. We find that a threatened species status is not appropriate for Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike because of their currently contracted ranges, because all populations are fragmented and isolated from one another, because the threats are occurring across the entire range of these species, and because the threats are ongoing currently and are expected to continue or worsen into the future. Because these species are already in danger of extinction throughout their ranges, a threatened status is not appropriate.

### Texas Fawnsfoot

Seven populations of the Texas fawnsfoot remain. Four populations are moderately healthy, and three are unhealthy or are functionally extirpated. Currently, unlike the other populations of this species, two of the moderately healthy populations are not subject to flow declines, due to increased flow returns in the Trinity River from wastewater treatment facilities and a lack of impoundments on the mainstem of the lower Brazos River. In the future, however, as extreme flow events become more frequent as rainfall patterns change, and increased urbanization results in reduced groundwater levels, we expect even these populations to be at an increased risk of extirpation. Future higher air

temperatures, higher rates of evaporation and transpiration, and changing precipitation patterns are expected within the range of the Texas fawnsfoot in central Texas (Jiang and Yang 2012, pp. 234–239, 242). These future climate changes are expected to lead to human responses, such as increased groundwater pumping and surface water diversions, associated with increasing demands for and decreasing availability of freshwater resources in the State (reviewed in Banner et al. 2010, entire). Within 25 to 50 years, even under the best conditions and with additional conservation efforts undertaken, given the ongoing effects of climate change and human activities on altered hydrology and habitat degradation, we expect only one population to be in healthy condition, one population to remain in moderately healthy condition, four populations to be in unhealthy condition, and one population to become functionally extirpated. Given the likelihood of increased climate and anthropogenic effects in the foreseeable future, as many as three populations are expected to become functionally extirpated, leaving no more than four unhealthy populations remaining after 25 years. After 50 years, we anticipated that as many as five populations are expected to become functionally extirpated, leaving no more than three unhealthy populations. In the future, we anticipate that the Texas fawnsfoot will have reduced viability, with no highly resilient populations and limited representation and redundancy. Thus, after assessing the best available information, we determine that the Texas fawnsfoot is not currently in danger of extinction but is likely to become in danger of extinction within the foreseeable future throughout all of its range. Our analysis of the species' current and future conditions, as well as the conservation efforts discussed above, show that the Texas fawnsfoot is likely to become in danger of extinction throughout all or a significant portion of its range within the foreseeable future due to increased frequency of drought and extremely high flow events, decreased water quality, and decreased substrate suitability. We considered whether the Texas fawnsfoot is presently in danger of extinction and determined that endangered status is not appropriate. The current condition shows two of the populations in two of the representative units are not currently subject to declining flows or extreme flow events. While threats are currently acting on the species and many of those threats are expected to

continue into the future, we did not find that the species is currently in danger of extinction throughout all of its range. According to our assessment of plausible future scenarios, the species is likely to become an endangered species within the foreseeable future of 25 years throughout all of its range. Twenty-five years encompasses about 5 generations of the Texas fawnsfoot; additionally, models of human demand for water (Texas Water Development Board 2017, p. 30) and climate change (e.g., Kinniburgh et al. 2015, p. 83) project decreased water availability over 25 and 50 years, respectively. As a result, we expect increased incidences of low flows followed by scour events as well as persistent decreased water quality to be occurring in 25 years. Thus, after assessing the best available information, we determine that the Texas fawnsfoot is not currently in danger of extinction but is likely to become in danger of extinction within the foreseeable future throughout all of its range.

### Status Throughout a Significant Portion of Its Range: Guadalupe Fatmucket, Texas Fatmucket, Guadalupe Orb, Texas Pimpleback, Balcones Spike, and False Spike

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so in the foreseeable future throughout all or a significant portion of its range. We have determined that the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike are in danger of extinction throughout all of their ranges and, accordingly, did not undertake an analysis of whether there are any significant portions of these species' ranges. Because the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike warrant listing as endangered throughout all of their ranges, our determination does not conflict with the decision in *Center for Biological Diversity v. Everson*, 435 F. Supp. 3d 69 (D.D.C. 2020), which vacated the provision of the Final Policy on Interpretation of the Phrase "Significant Portion of Its Range" in the Endangered Species Act's Definitions of "Endangered Species" and "Threatened Species" (Final Policy) (79 FR 37578, July 1, 2014) providing that if the Services determine that a species is threatened throughout all of its range, the Services will not analyze whether the species is endangered in a significant portion of its range.

*Status Throughout a Significant Portion of Its Range: Texas Fawnsfoot*

Under the Act and our implementing regulations, a species may warrant listing if it is in danger of extinction or likely to become so within the foreseeable future throughout all or a significant portion of its range. The court in *Center for Biological Diversity v. Everson*, 435 F. Supp. 3d 69 (D.D.C. 2020) (*Everson*), vacated the provision of the Final Policy on Interpretation of the Phrase “Significant Portion of Its Range” in the Endangered Species Act’s Definitions of “Endangered Species” and “Threatened Species” (Final Policy) (79 FR 37578; July 1, 2014) that provided if the Service determines that a species is threatened throughout all of its range, the Service will not analyze whether the species is endangered in a significant portion of its range.

Therefore, we proceed to evaluating whether the species is endangered in a significant portion of its range—that is, whether there is any portion of the species’ range for which both (1) the portion is significant; and (2) the species is in danger of extinction in that portion. Depending on the case, it might be more efficient for us to address the “significance” question or the “status” question first. We can choose to address either question first. Regardless of which question we address first, if we reach a negative answer with respect to the first question that we address, we do not need to evaluate the other question for that portion of the species’ range.

Following the court’s holding in *Everson*, we now consider whether there are any significant portions of the species’ range where the species is in danger of extinction now (*i.e.*, endangered). In undertaking this analysis for the Texas fawnsfoot, we choose to address the status question first—we consider information pertaining to the geographic distribution of both the species and the threats that the species faces to identify any portions of the range where the species may be endangered.

We evaluated the range of the Texas fawnsfoot to determine if the species is in danger of extinction now in any portion of its range. The range of a species can theoretically be divided into portions in an infinite number of ways. We focused our analysis on portions of the species’ range that may meet the definition of an endangered species. For Texas fawnsfoot, we considered whether the threats or their effects on the species are greater in any biologically meaningful portion of the species’ range than in other portions

such that the species is in danger of extinction now in that portion.

We examined the following threats throughout the range of the species: the accumulation of fine sediments, altered hydrology, and impairment of water quality (Factor A); collection (Factor B); predation (Factor C); and barriers to fish movement (Factor E).

We identified a portion of the range of the Texas fawnsfoot, the upper Brazos River (including the populations in the upper Brazos River and Clear Fork Brazos River), that is experiencing a concentration of the following threats: altered hydrology and degraded water quality. Although these threats are not unique to this area, they are acting at a greater intensity here (*e.g.*, populations higher in the watershed and that receive less rainfall are more vulnerable to stream drying because there is a smaller volume of water in the river), either individually or in combination, than elsewhere in the range. In addition, the small sizes of each population, coupled with the current condition information in the SSA report indicating the two populations in this area are unhealthy, leads us to find that this portion provides substantial information indicating the populations occurring here may be in danger of extinction now.

We then proceeded to the significance question, asking whether there is substantial information indicating that this portion of the range (*i.e.*, the upper Brazos River and Clear Fork Brazos River) may be significant. As an initial note, the Service’s most recent definition of “significant” within agency policy guidance has been invalidated by court order (see *Desert Survivors v. U.S. Department of the Interior*, 321 F. Supp. 3d 1011, 1070–74 (N.D. Cal. 2018)). In undertaking this analysis for the Texas fawnsfoot, we considered whether the upper Brazos River portion of the species’ range may be significant based on its biological importance to the overall viability of the Texas fawnsfoot. Therefore, for the purposes of this analysis, when considering whether this portion may be biologically significant, we considered whether the portion may (1) constitute a large geographic area relative to the range of the species as a whole; (2) occur in a unique habitat or ecoregion for the species; (3) contain high quality or high value habitat relative to the remaining portions of the range, for the species’ continued viability in light of the existing threats; or (4) contain habitat that is essential to a specific life-history function for the species and that is not found in the other portions (for

example, the principal breeding ground for the species).

We evaluated the available information about the portion of the range of the Texas fawnsfoot that occupies the upper Brazos River in this context, assessing its biological significance in terms of these three habitat criteria, and determined the information did not substantially indicate it may be significant. Texas fawnsfoot in these populations exhibit similar habitat and host fish use to Texas fawnsfoot in the remainder of the species’ range; thus, there is no unique observable environmental usage or behavioral characteristics attributable to just this area’s populations. The upper Brazos River constitutes 40 percent of the range for Texas fawnsfoot, and does not constitute a large geographic area relative the range of the species. This unit is not essential to any specific life-history function of the Texas fawnsfoot that is not found elsewhere in the range. Further, the habitat in the upper Brazos River is not of higher quality or higher value than the habitat in the remainder of the species’ range.

After reviewing the available information, we did not find that the upper Brazos River portion may be significant. Therefore, because we could not answer both the status and significance questions in the affirmative, we conclude that the upper Brazos River portion of the range does not warrant further consideration as a significant portion of the range.

We did not identify any portions of the Texas fawnsfoot’s range where: (1) the portion is significant; and (2) the species is in danger of extinction in that portion. Therefore, we conclude that the Texas fawnsfoot is likely to become in danger of extinction within the foreseeable future throughout all of its range. This does not conflict with the courts’ holdings in *Desert Survivors v. U.S. Department of the Interior*, 321 F. Supp. 3d 1011, 1070–74 (N.D. Cal. 2018) and *Center for Biological Diversity v. Jewell*, 248 F. Supp. 3d 946, 959 (D. Ariz. 2017) because, in reaching this conclusion, we did not apply the aspects of the Final Policy, including the definition of “significant” that those court decisions held to be invalid.

*Determination of Status: Guadalupe Fatmucket, Texas Fatmucket, Guadalupe Orb, Texas Pimpleback, Balcones Spike, and False Spike*

Our review of the best available scientific and commercial information indicates that the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike meet the Act’s definition of an



endangered species. Therefore, we are listing the Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike as endangered species in accordance with sections 3(6) and 4(a)(1) of the Act.

#### *Determination of Status: Texas Fawnsfoot*

Our review of the best scientific and commercial data available indicates that the Texas fawnsfoot meets the Act's definition of a threatened species. Therefore, we are listing the Texas fawnsfoot as a threatened species in accordance with sections 3(20) and 4(a)(1) of the Act.

#### **Available Conservation Measures**

Conservation measures provided to species listed as endangered or threatened species under the Act include recognition as a listed species, planning and implementation of recovery actions, requirements for Federal protection, and prohibitions against certain practices. Recognition through listing results in public awareness, and conservation by Federal, State, Tribal, and local agencies, private organizations, and individuals. The Act encourages cooperation with the States and other countries and calls for recovery actions to be carried out for listed species. The protection required by Federal agencies, including the Service, and the prohibitions against certain activities are discussed, in part, below.

The primary purpose of the Act is the conservation of endangered and threatened species and the ecosystems upon which they depend. The ultimate goal of such conservation efforts is the recovery of these listed species, so that they no longer need the protective measures of the Act. Section 4(f) of the Act calls for the Service to develop and implement recovery plans for the conservation of endangered and threatened species. The goal of this process is to restore listed species to a point where they are secure, self-sustaining, and functioning components of their ecosystems.

The recovery planning process begins with development of a recovery outline made available to the public soon after a final listing determination. The recovery outline guides the immediate implementation of urgent recovery actions while a recovery plan is being developed. Recovery teams (composed of species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) may be established to develop and implement recovery plans. The recovery planning

process involves the identification of actions that are necessary to halt and reverse the species' decline by addressing the threats to its survival and recovery. The recovery plan identifies recovery criteria for review of when a species may be ready for reclassification from endangered to threatened ("downlisting") or removal from protected status ("delisting"), and methods for monitoring recovery progress. Recovery plans also establish a framework for agencies to coordinate their recovery efforts and provide estimates of the cost of implementing recovery tasks. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our website (<https://www.fws.gov/program/endangered-species>), or from our Austin Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their ranges may occur primarily or solely on non-Federal lands. To achieve recovery of these species requires cooperative conservation efforts on private, State, and Tribal lands.

Once these species are listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost-share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Texas will be eligible for Federal funds to implement management actions that promote the protection or recovery of the central Texas mussels. Information on our grant programs that are available to aid species recovery can be found at: <https://www.fws.gov/service/financial-assistance>.

Please let us know if you are interested in participating in recovery efforts for the central Texas mussels. Additionally, we invite you to submit any new information on these species whenever it becomes available and any

information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**).

Section 7 of the Act is titled Interagency Cooperation and mandates all Federal action agencies to use their existing authorities to further the conservation purposes of the Act and to ensure that their actions are not likely to jeopardize the continued existence of listed species or adversely modify critical habitat. Regulations implementing Section 7 are codified at 50 CFR part 402.

Section 7(a)(2) states that each Federal action agency shall, in consultation with the Secretary, ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat. Each Federal agency shall review its action at the earliest possible time to determine whether it may affect listed species or critical habitat. If a determination is made that the action may affect listed species or critical habitat, formal consultation is required (50 CFR 402.14(a)), unless the Service concurs in writing that the action is not likely to adversely affect listed species or critical habitat. At the end of a formal consultation, the Service issues a biological opinion, containing its determination of whether the Federal action is likely to result in jeopardy or adverse modification.

Examples of discretionary actions for the central Texas mussels that may be subject to consultation procedures under section 7 of the Act are land management or other landscape-altering activities on Federal lands administered by the National Park Service as well as actions on State, Tribal, local, or private lands that require a Federal permit (such as a permit from the U.S. Army Corps of Engineers under section 404 of the Clean Water Act (33 U.S.C. 1251 *et seq.*) or a permit from the Service under section 10 of the Act) or that involve some other Federal action (such as funding from the Federal Highway Administration, Federal Aviation Administration, or the Federal Emergency Management Agency). Federal actions not affecting listed species or critical habitat—and actions on State, Tribal, local, or private lands that are not federally funded, authorized, or carried out by a Federal agency—do not require section 7 consultation. Federal agencies should coordinate with the local Service Field Office (see **FOR FURTHER INFORMATION CONTACT**) with any specific questions on section 7 consultation and conference requirements.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered wildlife. The prohibitions of section 9(a)(1) of the Act, codified at 50 CFR 17.21, make it illegal for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit or to cause to be committed any of the following: (1) Import endangered wildlife into, or export from, the United States; (2) take (which includes harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct) endangered wildlife within the United States or on the high seas; (3) possess, sell, deliver, carry, transport, or ship, by any means whatsoever, any such wildlife that has been taken illegally; (4) deliver, receive, carry, transport, or ship in interstate or foreign commerce in the course of commercial activity; or (5) sell or offer for sale in interstate or foreign commerce. Certain exceptions to these prohibitions apply to employees or agents of the Service, the National Marine Fisheries Service, other Federal land management agencies, and State conservation agencies.

We may issue permits to carry out otherwise prohibited activities involving endangered wildlife under certain circumstances. Regulations governing permits for endangered wildlife are codified at 50 CFR 17.22. With regard to endangered wildlife, a permit may be issued: for scientific purposes, for enhancing the propagation or survival of the species, or for take incidental to otherwise lawful activities. The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

It is the policy of the Service, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the extent known at the time a species is listed, specific activities that will not be considered likely to result in violation of section 9 of the Act. To the extent possible, activities that will be considered likely to result in violation will also be identified in as specific a manner as possible. The intent of this policy is to increase public awareness of the effect of a listing on proposed and ongoing activities within the range of the species.

Although most of the prohibitions in section 9 of the Act apply to endangered species, sections 9(a)(1)(G) and 9(a)(2)(E) of the Act prohibit the violation of any regulation under section 4 pertaining to any threatened species of fish or wildlife, or threatened species of plant, respectively. Section

4(d) of the Act directs the Secretary to promulgate protective regulations that are necessary and advisable for the conservation of threatened species. As a result, we interpret our policy to mean that, when we list a species as a threatened species, to the extent possible, we identify activities that will or will not be considered likely to result in violation of the protective regulations under section 4(d) for that species. For the Texas fawnsfoot, at this time, we are unable to identify specific activities that will or will not be considered likely to result in violation of section 9 of the Act beyond what is already clear from the descriptions of prohibitions and exceptions established by protective regulation under section 4(d) of the Act.

Questions regarding whether specific activities would constitute violation of section 9 of the Act should be directed to the Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**, above). See the discussion below under II. Final Rule Issued Under Section 4(d) of the Act, regarding protective regulations under section 4(d) of the Act for the Texas fawnsfoot.

For the central Texas mussels we are listing as endangered species (Guadalupe fatmucket, Texas fatmucket, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike), as discussed above, certain activities that are prohibited under section 9 may be permitted under section 10 of the Act. Additional activities that will not be considered likely to result in violation of section 9 of the Act may be identified during coordination with the local field office, and in some instances (e.g., with new information), the Service may conclude that one or more activities identified here will be considered likely to result in violation of section 9.

For the central Texas mussels we are listing as endangered species, to the extent currently known, the following is a list of examples of activities that will be considered likely to result in violation of section 9 of the Act in addition to what is already clear from the descriptions of the prohibitions found at 50 CFR 17.21:

- (1) Unauthorized handling or collecting of the species;
- (2) Modification of the channel or water flow of any stream in which the central Texas mussels are known to occur;
- (3) Livestock grazing that results in direct or indirect destruction of stream habitat; and
- (4) Discharge of chemicals or fill material into any waters in which the central Texas mussels are known to occur.

This list is intended to be illustrative and not exhaustive; additional activities that will be considered likely to result in violation of section 9 of the Act may be identified during coordination with the local field office, and in some instances (e.g., with new or site-specific information), the Service may conclude that one or more activities identified here will not be considered likely to result in violation of section 9.

Questions regarding whether specific activities would constitute violation of section 9 of the Act should be directed to the Austin Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**, above).

## II. Final Rule Issued Under Section 4(d) of the Act

### Background

Section 4(d) of the Act contains two sentences. The first sentence states that the Secretary shall issue such regulations as she deems necessary and advisable to provide for the conservation of species listed as threatened species. The U.S. Supreme Court has noted that statutory language similar to the language in section 4(d) of the Act authorizing the Secretary to take action that she “deems necessary and advisable” affords a large degree of deference to the agency (see *Webster v. Doe*, 486 U.S. 592 (1988)). Conservation is defined in the Act to mean the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Additionally, the second sentence of section 4(d) of the Act states that the Secretary may by regulation prohibit with respect to any threatened species any act prohibited under section 9(a)(1), in the case of fish or wildlife, or section 9(a)(2), in the case of plants. Thus, the combination of the two sentences of section 4(d) provides the Secretary with wide latitude of discretion to select and promulgate appropriate regulations tailored to the specific conservation needs of the threatened species. The second sentence grants particularly broad discretion to the Service when adopting one or more of the prohibitions under section 9.

The courts have recognized the extent of the Secretary’s discretion under this standard to develop rules that are appropriate for the conservation of a species. For example, courts have upheld, as a valid exercise of agency authority, rules developed under section 4(d) that included limited prohibitions against takings (see *Alesea Valley Alliance v. Lautenbacher*, 2007 WL

2344927 (D. Or. 2007); *Washington Environmental Council v. National Marine Fisheries Service*, 2002 WL 511479 (W.D. Wash. 2002)). Courts have also upheld 4(d) rules that do not address all of the threats a species faces (see *State of Louisiana v. Verity*, 853 F.2d 322 (5th Cir. 1988)). As noted in the legislative history when the Act was initially enacted, “once an animal is on the threatened list, the Secretary has an almost infinite number of options available to [her] with regard to the permitted activities for those species. [She] may, for example, permit taking, but not importation of such species, or [s]he may choose to forbid both taking and importation but allow the transportation of such species” (H.R. Rep. No. 412, 93rd Cong., 1st Sess. 1973).

The provisions of this 4(d) rule will promote conservation of the Texas fawnsfoot by encouraging management of the landscape in ways that meet both land management considerations and the conservation needs of the Texas fawnsfoot. The provisions of this rule are one of many tools that we will use to promote the conservation of the Texas fawnsfoot.

As mentioned previously in Available Conservation Measures, section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species.

These requirements are the same for a threatened species with a species-specific 4(d) rule. For example, as with an endangered species, a Federal agency’s determination that an action is “not likely to adversely affect” a threatened species will require the Service’s written concurrence (see 50 CFR 402.13(c)). Similarly, if a Federal agency determines that an action is “likely to adversely affect” a threatened species, the action will require formal consultation and the formulation of a biological opinion (see 50 CFR 402.14(a)).

#### Provisions of the 4(d) Rule

Exercising the Secretary’s authority under section 4(d) of the Act, we have developed a rule that is designed to address the Texas fawnsfoot’s specific threats and conservation needs. As discussed above under Summary of Biological Status and Threats, we have concluded that the Texas fawnsfoot is likely to become in danger of extinction within the foreseeable future primarily

due to habitat degradation or loss stemming from hydrologic alterations by impoundments, including dams and other barriers to fish movement, and diminished water quality from point and nonpoint source pollution and siltation. These threats contribute to the negative effects associated with the species’ reduced range and the potential effects of climate change. Section 4(d) of the Act requires the Secretary to issue such regulations as she deems necessary and advisable to provide for the conservation of each threatened species and authorizes the Secretary to include among those protective regulations any of the prohibitions that section 9(a)(1) of the Act prescribes for endangered species. We find that the protections, prohibitions, and exceptions in this rule as a whole satisfy the requirement in section 4(d) of the Act to issue regulations deemed necessary and advisable to provide for the conservation of the Texas fawnsfoot.

The protective regulations for the Texas fawnsfoot incorporate prohibitions from section 9(a)(1) to address the threats to the species. Section 9(a)(1) prohibits the following activities for endangered wildlife: importing or exporting; take; possession and other acts with unlawfully taken specimens; delivering, receiving, carrying, transporting, or shipping in interstate or foreign commerce in the course of commercial activity; and selling or offering for sale in interstate or foreign commerce. This protective regulation includes all of these prohibitions because the Texas fawnsfoot is at risk of extinction in the foreseeable future and putting these prohibitions in place will help to prevent further declines, preserve the species’ remaining populations, slow its rate of decline, and decrease synergistic, negative effects from other ongoing or future threats.

In particular, this 4(d) rule will provide for the conservation of the Texas fawnsfoot by prohibiting the following activities, except as otherwise authorized or permitted: import/export, take, possession of unlawfully taken specimens, interstate or foreign commerce, and sale or offer for sale. As discussed above under Summary of Biological Status and Threats, loss and fragmentation of habitat from siltation, water quality degradation, and impoundments are affecting the status of the Texas fawnsfoot. A range of activities have the potential to affect the Texas fawnsfoot, including instream construction, channel modification, water withdrawals, flow releases from upstream dams, riparian vegetation removal, improper handling, farming

and grazing practices, and wastewater treatment facility outflows. Regulating take associated with these activities will help preserve the Texas fawnsfoot’s remaining populations, slow the rate of population decline, and decrease synergistic, negative effects from other stressors. Therefore, regulating take associated with activities that increase siltation, diminish water quality, alter stream flow, or reduce fish passage will help preserve and potentially provide for expansion of remaining populations and decrease synergistic, negative effects from other threats.

Under the Act, “take” means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct. Some of these provisions have been further defined in regulations at 50 CFR 17.3. Take can result knowingly or otherwise, by direct and indirect impacts, intentionally or incidentally. Regulating take will help prevent further declines, preserve the species’ remaining populations, slow its rate of decline, and decrease synergistic, negative effects from other ongoing or future threats. Therefore, we are prohibiting take of the Texas fawnsfoot, except for take resulting from those actions and activities specifically excepted by the 4(d) rule.

Exceptions to the prohibition on take include most of the general exceptions to the prohibition on take of endangered wildlife, as set forth in 50 CFR 17.21 and certain other specific activities that we propose for exception, as described below.

The 4(d) rule will also provide for the conservation of the species by allowing exceptions that incentivize conservation actions or that, while they may have some minimal impact on the Texas fawnsfoot, are not expected to rise to the level that would have a negative impact (*i.e.*, would have only de minimis impacts) on the species’ conservation. The exceptions to these prohibitions include incidental and intentional take (described below) that are expected to have negligible impacts to the Texas fawnsfoot and its habitat.

Those exceptions include the following activities:

(1) Channel restoration projects that create natural, physically stable (streambanks and substrate remaining relatively unchanging over time), ecologically functioning streams or stream and wetland systems (containing an assemblage of fish, mussels, other invertebrates, and plants) that are reconnected with their groundwater aquifers. These projects can be accomplished using a variety of methods, but the desired outcome is a

natural channel with low shear stress (force of water moving against the channel); bank heights that enable reconnection to the floodplain; a reconnection of surface and groundwater systems, resulting in perennial flows in the channel; riffles and pools composed of existing soil, rock, and wood instead of large imported materials; low compaction of soils within adjacent riparian areas; and inclusion of riparian wetlands and woodland buffers. To qualify for this exception, a channel restoration project must satisfy all applicable Federal, State, and local permitting requirements. In addition, at least 30 days prior to commencing actual construction within an area designated as critical habitat for Texas fawnsfoot, notice must be provided to the Service, through the Austin Ecological Services Field Office, of the location and nature of the proposed work to allow the Service to make arrangements for surveys and potential relocation of any mussels that might be adversely affected. This exception to the 4(d) rule for incidental take would promote conservation of Texas fawnsfoot by creating stable stream channels that are less likely to scour during high flow events, thereby increasing population resiliency.

(2) Bioengineering methods such as streambank stabilization using native live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or native brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). Methods that include the use of quarried rock (riprap) for more than 25 percent of the area within the streambanks or include the use of rock baskets or gabion structures do not qualify for this exception. In addition, to reduce streambank erosion and sedimentation into the stream, work using these bioengineering methods would be performed at base flow or low water conditions and when significant rainfall likely to result in significant runoff is not predicted at or upstream of the area where work is proposed for a period of at least 3 days after the work is scheduled to be undertaken. Further, streambank stabilization projects that involve the placement or use of equipment in the stream channels or water do not qualify for this exception. To qualify for this exception, a project using bioengineering methods must satisfy all applicable Federal, State, and

local permitting requirements. Similar to channel restoration projects, this exception to the 4(d) rule for incidental take would promote conservation of Texas fawnsfoot by creating stable stream channels that are less likely to scour during high flow events, thereby increasing population resiliency.

(3) Soil and water conservation practices and riparian and adjacent upland habitat management activities that restore instream habitats for the species, restore adjacent riparian habitats that enhance stream habitats for the species, stabilize degraded and eroding stream banks to limit sedimentation and scour of the species' habitats, restore or enhance nearby upland habitats to limit sedimentation of the species' habitats, and comply with conservation practice standards and specifications and technical guidelines developed by the NRCS and available from the Service. In addition, at least 30 days prior to commencing soil and water conservation practices within an area designated as critical habitat for the Texas fawnsfoot, notice must be provided to the Service, through the Austin Ecological Services Field Office, of the location and nature of the proposed work to allow the Service to make arrangements for surveys and potential relocation of any mussels that might be adversely affected. Soil and water conservation practices and aquatic species habitat restoration projects associated with NRCS conservation plans are designed to improve water quality and enhance fish and aquatic species habitats. This exception to the 4(d) rule for incidental take would promote conservation of Texas fawnsfoot by creating stable stream channels and reducing sediment inputs to the stream, thereby increasing population resiliency.

(4) Presence or abundance surveys for Texas fawnsfoot conducted by individuals who successfully complete and show proficiency by passing the end-of-course test with a score equal to or greater than 90 percent, and with 100 percent accuracy in identification of mussel species listed under the Act in an approved freshwater mussel identification and sampling course (specific to the species and basins in which the Texas fawnsfoot is known to occur), such as that administered by the Service, State wildlife agency, or qualified university experts. To qualify for this exception, those reports must be provided to the Service annually on the number, specific location (e.g., GPS coordinates), and date of the encounter. This exception does not apply if lethal take or collection is anticipated. This exception only applies for 5 years from

the date of successful completion of the course. This provision of the 4(d) rule for intentional take would promote conservation of Texas fawnsfoot by ensuring surveyors are proficient at identification of freshwater mussels and would add to the knowledge and understanding of the distribution of Texas fawnsfoot populations.

Despite these prohibitions regarding threatened species, we may under certain circumstances issue permits to carry out one or more otherwise prohibited activities, including those described above. The regulations that govern permits for threatened wildlife state that the Director may issue a permit authorizing any activity otherwise prohibited with regard to threatened species. These include permits issued for the following purposes: for scientific purposes, to enhance propagation or survival, for economic hardship, for zoological exhibition, for educational purposes, for incidental taking, or for special purposes consistent with the purposes of the Act (50 CFR 17.32). The statute also contains certain exemptions from the prohibitions, which are found in sections 9 and 10 of the Act.

We recognize the special and unique relationship with our State natural resource agency partners in contributing to conservation of listed species. State agencies often possess scientific data and valuable expertise on the status and distribution of endangered, threatened, and candidate species of wildlife and plants. State agencies, because of their authorities and their close working relationships with local governments and landowners, are in a unique position to assist us in implementing all aspects of the Act. In this regard, section 6 of the Act provides that we shall cooperate to the maximum extent practicable with the States in carrying out programs authorized by the Act. Therefore, any qualified employee or agent of a State conservation agency that is a party to a cooperative agreement with the Service in accordance with section 6(c) of the Act, who is designated by his or her agency for such purposes, will be able to conduct activities designed to conserve the Texas fawnsfoot that may result in otherwise prohibited take without additional authorization.

Nothing in this 4(d) rule will change in any way the recovery planning provisions of section 4(f) of the Act, the consultation requirements under section 7 of the Act, or the ability of the Service to enter into partnerships for the management and protection of the Texas fawnsfoot. However, interagency cooperation may be further streamlined

through planned programmatic consultations for the species between Federal agencies and the Service.

### III. Critical Habitat

#### Background

Section 4(a)(3) of the Act requires that, to the maximum extent prudent and determinable, we designate a species' critical habitat concurrently with listing the species. Critical habitat is defined in section 3 of the Act as:

(1) The specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the Act, on which are found those physical or biological features

(a) Essential to the conservation of the species, and

(b) Which may require special management considerations or protection; and

(2) Specific areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Our regulations at 50 CFR 424.02 define the geographical area occupied by the species as an area that may generally be delineated around species' occurrences, as determined by the Secretary (*i.e.*, range). Such areas may include those areas used throughout all or part of the species' life cycle, even if not used on a regular basis (*e.g.*, migratory corridors, seasonal habitats, and habitats used periodically, but not solely by vagrant individuals).

This critical habitat designation was proposed when the regulations defining "habitat" (85 FR 81411; December 16, 2020) and governing the section 4(b)(2) exclusion process for the Service (85 FR 82376; December 18, 2020) were in place and in effect. However, those two regulations have been rescinded (87 FR 37757, June 24, 2022, and 87 FR 43433; July 21, 2022) and no longer apply to any designations of critical habitat. Therefore, for this final rule designating critical habitat for the central Texas mussels, we apply the regulations at 50 CFR 424.19 and the Policy Regarding Implementation of Section 4(b)(2) of the Endangered Species Act (hereafter, the "2016 Policy"; 81 FR 7226, February 11, 2016).

Conservation, as defined under section 3 of the Act, means to use and the use of all methods and procedures that are necessary to bring an endangered or threatened species to the point at which the measures provided pursuant to the Act are no longer necessary. Such methods and

procedures include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

Critical habitat receives protection under section 7 of the Act through the requirement that each Federal action agency ensure, in consultation with the Service, that any action they authorize, fund, or carry out is not likely to result in the destruction or adverse modification of designated critical habitat. The designation of critical habitat does not affect land ownership or establish a refuge, wilderness, reserve, preserve, or other conservation area. Such designation also does not allow the government or public to access private lands. Such designation does not require implementation of restoration, recovery, or enhancement measures by non-Federal landowners. Rather, designation requires that, where a landowner requests Federal agency funding or authorization for an action that may affect an area designated as critical habitat, the Federal agency consult with the Service under section 7(a)(2) of the Act. If the action may affect the listed species itself (such as for occupied critical habitat), the Federal action agency would have already been required to consult with the Service even absent the critical habitat designation because of the requirement to ensure that the action is not likely to jeopardize the continued existence of the species. Even if the Service were to conclude after consultation that the proposed activity is likely to result in destruction or adverse modification of the critical habitat, the Federal action agency and the landowner are not required to abandon the proposed activity, or to restore or recover the species; instead, they must implement "reasonable and prudent alternatives" to avoid destruction or adverse modification of critical habitat.

Under the first prong of the Act's definition of critical habitat, areas within the geographical area occupied by the species at the time it was listed are included in a critical habitat designation if they contain physical or biological features (1) which are essential to the conservation of the species and (2) which may require special management considerations or protection. For these areas, critical habitat designations identify, to the

extent known using the best scientific data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat).

Under the second prong of the Act's definition of critical habitat, we can designate critical habitat in areas outside the geographical area occupied by the species at the time it is listed, upon a determination that such areas are essential for the conservation of the species.

Section 4 of the Act requires that we designate critical habitat on the basis of the best scientific data available. Further, our Policy on Information Standards Under the Endangered Species Act (published in the **Federal Register** on July 1, 1994 (59 FR 34271)), the Information Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001 (Pub. L. 106-554; H.R. 5658)), and our associated Information Quality Guidelines provide criteria, establish procedures, and provide guidance to ensure that our decisions are based on the best scientific data available. They require our biologists, to the extent consistent with the Act and with the use of the best scientific data available, to use primary and original sources of information as the basis for recommendations to designate critical habitat.

When we are determining which areas should be designated as critical habitat, our primary source of information is generally the information from the SSA report and information developed during the listing process for the species. Additional information sources may include any generalized conservation strategy, criteria, or outline that may have been developed for the species; the recovery plan for the species; articles in peer-reviewed journals; conservation plans developed by States and counties; scientific status surveys and studies; biological assessments; other unpublished materials; or experts' opinions or personal knowledge.

Habitat is dynamic, and species may move from one area to another over time. We recognize that critical habitat designated at a particular point in time may not include all of the habitat areas that we may later determine are necessary for the recovery of the species. For these reasons, a critical habitat designation does not signal that habitat outside the designated area is unimportant or may not be needed for recovery of the species. Areas that are important to the conservation of the species, both inside and outside the

critical habitat designation, will continue to be subject to: (1) Conservation actions implemented under section 7(a)(1) of the Act; (2) regulatory protections afforded by the requirement in section 7(a)(2) of the Act for Federal agencies to ensure their actions are not likely to jeopardize the continued existence of any endangered or threatened species; and (3) the prohibitions found in section 9 (for endangered species), and the 4(d) rule (for threatened species). Federally funded or permitted projects affecting listed species outside their designated critical habitat areas may still result in jeopardy findings in some cases. These protections and conservation tools will continue to contribute to recovery of this species. Similarly, critical habitat designations made on the basis of the best available information at the time of designation will not control the direction and substance of future recovery plans, habitat conservation plans (HCPs), or other species conservation planning efforts if new information available at the time of these planning efforts calls for a different outcome.

#### **Physical or Biological Features Essential to the Conservation of the Species**

In accordance with section 3(5)(A)(i) of the Act and regulations at 50 CFR 424.12(b), in determining which areas we will designate as critical habitat from within the geographical area occupied by the species at the time of listing, we consider the physical or biological features that are essential to the conservation of the species, and which may require special management considerations or protection. The regulations at 50 CFR 424.02 define “physical or biological features essential to the conservation of the species” as the features that occur in specific areas and that are essential to support the life-history needs of the species, including, but not limited to, water characteristics, soil type, geological features, sites, prey, vegetation, symbiotic species, or other features. A feature may be a single habitat characteristic or a more complex combination of habitat characteristics. Features may include habitat characteristics that support ephemeral or dynamic habitat conditions. Features may also be expressed in terms relating to principles of conservation biology, such as patch size, distribution distances, and connectivity. For example, physical features essential to the conservation of the species might include gravel of a particular size required for spawning, alkaline soil for seed germination, protective cover for

migration, or susceptibility to flooding or fire that maintains necessary early-successional habitat characteristics. Biological features might include prey species, forage grasses, specific kinds or ages of trees for roosting or nesting, symbiotic fungi, or absence of a particular level of nonnative species consistent with conservation needs of the listed species. The features may also be combinations of habitat characteristics and may encompass the relationship between characteristics or the necessary amount of a characteristic essential to support the life history of the species.

In considering whether features are essential to the conservation of the species, we may consider an appropriate quality, quantity, and spatial and temporal arrangement of habitat characteristics in the context of the life-history needs, condition, and status of the species. These characteristics include, but are not limited to, space for individual and population growth and for normal behavior; food, water, air, light, minerals, or other nutritional or physiological requirements; cover or shelter; sites for breeding, reproduction, or rearing (or development) of offspring; and habitats that are protected from disturbance.

#### *Summary of Essential Physical or Biological Features*

We derive the specific physical or biological features essential to the conservation of the central Texas mussels from studies of the species’ habitat, ecology, and life history as described below. Additional information can be found in the SSA report (Service 2022, entire; available on <https://www.regulations.gov> under Docket No. FWS-R2-ES-2019-0061). The life histories of the seven central Texas mussel species are very similar—mussels need flowing water, suitable substrate, suitable water quality, flow refuges, and appropriate host fish—and so we will discuss their common habitat needs and then describe any species-specific needs thereafter.

#### **Space for Individual and Population Growth and for Normal Behavior**

Most freshwater mussels, including the central Texas mussels, are found in aggregations, called mussel beds, that vary in size from about 50 to greater than 5,000 square meters (m<sup>2</sup>), separated by stream reaches in which mussels are absent or rare (Vaughn 2012, p. 983). Freshwater mussel larvae (called glochidia) are parasites that must attach to a host fish. A population incorporates more than one mussel bed; it is the collection of mussel beds within a

stream reach between which infested host fish may travel, allowing for ebbs and flows in mussel bed density and abundance over time throughout the population’s occupied reach. Therefore, sufficiently resilient mussel populations must occupy stream reaches long enough so that stochastic events that affect individual mussel beds do not eliminate the entire population. Repopulation by infested host fish from other mussel beds within the reach can allow the population to recover from these events. Longer stream reaches are more likely to support populations of the central Texas mussels into the future than shorter stream reaches. Therefore, we determine that long stream reaches, of more than 50 miles (80 km) in length, are an important component of a riverine system with habitat to support all life stages of the central Texas mussels.

All seven species of central Texas mussels need flowing water for survival. They are not found in lakes, reservoirs, or in pools without flow, or in areas that are regularly dewatered. River reaches with continuous flow support all life stages of the central Texas mussels, while those with little or no flow do not. Flow rates needed by each species will vary depending on the species and the river size, location, and substrate type.

Additionally, each species of central Texas mussel has specific substrate needs, including gravel/cobble (Guadalupe orb, Texas pimpleback, false spike, and Balcones spike), gravel/sand/silt (Texas fawnsfoot), and bedrock crevices/vegetated runs (Guadalupe fatmucket and Texas fatmucket). Except for habitats for Texas fawnsfoot, these locations must be relatively free of fine sediments such that the mussels are not smothered.

#### **Physiological Requirements: Water Quality Requirements**

Freshwater mussels, as a group, are sensitive to changes in water quality parameters such as dissolved oxygen, salinity, ammonia, and pollutants. Habitats with appropriate levels of these parameters are considered suitable, while those habitats with levels outside of the appropriate ranges are considered less suitable. We have used information for these seven central Texas mussel species, where available, and data from other species when species-specific information is not available. Juvenile freshwater mussels are particularly susceptible to low dissolved oxygen levels. Juveniles will reduce feeding behavior when dissolved oxygen is between 2–4 milligrams per liter (mg/L), and mortality has been shown to occur at dissolved oxygen levels below 1.3

mg/L. Increased salinity levels may also be stressful to freshwater mussels, and the central Texas mussels show signs of stress at salinity levels of 2 ppt or higher (Bonner et al. 2018, pp. 155–156).

The release of pollutants into streams from point and nonpoint sources have immediate impacts on water quality conditions and may make environments unsuitable for habitation by mussels. Early life stages of freshwater mussels are some of the most sensitive organisms of all species to ammonia and copper (Naimo 1995, pp. 351–352; Augspurger et al. 2007, p. 2025). Additionally, sublethal effects of contaminants over time can result in reduced feeding efficiency, reduced growth, decreased reproduction, changes in enzyme activity, and behavioral changes to all mussel life stages. Even wastewater discharges with low ammonia levels have been shown to negatively affect mussel populations.

Finally, water temperature plays a critical role in the life history of freshwater mussels. High water temperatures can cause valve closure, reduced reproductive output, and death. The central Texas mussels differ in their optimal temperature ranges, with some species much more tolerant of high temperatures than others. Laboratory studies investigating the effects of thermal stress on glochidia and adults has indicated thermal stress may occur at 29 °C (84.2 °F) (Bonner et al. 2018, pp. 123–146; Khan et al. 2019, entire).

Based on the above information, we determine that stream reaches with the following water quality parameters are suitable for the Guadalupe fatmucket, Texas fatmucket, Texas fawnsfoot, Guadalupe orb, Texas pimpleback, false spike, and Balcones spike:

- Low salinity (less than 2 ppt);
- Low total ammonia (less than 0.77 mg/L total ammonia nitrogen);
- Low levels of contaminants;
- Dissolved oxygen levels greater than 2 mg/L;
- Water temperatures below 29 °C (84.2 °F).

#### Sites for Development of Offspring

As discussed above, freshwater mussel larvae are parasites that must attach to a host fish to develop into juvenile mussels. The central Texas mussels use a variety of host fish, many of which are widely distributed throughout their ranges. The presence of these fish species, either singly or in combination, supports the life-history needs of the central Texas mussels:

- Balcones spike and false spike: blacktail shiner (*Cyprinella venusta*) and red shiner (*C. lutrensis*);

- Texas fawnsfoot: freshwater drum (*Aplodinotus grunniens*);
- Texas pimpleback and Guadalupe orb: channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), and tadpole madtom (*Noturus gyrinus*);
- Texas fatmucket and Guadalupe fatmucket: green sunfish (*Lepomis cyanellus*), bluegill (*L. macrochirus*), largemouth bass (*Micropterus salmoides*), and Guadalupe bass (*M. treculii*).

While the specific PBFs for each species may differ slightly (as specified in the regulatory text at the end of this rule), in summary, we have determined that the following PBFs are essential to the conservation of the central Texas mussels:

(1) Suitable substrates and connected instream habitats, characterized by geomorphically stable stream channels and banks (*i.e.*, channels that maintain lateral dimensions, longitudinal profiles, and sinuosity patterns over time without an aggrading or degrading bed elevation) with habitats that support a diversity of freshwater mussel and native fish (such as stable riffle-run-pool habitats that provide flow refuges consisting of silt-free gravel and coarse sand substrates).

(2) Adequate flows, or a hydrologic flow regime (which includes the severity, frequency, duration, and seasonality of discharge over time), necessary to maintain benthic habitats where the species are found and to maintain connectivity of streams with the floodplain, allowing the exchange of nutrients and sediment for maintenance of the mussels' and fish hosts' habitat, food availability, spawning habitat for native fishes, and the ability for newly transformed juveniles to settle and become established in their habitats.

(3) Water and sediment quality (including, but not limited to, dissolved oxygen levels greater than 2 mg/L, conductivity, hardness, turbidity, temperatures below 29 °C (84.2 °F), pH (low salinity, less than 2 ppt), low total ammonia (less than 0.77 mg/L total ammonia nitrogen), heavy metals, and chemical constituents) necessary to sustain natural physiological processes for normal behavior, growth, and viability of all life stages.

(4) The presence and abundance of fish hosts necessary for recruitment of the central Texas mussels.

#### Special Management Considerations or Protection

When designating critical habitat, we assess whether the specific areas within the geographical area occupied by the species at the time of listing contain

features which are essential to the conservation of the species and which may require special management considerations or protection. The features essential to the conservation of the central Texas mussels may require special management considerations or protections to reduce the following threats: increased fine sediment, changes in water quality, altered hydrology from both inundation and flow loss/scour, predation and collection, and barriers to fish movement.

Management activities that could ameliorate these threats include, but are not limited to: Use of best management practices (BMPs) designed to reduce sedimentation, erosion, and bank side destruction; protection of riparian corridors and retention of sufficient canopy cover along banks; exclusion of livestock and nuisance wildlife (feral hogs, exotic ungulates); moderation of surface and groundwater withdrawals to maintain natural flow regimes; increased use of stormwater management and reduction of stormwater flows into the systems; use of highest water quality standards for wastewater and other return flows; and reduction of other watershed and floodplain disturbances that release sediments, pollutants, or nutrients into the water.

In summary, we find that the occupied areas we are designating as critical habitat contain the PBFs that are essential to the conservation of the species and that may require special management considerations or protection. Special management considerations or protection may be required of the Federal action agency to eliminate, or to reduce to negligible levels, the threats affecting the PBFs of each unit.

#### Criteria Used To Identify Critical Habitat

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. In accordance with the Act and our implementing regulations at 50 CFR 424.12(b), we review available information pertaining to the habitat requirements of the species and identify specific areas within the geographical area occupied by the species at the time of listing and any specific areas outside the geographical area occupied by the species to be considered for designation as critical habitat.

We are designating critical habitat in areas within the geographical area occupied by the central Texas mussels at the time of listing. We also are designating specific areas outside the



geographical area occupied by the Texas fatmucket, Texas pimpleback, and Texas fawnsfoot at the time of listing because we have determined that those areas are essential for the conservation of these three species. The designated unoccupied subunits provide for the growth and expansion of the current species' ranges within portions of their historical ranges. Each of the unoccupied subunits constitute habitat for the species because they support life history requirements from the species, have the host fish, and expand the occupied reach length of a smaller population to a length that will be more resilient to stochastic events. For the Guadalupe fatmucket, Guadalupe orb, Balcones spike, and false spike, we are not designating any areas outside the geographical area occupied by the species because we have not identified any unoccupied areas that meet the definition of critical habitat.

The current distributions of all seven of the central Texas mussels are much reduced from their historical distributions. We anticipate that recovery will require continued protection of existing populations and habitat, as well as ensuring that there are adequate numbers of mussels in stable populations that occur over a wide geographic area. This strategy will help to ensure that catastrophic events, such as the effects of hurricanes (which can lead to flooding that causes excessive sedimentation, nutrients, and debris to disrupt stream ecology, etc.) and drought, cannot simultaneously affect all known populations. Rangewide recovery considerations, such as maintaining existing genetic diversity and striving for representation of all major portions of the species' current ranges, were considered in formulating this critical habitat designation.

Sources of data for this critical habitat designation include multiple databases maintained by universities and State agencies, scientific and agency reports, and numerous survey reports on streams throughout the species' ranges (see Service 2022, pp. 31–44, and 75–127).

In summary, for areas within the geographic area occupied by the species at the time of listing, we delineated critical habitat unit boundaries by evaluating habitat suitability of stream segments within the geographical area occupied at the time of listing and

retaining those segments that contain some or all of the PBFs to support life-history functions essential for conservation of the species.

As a final step, we evaluated those occupied stream segments retained through the above analysis and refined the starting and ending points by evaluating the presence or absence of appropriate PBFs. We selected upstream and downstream cutoff points to reference existing easily recognizable geopolitical features including confluences, highway crossings, and county lines. Using these features as end points allows the public to clearly understand the boundaries of critical habitat. Unless otherwise specified, any stream beds located directly beneath bridge crossings or other landmark features used to describe critical habitat spatially, such as stream confluences, are considered to be wholly included within the critical habitat unit. Critical habitat stream segments were then mapped using ArcMap version 10 (ESRI, Inc.), a Geographic Information Systems program.

We consider the following streams to be occupied by the Guadalupe fatmucket at the time of listing: Guadalupe River, North Fork Guadalupe River, and Johnson Creek (see Final Critical Habitat Designation, below).

We consider the following streams to be occupied by the Texas fatmucket at the time of listing: Bluff Creek, Lower Elm Creek, San Saba River, Cherokee Creek, North Llano River, South Llano River, Llano River, James River, Threadgill Creek, Beaver Creek, Pedernales River, Live Oak Creek, and Onion Creek (see Final Critical Habitat Designation, below).

We consider the following streams to be occupied by the Texas fawnsfoot at the time of listing: Upper Clear Fork of the Brazos River, Upper Brazos River, Lower San Saba River, and Upper Colorado River (see Final Critical Habitat Designation, below).

We consider the following streams to be occupied by the Guadalupe orb at the time of listing: Upper Guadalupe River, South Fork Guadalupe River, Lower Guadalupe River, and San Marcos River (see Final Critical Habitat Designation, below).

We consider the following streams to be occupied by the Texas pimpleback at the time of listing: Bluff Creek, Lower Elm Creek, Lower Concho River, Upper

Colorado River, Lower San Saba River, Upper San Saba River, and Upper Llano River (see Final Critical Habitat Designation, below).

We consider the following streams to be occupied by false spike at the time of listing: San Marcos River and Guadalupe River (see Final Critical Habitat Designation, below).

We consider the following streams to be occupied by Balcones spike at the time of listing: San Saba River and Llano River (see Final Critical Habitat Designation, below).

For areas outside the geographic area occupied by the species at the time of listing, we delineated critical habitat unit boundaries by evaluating habitat suitability of stream segments and retaining those segments that contain some or all of the PBFs to support life-history functions essential for the conservation of the species.

The unoccupied reaches we are designating for critical habitat designation are Upper Elm Creek for the Texas fatmucket (TXFM–1c); the Lower Clear Fork Brazos River for the Texas fawnsfoot (TXFF–1b); and the Upper Concho River and Lower Llano River for the Texas pimpleback (TXPB–2b and TXPB–5b, respectively) (see table 8, below). The longer the reach occupied by a species, the more likely it is that the population can withstand stochastic events such as extreme flooding, dewatering, or water contamination. These designated areas are located immediately adjacent to currently occupied stream reaches that are relatively short, ranging from 8.9 river mi (14.4 river km) to 27.9 river mi (45.0 river km), include one or more of the essential PBFs, and allow for expansion of existing populations as necessary to improve population resiliency, extend physiographic representation, and reduce the risk of extinction for the species. The establishment of additional moderately healthy to healthy populations across the range of these species would sufficiently reduce their risk of extinction. Improving the resiliency of populations in the currently occupied streams, and into identified unoccupied areas, will improve species viability; therefore, these unoccupied subunits are each essential for the conservation of the species.

When determining critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, and other structures because such lands lack physical or biological features necessary for the central Texas mussels. The scale of the maps we prepared under the parameters for publication within the Code of Federal Regulations may not reflect the exclusion of such developed lands. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this rule have been excluded by text in the rule and are not designated as critical habitat. Therefore, a Federal action involving these lands will not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action will affect the PBFs in the adjacent critical habitat.

The critical habitat designation is defined by the map or maps, as modified by any accompanying regulatory text, presented at the end of

this document under Regulation Promulgation. We include more detailed information on the boundaries of the critical habitat designation in the preamble of this document. We will make the coordinates or plot points or both on which each map is based available to the public on <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061, and on our internet site at <https://www.fws.gov/office/austin-ecological-services>.

**Final Critical Habitat Designation**

We are designating approximately 1,577.5 river mi (2,538.7 river km) in total, accounting for overlapping units, in 20 units (with a total of 32 subunits; see table 8 and map, below) as critical habitat for the central Texas mussel species: the Guadalupe fatmucket, Texas fatmucket, Texas fawnsfoot, Texas pimpleback, Guadalupe orb, Balcones spike, and false spike. All but four of the subunits are currently occupied by one or more of the species, and each of the 20 units contains the physical and

biological features essential to the conservation of each species. Each species historically occurred in a different subset of watersheds in central Texas; therefore, there are large differences in the amount of critical habitat designated for each species. Texas surface water is owned by the State, as are the beds of navigable streams; thus, the actual critical habitat units (occupied waters and streambeds up to the ordinary high-water mark) are owned by the State of Texas (Texas Water Code, sections 11.021 and 11.0235). Adjacent riparian areas are in most cases, privately owned, and are what is reported in the discussion that follows, although these adjacent riparian areas are not included in the critical habitat designation. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the seven central Texas mussel species. Table 8 shows the critical habitat units and the approximate area of each unit.

TABLE 8—FINAL DESIGNATED CRITICAL HABITAT FOR THE CENTRAL TEXAS MUSSELS

Species	Basin/unit name	Occupied	Designated critical habitat rmi (km)
Guadalupe fatmucket .....	<i>Guadalupe River:</i> .....	Yes .....	Total: 52.2 (84.0).
	GUFM-1a: North Fork Guadalupe River .....	.....	6.9 (11.0).
	GUFM-1b: Johnson Creek .....	.....	10.1 (16.3).
	GUFM-1c: Guadalupe River .....	.....	35.2 (56.7).
Texas fatmucket .....	<i>Colorado River:</i> .....	Yes .....	Total: 419.5 (675.2).
	TXFM-1a: Bluff Creek .....	.....	11.6 (18.7).
	TXFM-1b: Lower Elm Creek .....	.....	12.3 (19.8).
	TXFM-2: San Saba River .....	.....	90.8 (146.1).
	TXFM-3: Cherokee Creek .....	.....	17.8 (28.6).
	TXFM-4a: North Llano River .....	.....	30.2 (48.7).
	TXFM-4b: South Llano River .....	.....	22.5 (36.2).
	TXFM-4c: Llano River .....	.....	90.9 (146.4).
	TXFM-4d: James River .....	.....	18.3 (29.4).
	TXFM-4e: Threadgill Creek .....	.....	8.1 (13.1).
	TXFM-4f: Beaver Creek .....	.....	12.7 (20.5).
	TXFM-5a: Pedernales River .....	.....	78.2 (125.8).
	TXFM-5b: Live Oak Creek .....	.....	2.6 (4.2).
	TXFM-6: Onion Creek .....	.....	23.5 (37.8).
	<i>Colorado River:</i> .....	No .....	Total: 8.9 (14.4).
	TXFM-1c: Upper Elm Creek .....	.....	8.9 (14.4).
Texas fawnsfoot .....	<i>Brazos River:</i> .....	Yes .....	Total: 105.3 (169.5).
	TXFF-1a: Upper Clear Fork Brazos River .....	.....	27.3 (44.0).
	TXFF-2: Upper Brazos River .....	.....	78.0 (125.5).
	<i>Brazos River:</i> .....	No .....	Total: 27.9 (45.0).
	TXFF-1b: Lower Clear Fork Brazos River .....	.....	27.9 (45.0).
	<i>Colorado River:</i> .....	Yes .....	Total: 59.5 (95.7).
TXFF-5a: Lower San Saba River .....	.....	49.2 (79.1).	
TXFF-5b: Upper Colorado River .....	.....	10.3 (16.6).	
Guadalupe orb .....	<i>Guadalupe River:</i> .....	Yes .....	Total: 288.5 (464.3).
	GORB-1a: South Fork Guadalupe River .....	.....	5.1 (8.2).
	GORB-1b: Upper Guadalupe River .....	.....	97.1 (156.3).
	GORB-2a: San Marcos River .....	.....	63.9 (102.8).
GORB-2b: Lower Guadalupe River .....	.....	122.4 (197.0).	
Texas pimpleback .....	<i>Colorado River:</i> .....	Yes .....	Total: 346.7 (558.0).
	TXPB-1a: Bluff Creek .....	.....	11.6 (18.7).
	TXPB-1b: Lower Elm Creek .....	.....	12.3 (19.8).
	TXPB-2a: Lower Concho River .....	.....	34.6 (55.7).
	TXPB-3a: Upper Colorado River .....	.....	150.4 (242.1).
	TXPB-3b: Lower San Saba River .....	.....	49.2 (79.1).

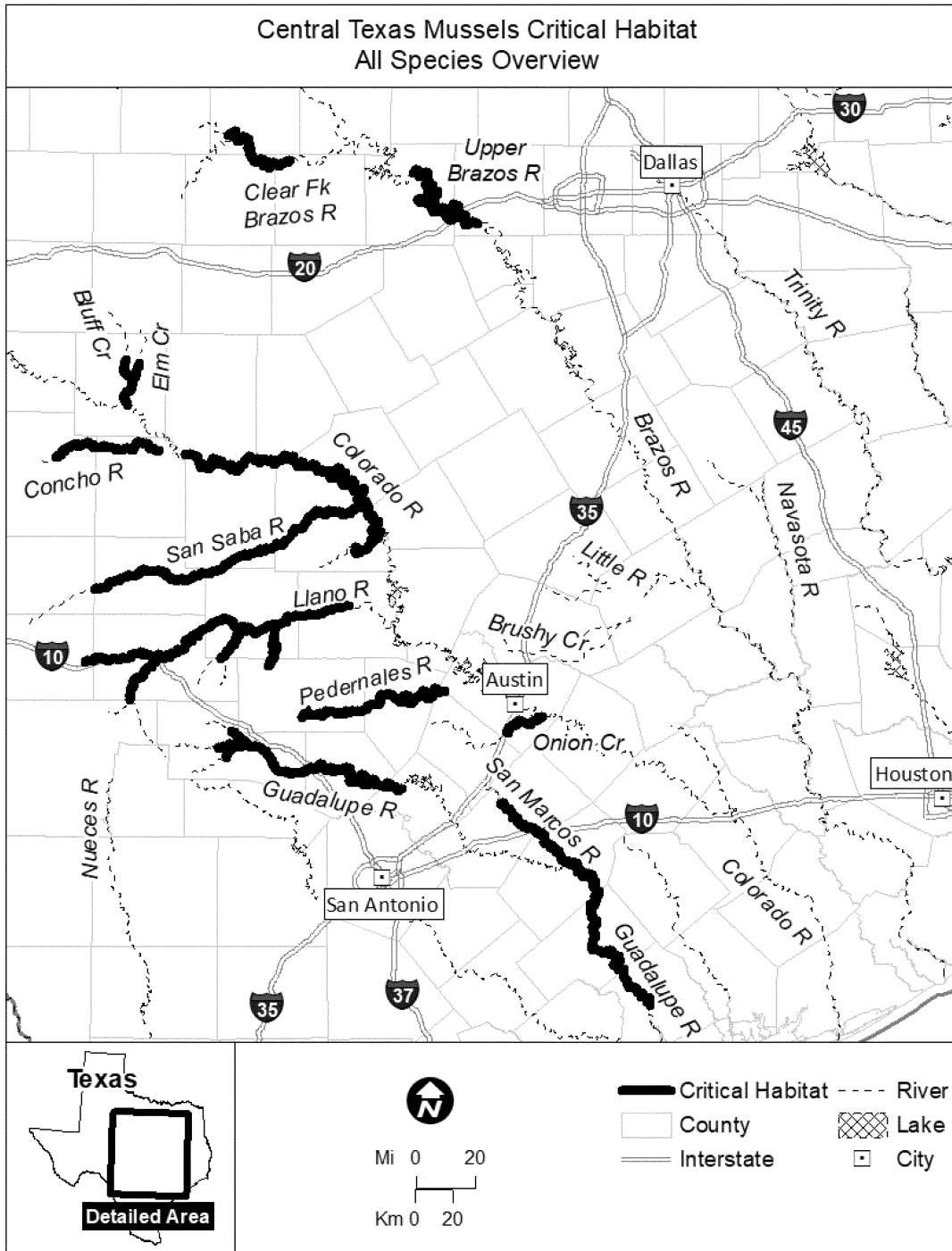
TABLE 8—FINAL DESIGNATED CRITICAL HABITAT FOR THE CENTRAL TEXAS MUSSELS—Continued

Species	Basin/unit name	Occupied	Designated critical habitat rmi (km)
	TXPB-4: Upper San Saba River .....	.....	51.4 (82.7).
	TXPB-5a: Upper Llano River .....	.....	37.2 (59.9).
	Colorado River: .....	No .....	Total: 27.3 (44.0).
	TXPB-2b: Upper Concho River .....	.....	15.5 (25.0).
	TXPB-5b: Lower Llano River .....	.....	11.8 (19.1).
False spike .....	Guadalupe River: .....	Yes .....	Total: 143.6 (231.0).
	FASP-1a: San Marcos River .....	.....	21.2 (34.0).
	FASP-1b: Guadalupe River .....	.....	122.4 (197.0).
Balcones spike .....	Colorado River: .....	Yes .....	Total: 98.1 (157.9).
	BASP-2: San Saba River .....	.....	49.1 (79.0).
	BASP-3: Llano River .....	.....	49.0 (78.9).

**Note:** Stream lengths will not sum due to overlapping units, and due to rounding, kilometers (km) may not sum to total.

BILLING CODE 4333-15-P

Map of Final Designated Critical Habitat for the Central Texas Mussels



BILLING CODE 4333-15-C

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for each of the listed species, below.

*Guadalupe Fatmucket*

We are designating approximately 52.2 river mi (84.0 river km) in a single unit, consisting of three subunits, as critical habitat for the Guadalupe fatmucket. The critical habitat areas we describe below constitute our current

best assessment of areas that meet the definition of critical habitat for the Guadalupe fatmucket. The unit we have designated as critical habitat is GUFM-1: Guadalupe River Unit. Table 9 shows the occupancy of the unit, the ownership of adjacent riparian lands, and approximate length of the

designated areas for the Guadalupe fatmucket.

TABLE 9—DESIGNATED CRITICAL HABITAT UNITS FOR THE GUADALUPE FATMUCKET

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
GUFM-1: Guadalupe River .....	GUFM-1a: North Fork Guadalupe River .....	Private .....	Occupied .....	6.9 (11.0)
	GUFM-1b: Johnson Creek .....	Private .....	Occupied .....	10.1 (16.3)
	GUFM-1c: Guadalupe River .....	Private .....	Occupied .....	32.9 (53.0)
		State/Local .....	Occupied .....	2.3 (3.7)
Total .....	.....	.....	.....	52.2 (84.0)

Note: Lengths may not sum due to rounding.

We present a brief description of the unit, and reasons why it meets the definition of critical habitat for Guadalupe fatmucket, below.

Unit GUFM-1: Guadalupe River

*Subunit GUFM-1a: North Fork Guadalupe River.* The North Fork Guadalupe River subunit consists of 6.9 river mi (11.0 river km) in Kerr County, Texas. The adjacent riparian areas of the subunit are privately owned. The entire subunit is currently occupied by the species. The North Fork Guadalupe River subunit extends from the Farm-to-Market (FM) 1340 bridge crossing (just upstream of the Bear Creek Boy Scout camp) downstream to the confluence with the Guadalupe River. This subunit contains all of the PBFs essential to the conservation of the Guadalupe fatmucket. The North Fork Guadalupe River subunit is in a mostly rural setting; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. Special management considerations may be necessary to ensure adequate instream flow and water quality.

*Subunit GUFM-1b: Johnson Creek.* The Johnson Creek subunit consists of 10.1 river mi (16.3 river km) within Kerr County, Texas. The Johnson Creek subunit begins at the Byas Springs Road

crossing downstream to the confluence with the Guadalupe River. The adjacent riparian area is privately owned. The subunit is occupied by the Guadalupe fatmucket. This site contains all of the PBFs essential to the conservation of the species, although certain PBFs, such as sufficient water flow and water quality (e.g., dissolved oxygen levels and water temperature) may be degraded during times of drought. The Johnson Creek subunit is in a mostly rural but urbanizing setting; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

*Subunit GUFM-1c: Guadalupe River.* This unit consists of approximately 35.2 river mi (56.7 river km) in Kendall and Kerr Counties, Texas. The Guadalupe River subunit extends from the confluence of the North and South Fork Guadalupe Rivers downstream to the Interstate Highway 10 bridge crossing near Comfort, Texas. Ownership of adjacent riparian areas is approximately 93 percent private and 7 percent State/local government. The subunit is occupied by the Guadalupe fatmucket. This portion of the Guadalupe River Basin is largely agricultural with several municipalities and multiple low-head dams originally built for a variety of

purposes and is now largely used for recreation (kayaking, fishing, camping, swimming, etc.). This subunit contains all of the PBFs essential to the conservation of the species. The Guadalupe River subunit is experiencing some urbanization; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by Guadalupe orb.

Texas Fatmucket

We are designating approximately 419.5 river mi (675.2 km) in 6 units, including 11 subunits, as critical habitat for Texas fatmucket. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the Texas fatmucket. The six areas we are designating as critical habitat are: TXFM-1: Elm Creek Unit; TXFM-2: San Saba River Unit; TXFM-3: Cherokee Creek Unit; TXFM-4: Llano River Unit; TXFM-5: Pedernales River Unit; and TXFM-6: Onion Creek Unit. Table 10 shows the occupancy of the units, the ownership of adjacent riparian lands, and approximate length of the designated areas for the Texas fatmucket.

TABLE 10—DESIGNATED CRITICAL HABITAT UNITS FOR TEXAS FATMUCKET

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
TXFM-1: Elm Creek .....	TXFM-1a: Bluff Creek .....	Private .....	Occupied .....	11.6 (18.7)
	TXFM-1b: Lower Elm Creek .....	Private .....	Occupied .....	11.9 (19.2)
		State/Local .....	.....	.....
	TXFM-1c: Upper Elm Creek .....	Private .....	Unoccupied .....	8.9 (14.4)

TABLE 10—DESIGNATED CRITICAL HABITAT UNITS FOR TEXAS FATMCKET—Continued

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
TXFM-2: San Saba River .....	.....	Private .....	Occupied .....	90.8 (146.1)
TXFM-3: Cherokee Creek .....	.....	Private .....	Occupied .....	17.8 (28.6)
TXFM-4: Llano River .....	TXFM-4a: North Llano River .....	Private .....	Occupied .....	30.2 (48.7)
	TXFM-4b: South Llano River .....	Private .....	Occupied .....	20.2 (32.5)
		State .....		2.3 (3.7)
	TXFM-4c: Llano River .....	Private .....	Occupied .....	90.4 (145.6)
		State/Local .....		0.5 (0.8)
	TXFM-4d: James River .....	Private .....	Occupied .....	18.3 (29.4)
	TXFM-4e: Threadgill Creek .....	Private .....	Occupied .....	8.1 (13.1)
	TXFM-4f: Beaver Creek .....	Private .....	Occupied .....	12.7 (20.5)
TXFM-5: Pedernales River .....	TXFM-5a: Pedernales River .....	Private .....	Occupied .....	68.9 (110.9)
		State/Local .....		6.8 (10.9)
		Federal .....		2.5 (4.0)
	TXFM-5b: Live Oak Creek .....	Private .....	Occupied .....	1.2 (2.0)
		State/Local .....		1.4 (2.2)
TXFM-6: Onion Creek .....	.....	Private .....	Occupied .....	10.3 (16.6)
		State/Local .....		13.2 (21.2)
Total .....	.....	.....	.....	428.4 (689.4)

Note: Lengths may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Texas fatmucket, below.

Unit TXFM-1: Elm Creek

*Subunit TXFM-1a: Bluff Creek.* This occupied critical habitat subunit consists of 11.6 river mi (18.7 km) of Bluff Creek, a tributary to Elm Creek, in Runnels County, Texas. The subunit extends from the County Road 153 bridge crossing, near the town of Winters, Texas, downstream to the confluence of Bluff and Elm creeks. The adjacent riparian area of this subunit is privately owned. This subunit is currently occupied by the Texas fatmucket. This subunit contains all of the PBFs, although suitable substrate, stream flow, and water quality are degraded. The Bluff Creek subunit is in a rural setting; is influenced by drought, low flows, and elevated chlorides; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas pimpleback.

*Subunit TXFM-1b: Lower Elm Creek.* This subunit consists of 12.3 river mi (19.8 km) of Elm Creek beginning at the confluence of Bluff Creek and continuing downstream to Elm Creek’s confluence with the Colorado River in Runnels County, Texas. Ownership of

adjacent riparian areas is approximately 97 percent private and 3 percent State/local government. The Elm Creek watershed is relatively small and remains largely rural and dominated by agricultural practices. This stream regularly has extremely low or no flow during times of drought. Moreover, this stream has degraded quality, in the form of elevated chloride concentrations and sedimentation, resulting in reduced habitat quality and availability. Lower Elm Creek is occupied by the Texas fatmucket and contains at least one of the PBFs essential to the conservation of the species: the presence of host fish. Other PBFs are present in the subunit but are in degraded condition and would benefit from management actions such as improving water quality and substrate. The Lower Elm Creek subunit is influenced by drought, low flows, and elevated chlorides, and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas pimpleback.

*Subunit TXFM-1c: Upper Elm Creek.* Upper Elm Creek is not currently occupied by the Texas fatmucket, but is essential for the conservation of the species. This subunit consists of 8.9 river mi (14.4 km) from the County Road 153 crossing, south of Lake Winters, downstream to the confluence of Bluff

and Elm creeks. Adjacent riparian area is privately owned. The entire Elm Creek watershed is dominated by agriculture and remains rural. Upper Elm Creek is essential for the conservation of the species because it provides for the growth and expansion of the Texas fatmucket within a portion of its historical range on Elm Creek; the occupied Lower Elm Creek Subunit is too small to ensure conservation of the Texas fatmucket over the long term. This subunit is important to the conservation of the Texas fatmucket because it is the farthest upstream population, and its loss would shrink the overall range of the Texas fatmucket to the lower, larger tributaries of the Colorado River. Additionally, this population of Texas fatmucket is substantially far from the other population of the species, such that if a catastrophic event such as drought or extreme flooding were to occur, it is likely that this population would be affected differently, increasing the chance of the species surviving such an event.

The Upper Elm Creek subunit is in a rural setting; is influenced by drought, low flows, and elevated chlorides; and is being affected by ongoing agricultural activities. Although it is considered unoccupied, portions of this subunit contain some or all of the PBFs essential for the conservation of the species. As previously mentioned, flow rates in this subunit are typically not within the range required by the Texas fatmucket. This subunit is often characterized by small, isolated pools separated by short riffles over bedrock during low flow and when dam releases are minimal.

Suitable stream habitat and hydrological connectivity are unsupported throughout the entirety of this subunit but do occur in portions of the delineated unit. Specifically, low flows during times of drought punctuated by high flows are either scouring the stream habitat, or depositing stream sediments downstream. Because mussels are sedentary organisms, transportation of individuals during flooding events is often lethal.

The Texas fatmucket uses predatory fish (e.g., bass and sunfishes) for its host infestation period of its lifecycle. These host fishes are estimated to be common throughout the State of Texas and within the Upper Elm Creek subunit.

This subunit is not included in TCEQ classified stream segments; therefore, we have no specific water quality information for this area. During times of normal flow, this subunit likely supports healthy water quality parameters for the Texas fatmucket, but water quality is likely compromised during low flows, when water temperatures rise and dissolved oxygen drops. The Upper Elm Creek subunit will require additional management practices to ensure sufficient water quality standards are being met and maintained for the Texas fatmucket. Because this reach of Elm Creek periodically contains the flowing water conditions and host fish species used by the Texas fatmucket, it is habitat for Texas fatmucket.

If the Texas fatmucket can be reestablished in this reach, it will expand the occupied reach in Elm Creek to a length that will be more resilient to the stressors that the species is facing. The longer the reach occupied by a species, the more likely it is that the population can withstand stochastic events such as extreme flooding, dewatering, or water contamination. In the SSA report, we identified 50 miles (80 km) as a reach long enough for a population to be able to withstand stochastic events, and the addition of this 8.9-mile reach, as well as the adjacent tributary of Bluff Creek, will extend to closer to 50 miles the existing Texas fatmucket population downstream in Lower Elm Creek and in Bluff Creek. The addition of multiple tributaries increases the value of the overall critical habitat unit, providing protection for the population should a stochastic event occur in one tributary. If Texas fatmucket were to become reestablished throughout this unit, it would likely be a moderately to highly resilient population due to longer stream length and would increase the species' future viability. This

unoccupied unit is essential for the conservation of the species because it provides habitat for range expansion in portions of known historical habitat and is necessary to increase viability of the species by increasing population resiliency.

#### Unit TXFM-2: San Saba River

This unit consists of 90.8 river mi (146.1 km) of the San Saba River in Mason, McCulloch, Menard, and San Saba Counties, Texas. This unit of the San Saba River extends from the Schleicher and Menard County line, near Fort McKavett, Texas, downstream to the San Saba River confluence with the Colorado River. The adjacent riparian areas are privately owned. This basin is largely rural and is dominated by mostly agricultural activities including cattle grazing, hay farming, and pecan farming. During the summer, this unit is affected by very low flows, which are exacerbated by pumping, and drought. This unit contains all of the PBFs essential to the conservation of the Texas fatmucket and is currently occupied by the species. The San Saba River unit is influenced by drought; low flows; underlying geology resulting in a losing reach; and ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and collection. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, improve habitat connectivity, and manage collection. Special management may be necessary to ensure adequate flow and prevent water quality degradation. This unit is also occupied by the Texas fawnsfoot, Texas pimpleback, and Balcones spike.

#### Unit TXFM-3: Cherokee Creek

This unit consists of 17.8 river mi (28.6 km) of Cherokee Creek in San Saba County, Texas. The adjacent riparian areas are privately owned. The Cherokee Creek unit extends from the County Road 409 bridge crossing downstream to the confluence with the Colorado River. This unit is occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. Even though this unit is smaller than 50 miles, which we had determined was the reach length long enough to withstand stochastic events, this population increases the species' redundancy, making it more likely to withstand catastrophic events that may eliminate one or more of the other populations. The Cherokee Creek unit is in a rural setting; is influenced by

drought and low flows; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. Special management may be necessary to limit the effect of low flow and drought conditions.

#### Unit TXFM-4: Llano River

*Subunit TXFM-4a: North Llano River.* This subunit consists of 30.2 river mi (48.7 km) in Sutton and Kimble Counties, Texas. The North Llano River subunit extends from the most upstream County Road 307 bridge crossing in Sutton County downstream for 30.2 river mi (48.7 river km) into Kimble County at the confluence with the South Llano River near the city of Junction, Texas. The North Llano River is occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. Riparian areas adjacent to this subunit are privately owned and largely dominated by rural agricultural operations. This subunit is not heavily influenced by spring inputs like some other tributaries to the Llano River, such as the South Llano River. During summertime low flows and extended periods of drought, this subunit often becomes a series of isolated pools separated by shallow flowing riffles over bedrock. These reduced flows can leave mussels stranded and desiccated in dry beds or isolated in shallow pools. Decreased flows can also result in decreased water quality, specifically in the form of reduced dissolved oxygen and increased temperature. Special management considerations may be necessary to address ongoing concerns of low flows and subsequent water quality degradation.

*Subunit TXFM-4b: South Llano River.* The South Llano River subunit extends from the Edwards and Kimble County line downstream 22.5 river mi (36.2 river km) to the confluence with the North Llano River in Kimble County, Texas. Ownership of adjacent riparian areas is 90 percent private and 10 percent State. Major activities in this basin are farming, ranching, and other agricultural uses, as the watershed remains largely rural. The South Llano River subunit is occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. The South Llano River subunit is influenced by flooding (leading to



scour), drought, and low flows, and this subunit is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. Special management may be required to address episodic low flows during summer drought and associated with reduced spring flow.

*Subunit TXFM-4c: Llano River.* This subunit consists of 90.9 river mi (146.4 river km) in Kimble, Mason, and Llano Counties, Texas. The Llano River subunit begins at the confluence of the North and South Fork Llano River and continues downstream to the State Highway 16 bridge crossing in Llano County. Ownership of adjacent riparian areas is 99.5 percent private and 0.5 percent State/local government, and the watershed remains largely rural. The Llano River subunit is occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. The Llano River subunit is in a rural setting; is influenced by flooding (leading to scour), drought, and low flows; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas pimpleback and Balcones spike.

*Subunit TXFM-4d: James River.* The James River subunit consists of 18.3 river mi (29.4 river km) of the James River in Kimble and Mason Counties, Texas. The subunit begins at the Kimble and Mason County line and continues downstream to the Llano River confluence. Adjacent riparian areas are privately owned. The James River subunit is occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. The James River subunit is in a rural setting; is influenced by flooding (leading to scour), drought, and low flows; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain

adequate flows, and improve habitat connectivity.

*Subunit TXFM-4e: Threadgill Creek.* The Threadgill Creek subunit consists of 8.1 river mi (13.1 river km) extending from the Ranch Road 783 bridge crossing downstream to the confluence with Beaver Creek in Gillespie and Mason Counties, Texas. Riparian lands adjacent to this subunit are privately owned. Threadgill Creek is occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. The Threadgill Creek subunit is in a rural setting; is influenced by flooding (leading to scour), drought, and low flows; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

*Subunit TXFM-4f: Beaver Creek.* The Beaver Creek Subunit consists of 12.7 river mi (20.5 river km) and begins at the confluence with Threadgill Creek and continues downstream to the confluence with the Llano River in Mason County, Texas. Adjacent riparian habitats are privately owned. This subunit contains all of the PBFs essential to the conservation of the Texas fatmucket. The Beaver Creek subunit is in a rural setting; is influenced by flooding (leading to scour), drought, and low flows; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

This subunit is connected to known populations of the Texas fatmucket in subunits TXFM-4c and TXFM-4e, but there are no recent surveys of Beaver Creek itself. There are no instream structures in subunits TXFM-4c and TXFM-4e that would impede water flow; the flow regime is the same as in those subunits; and the host fish may move between the subunits freely. Based on this information, it is reasonable to conclude that the populations in subunits TXFM-4c and TXFM-4e are unlikely to stop at the most upstream or downstream survey location; therefore, we conclude that this subunit is occupied.

However, due to the lack of recent surveys, we are analyzing this subunit against the second prong of the definition of critical habitat for unoccupied habitat out of an abundance of caution. If subunit TXFM-4f is not, in fact, occupied, it is essential for the conservation of the species because it provides for needed growth and expansion of the species in this portion of its historical range and connectivity between documented occupied reaches. Connecting occupied reaches increases the resiliency of the occupied reaches by allowing for gene flow and repopulation after stochastic events. The longer the occupied reach, the more likely it is that the Texas fatmucket population can rebound after stochastic events such as extreme flooding, dewatering, or water contamination. This unoccupied unit is essential for the conservation of the species because it contains all of the PBFs, provides habitat for range expansion in portions of known historical habitat, and is necessary to increase viability of the species by increasing population resiliency.

Unit TXFM-5: Pedernales River

*Subunit TXFM-5a: Pedernales River.* The Pedernales River subunit consists of 78.2 river mi (125.8 river km) in Blanco, Gillespie, Hays, and Travis Counties, Texas. The Pedernales River subunit extends from the origination of the Pedernales River at the confluence of Bear and Wolf creeks in Gillespie County downstream to the FM 3238 (Hamilton Pool Road) bridge crossing in Travis County. Ownership of adjacent riparian areas is 87 percent private, 10 percent State/local government, and 3 percent Federal; 2.5 river mi (4.0 river km) are within Lyndon B. Johnson National Historical Park, which is owned and managed by the National Park Service (NPS) in Gillespie County, Texas. The subunit is currently occupied by the Texas fatmucket and supports all of the PBFs essential to the conservation of the species. The watershed of the Pedernales River is characterized by agricultural uses, including irrigated orchards and vineyards. Excess nutrients, sediment, and pollutants enter the Pedernales River from wastewater, agricultural runoff, and urban stormwater runoff, all of which reduces instream water quality. The Pedernales River geology, like many central Texas rivers, is predominately limestone outcroppings; therefore, this system is subject to flashy, episodic flooding during rain events that mobilize large amounts of sediment and wood materials. Special management considerations may be

necessary in this subunit to address low water levels as a result of water withdrawals and drought. Additionally, implementation of the highest levels of treatment of wastewater practicable would improve water quality in this subunit, and maintenance of riparian habitat and upland buffers would maintain or improve substrate quality.

*Subunit TXFM-5b: Live Oak Creek.* The Live Oak Creek subunit consists of 2.6 river mi (4.2 river km) in Gillespie County, Texas. Ownership of adjacent riparian areas is approximately 46 percent private and 54 percent State/local government. The Live Oak Creek subunit originates at the FM 2093 bridge crossing downstream to its confluence with the Pedernales River. This subunit is currently occupied by the Texas fatmucket and contains all of the PBFs essential to the conservation of the species. The Live Oak Creek subunit is in a mostly rural setting with some urbanization; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing development and agricultural activities resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

Unit TXFM-6: Onion Creek (Previously TXFM-6a: Lower Onion Creek)

The Onion Creek unit consists of 23.5 river mi (37.8 river km) in Travis County, Texas. This unit combines the

proposed Lower Onion Creek (TXFM-6a) subunit and the proposed Upper Onion Creek (TXFM-6b) subunit. We consolidated these proposed subunits into one unit (TXFM-6) due to recent survey data confirming that Texas fatmucket inhabit Upper Onion Creek, which had been thought to be unoccupied.

Unit TXFM-6 begins at the Interstate Highway 35 bridge crossing downstream to the confluence with the Colorado River. The upper portion of this unit is in a rural but urbanizing setting and is influenced by drought, low flows, and flooding (leading to scour). Ownership of adjacent riparian areas is approximately 44 percent private and 56 percent State/local government. The lower portion of this unit is in close proximity to the rapidly urbanizing city of Austin, Texas, and contains substantial municipal developments. The effects of such rapid and widespread urbanization have contributed to significantly altered flows in Onion Creek that have led to bank destabilization, increased sedimentation and streambed mobilization, and loss of stable substrate. Further, urban runoff pollutants are responsible for degraded water quality conditions. Even though this unit is smaller than 50 miles, which we had determined was the reach length long enough to withstand stochastic events, the population increases the species' redundancy, making it more likely to withstand catastrophic events that may eliminate one or more of the other populations. Further, it is the easternmost population of the Texas fatmucket, which expands the species'

overall distribution. The Onion Creek unit is occupied by the Texas fatmucket and contains most of the PBFs essential to the conservation of Texas fatmucket. Several PBFs, such as water quality, sufficient flow rates, and suitable substrate, are present in the lower portions of the unit and at times of low flow may be either missing or minimally acceptable for the species in the upper portions of the unit. Suitable host fishes are believed to occur throughout the unit. Special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

*Texas Fawnsfoot*

We are designating approximately 192.7 river mi (310.2 river km) in three units (including four subunits) as critical habitat for the Texas fawnsfoot. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the Texas fawnsfoot. The three areas we designate as critical habitat are: TXFF-1: Clear Fork Brazos River Unit; TXFF-2: Upper Brazos River Unit; and TXFF-5: Lower San Saba and Upper Colorado River Unit. We are excluding units TXFF-3: Lower Brazos River; TXFF-4: Little River; TSFF-6: Lower Colorado River; TXFF-7: East Fork of the Trinity River; and TXFF-8: Trinity River (see Summary of Exclusion, below). Table 11 shows the occupancy of the units, the ownership of adjacent riparian lands, and approximate length of the designated areas for the Texas fawnsfoot.

TABLE 11—DESIGNATED CRITICAL HABITAT UNITS FOR THE TEXAS FAWNSFOOT (Truncilla macrodon)

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
TXFF-1: Clear Fork Brazos River	TXFF-1a: Upper Clear Fork Brazos River .....	Private .....	Occupied .....	27.3 (44.0)
	TXFF-1b: Lower Clear Fork Brazos River .....	Private .....	Unoccupied .....	27.5 (44.3)
TXFF-2: Upper Brazos River ..... TXFF-5: Lower San Saba and Upper Colorado River.	.....	State/Local .....	.....	0.4 (0.7)
	TXFF-5a. Lower San Saba River .....	Private .....	Occupied .....	78.0 (125.5)
	.....	State/Local .....	Occupied .....	48.6 (78.1)
	TXFF-5b. Upper Colorado River .....	Private .....	Occupied .....	10.3 (16.6)
Total .....	.....	.....	.....	192.7 (310.2)

**Note:** Lengths may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Texas fawnsfoot, below.

Unit TXFF-1: Clear Fork of the Brazos River

*Subunit TXFF-1a: Upper Clear Fork of the Brazos River.* The Upper Clear Fork of the Brazos River subunit consists of approximately 27.3 river mi (44.0 river km) in Shackelford and

Throckmorton Counties, Texas. The subunit begins at the confluence of Paint Creek and extends downstream to the U.S. Highway 283 bridge, near Fort Griffin, Texas. Adjacent riparian lands are privately owned. This subunit is occupied by the Texas fawnsfoot and

contains several of the PBFs essential to the conservation of the species, such as appropriate fish hosts and appropriate flows during portions of the year. Largely due to ongoing low-flow conditions from summertime drought and continued pressure on already strained water resources for municipal and agricultural uses, the Upper Clear Fork of the Brazos River does not consistently have sufficient flow and water quality is often inadequate for the Texas fawnsfoot in this subunit. Special management considerations may be necessary to address the threats in this unit by maintaining adequate flows and improving habitat connectivity.

*Subunit TXFF-1b: Lower Clear Fork of the Brazos River.* Lower Clear Fork is not currently occupied by the Texas fawnsfoot, but is essential for the conservation of the species. The Lower Clear Fork of the Brazos River subunit consists of 27.9 river mi (45.0 river km) in Shackelford and Stephens Counties, Texas. This subunit begins at the U.S. Highway 283 bridge and continues downstream to the U.S. Highway 183 bridge in Stephens County, Texas. Ownership of adjacent riparian areas is approximately 99 percent private and 1 percent State/local government.

This unit is essential to the conservation of the Texas fawnsfoot because it would expand the most northern population and increase the distribution of Texas fawnsfoot outside of mainstem, higher order streams. Additionally, this population of Texas fawnsfoot is geographically distant from the other populations of the species, such that if a catastrophic event were to occur within the range of the Texas fawnsfoot, such as extreme flooding or drought, it is likely that this population would not be affected in the same way, increasing the chance of the species surviving such an event. The Lower Clear Fork Brazos River subunit is in a rural setting; is influenced by drought, low flows, and chlorides; and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs.

Although it is considered unoccupied, portions of this subunit contain some or all of the PBFs essential for the conservation of the species. Flowing water at rates needed by the Texas fawnsfoot are present in the subunit but may not be adequate in this subunit throughout portions of the year due to low precipitation, surface diversions, and groundwater withdrawals. In the SSA report, we noted that the Lower Clear Fork of the Brazos River

experienced both the lowest flow rate (0 cfs) during the 2011 drought and the highest flow rate (approaching 4,000 cfs) during the 2015 floods (Service 2022, p. 59). This altered hydrological regime also degrades stream habitat by either scouring out available substrate or depositing large amounts of sediment on top of otherwise suitable areas. Appropriate substrates are found only in isolated reaches. Management actions that allow for improvement of degraded habitat areas within this subunit would allow Texas fawnsfoot populations to expand and increase the subunit's resiliency.

The freshwater drum, the Texas fawnsfoot's host fish, is expected to be present in the Lower Clear Fork of the Brazos River. Thus, management actions may be necessary to ensure appropriate populations of host fish are co-occurring with Texas fawnsfoot.

Water quality may not be sufficient in the Lower Clear Fork of the Brazos River. Elevated chloride levels from naturally occurring underground salt formations are exacerbated by reduced water flow. In order for Texas fawnsfoot populations to expand and occupy the Lower Clear Fork of the Brazos River subunit, management actions may be necessary to reduce chloride levels. Because this reach of the Clear Fork Brazos River periodically contains the flowing water conditions and host fish species used by Texas fawnsfoot, it is habitat for the Texas fawnsfoot.

If the Texas fawnsfoot can be reestablished in this reach, it will expand the occupied reach length in the Clear Fork Brazos River to a length that will be more resilient to the stressors that the species is experiencing. The longer the reach occupied by a species, the more likely it is that the population can withstand stochastic events such as extreme flooding, dewatering, or water contamination. In the SSA report, we identified 50 miles (80 km) as a reach long enough for a population to be able to withstand stochastic events, and the addition of this 27.9-mile reach to the 27.3-mile occupied section of the Clear Fork Brazos River (subunit TXFF-1a) expands the existing Texas fawnsfoot population in the Clear Fork Brazos River to 55.2 miles, achieving a length that allows for a highly resilient population to be reestablished, increasing the species' future viability. This unit is essential for the conservation of the species because it provides habitat for range expansion in portions of known historical habitat, which is necessary to increase viability of the species.

Unit TXFF-2: Upper Brazos River

The Upper Brazos River Unit consists of approximately 78.0 river mi (125.5 river km) of the Brazos River in Palo Pinto and Parker Counties, Texas. The Upper Brazos River Unit extends from the FM 4 bridge crossing in Palo Pinto County, Texas, downstream to the FM 1189 bridge in Parker County, Texas. The unit is currently occupied by the species, and adjacent riparian lands are privately owned. This unit currently supports some of the PBFs essential to the conservation of Texas fawnsfoot, such as presence of appropriate fish hosts and suitable flow conditions during portions of the year (but flow conditions become unsuitable during times of drought). The PBFs of water quality and sufficient flow are present but degraded in this unit, as excessive chloride concentrations and persistent low flows diminish habitat quality in this unit. Elevated chloride concentrations in this portion of central Texas are often a result of natural causes, such as saline water inputs from spring releases flowing through subterranean salt deposits. However, while the Texas fawnsfoot may be able to tolerate some minor increases in salinity, low flow rates in this unit exacerbate the concentrations of chlorides.

The Upper Brazos River Unit is in a rural setting with some urbanization; is influenced by drought, low flows, chlorides, and reservoir operations; and is being affected by mining (rock, sand, and gravel), ongoing agricultural activities, and development, which result in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

Unit TXFF-5: Lower San Saba River and Upper Colorado River

*Subunit TXFF-5a: Lower San Saba River.* The Lower San Saba River subunit consists of approximately 49.2 river mi (79.1 river km) in San Saba County, Texas. This subunit begins at the Brady Creek confluence and extends to the Colorado River confluence. Ownership of adjacent riparian areas is approximately 99 percent private and 1 percent State/local government, and these areas are primarily in agricultural use. The river experiences periods of low flow due to drought and water withdrawals, and water withdrawals are expected to increase in the future. The

subunit is occupied by the Texas fawnsfoot and contains all of the PBFs essential to the conservation of the species. The Lower San Saba River subunit is experiencing some urbanization and is influenced by drought, low flows, and wastewater discharges. The watershed is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas pimpleback and Balcones spike.

*Subunit TXFF-5b: Upper Colorado River.* The Upper Colorado River subunit consists of 10.3 river mi (16.6 river km) of the Colorado River near its confluence with the San Saba River in

Lampasas, Mills, and San Saba Counties, Texas. This subunit extends from the County Road 124 bridge and continues downstream to the U.S. Highway 190 bridge. Activities in the watershed are mostly agricultural. The river experiences periodic low flows from drought and upstream water withdrawals. The average daily flow rate of the upper Colorado River in this segment has been declining since the early 1920s. This subunit is currently occupied, and adjacent riparian lands are privately owned. All of the PBFs essential to the conservation of Texas fawnsfoot are present in this subunit, with the exception of appropriate flows throughout the year.

The Upper Colorado River subunit is influenced by reservoir operations and chlorides and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and

wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas pimpleback.

*Guadalupe Orb*

We are designating approximately 288.5 river mi (464.3 river km) in two units, consisting of four subunits, as critical habitat for the Guadalupe orb. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for Guadalupe orb. The two areas we are designating as critical habitat are: GORB-1: Upper Guadalupe River Unit and GORB-2: Lower Guadalupe River Unit. Table 12 shows the occupancy of the units, the ownership of adjacent riparian lands, and approximate length of the designated areas for the Guadalupe orb.

TABLE 12—DESIGNATED CRITICAL HABITAT UNITS FOR THE GUADALUPE ORB

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (Kilometers)
GORB-1: Upper Guadalupe River .....	GORB-1a: South Fork Guadalupe River	Private .....	Occupied .....	5.1 (8.2)
	GORB-1b: Upper Guadalupe River .....	Private .....	Occupied .....	91.3 (147.0)
GORB-2: Lower Guadalupe River .....	GORB-2a: San Marcos River .....	State/Local .....	Occupied .....	5.8 (9.3)
		Private .....		60.2 (96.9)
	GORB-2b: Lower Guadalupe River .....	State/Local .....	Occupied .....	3.7 (5.9)
		Private .....		116.7 (187.8)
	State/Local .....		5.7 (9.2)	
Total .....				288.5 (464.3)

**Note:** Lengths may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Guadalupe orb, below.

Unit GORB-1: Upper Guadalupe River

*Subunit GORB-1a: South Fork Guadalupe River.* The South Fork Guadalupe River subunit consists of 5.1 river mi (8.2 river km) of the South Fork Guadalupe River in Kerr County, Texas. This subunit extends from Griffin Road crossing just downstream of the Texas Highway 39 crossing in Kerr County, to its confluence with the North Fork Guadalupe River. This subunit is occupied by the Guadalupe orb, and the adjacent riparian area is privately owned. This subunit is mostly rural and agricultural, with organized recreational camps. These camps often operate very low dams that form small impoundments along the subunit. The South Fork Guadalupe River subunit contains all of the PBFs essential to the conservation of the species. This

subunit, combined with the Upper Guadalupe River subunit (GORB-1b), results in a highly resilient population with presence in several tributaries, protecting the population from a single stochastic event eliminating the entire population.

The South Fork Guadalupe River subunit is in a mostly rural setting; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

*Subunit GORB-1b: Upper Guadalupe River.* The Upper Guadalupe River subunit consists of 97.1 river mi (156.3 river km) of the Guadalupe River in

Comal, Kendall, and Kerr Counties, Texas. This subunit extends from the confluence of the North and South Forks of the Guadalupe River downstream to the U.S. Highway 311 bridge in Comal County, Texas. The Upper Guadalupe River subunit is occupied by the Guadalupe orb, and ownership of adjacent riparian areas is approximately 95 percent private and 5 percent State/local government. At times, the subunit contains all the PBFs essential to the conservation of the Guadalupe orb. In recent years, Guadalupe orb individuals in this reach have experienced some of the highest and lowest flows on record, as well as water quality degradation (high temperature and low dissolved oxygen). Extreme high flows removed needed gravel and cobble in some locations, while extended low flow periods have caused suspended sediment to settle out in areas, reducing substrate quality for the Guadalupe orb.

The Upper Guadalupe River subunit is in a mostly rural setting with some urbanization; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Guadalupe fatmucket.

Unit GORB-2: Lower Guadalupe River

*Subunit GORB-2a: San Marcos River.*

The San Marcos River subunit consists of approximately 63.9 river mi (102.8 river km) in Caldwell, Gonzales, and Guadalupe Counties, Texas. The subunit extends from the FM 1977 bridge crossing in Caldwell County to the Guadalupe River confluence. The subunit is currently occupied by the Guadalupe orb, and ownership of adjacent riparian areas is approximately 94 percent private and 6 percent State/local government. The San Marcos River drains the City of San Marcos, including the campus of Texas State University, leading to impacts of urban runoff, wastewater inputs, and altered hydrology. The large San Marcos springs complex, the second largest in Texas, contributes significantly to the flows in this river and the lower Guadalupe River. This subunit contains all of the PBFs essential to the conservation of the species.

The San Marcos River subunit is in a mostly rural setting with some urbanization; is downstream from an urban area; is influenced by drought, low flows, flooding (leading to scour), and wastewater discharges; and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the false spike.

*Subunit GORB-2b: Lower Guadalupe River.*

The Lower Guadalupe River subunit consists of approximately 122.4 river mi (197 river km) in DeWitt, Gonzales, and Victoria Counties, Texas. This subunit extends from the San Marcos River confluence downstream to the U.S. Highway 59 bridge crossing near Victoria, Texas. The Lower Guadalupe River subunit is currently occupied by the Guadalupe orb, and ownership of adjacent riparian areas is approximately 95 percent private and 5 percent State/local government. This subunit contains all of the PBFs necessary for the Guadalupe orb and is the most resilient population known. Existing protections for the San Marcos and Comal Springs from the Edwards Aquifer Authority Habitat Conservation Plan provide some protection to spring flows. It is believed that these protected spring flows help ensure that flow rates and water quality are suitable for downstream mussel beds during times of drought and low flows.

The Lower Guadalupe River subunit is in a mostly rural setting with some urbanization downstream from some urban areas; is influenced by reservoir operations, drought, low flows, flooding (leading to scour), and wastewater discharges; and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the false spike.

*Texas Pimpleback*

We are designating approximately 374 river mi (602.1 river km) in five units, including eight subunits, as critical habitat for the Texas pimpleback. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the Texas pimpleback. The five areas we are designating as critical habitat are: TXPB-1: Elm Creek Unit; TXPB-2: Concho River Unit; TXPB-3: Upper Colorado River/Lower San Saba River Unit; TXPB-4: Upper San Saba River Unit; and TXPB-5: Llano River Unit. We are excluding Unit TXPB-6: Lower Colorado River (see Summary of Exclusions, below). Table 13 shows the occupancy of the units, the ownership of riparian lands, and approximate length of the designated areas for the Texas pimpleback.

TABLE 13—DESIGNATED CRITICAL HABITAT UNITS FOR THE TEXAS PIMPLEBACK

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
TXPB-1: Elm Creek	TXPB-1a: Bluff Creek	Private	Occupied	11.6 (18.7)
	TXPB-1b: Lower Elm Creek	Private State/Local	Occupied	0.4 (0.6) 11.9 (19.2)
TXPB-2: Concho River	TXPB-2a: Lower Concho River	Private	Occupied	34.6 (55.7)
TXPB-2b: Upper	Private	Unoccupied	15.2 (24.5).	
	Concho River	State/Local		0.3 (0.5)
TXPB-3: Upper Colorado River/ Lower San Saba River.	TXPB-3a: Upper Colorado River	Private	Occupied	150.4 (242.1)
TXPB-3b: Lower	Private	Occupied	48.6 (78.1).	
	San Saba River	State/Local		0.6 (1.0).
TXPB-4: Upper San Saba River		Private	Occupied	51.4 (82.7)
TXPB-5: Llano River	TXPB-5a: Upper Llano River	Private	Occupied	37.2 (59.9)
	TXPB-5b: Lower Llano River	Private	Unoccupied	11.8 (19.1)
Total				374.0 (602.0)

Note: Lengths may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Texas pimpleback, below.

#### Unit TXPB-1: Elm Creek

*Subunit TXPB-1a: Bluff Creek.* This occupied critical habitat subunit consists of 11.6 river mi (18.7 river km) of Bluff Creek, a tributary to Elm Creek, in Runnels County, Texas. The subunit extends from the County Road 153 bridge crossing, near the town of Winters, Texas, downstream to the confluences of Bluff and Elm creeks. The adjacent riparian area of this subunit is privately owned. This subunit is currently occupied by Texas pimpleback. This subunit contains all of the PBFs, although suitable substrate, flow, and water quality are degraded. The Bluff Creek subunit is in a rural setting; is influenced by drought, low flows, and elevated chlorides; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas fatmucket.

*Subunit TXPB-1b: Lower Elm Creek.* This subunit consists of 12.3 river mi (19.8 river km) of Elm Creek beginning at the County Road 344 crossing downstream to Elm Creek's confluence with the Colorado River in Runnels County, Texas. Ownership of the adjacent riparian areas is approximately 97 percent private and 3 percent State/local government. The Elm Creek watershed is relatively small and remains largely rural and dominated by agricultural practices. This stream regularly has extremely low or no flow during times of drought. Moreover, this stream has elevated chloride concentrations and sedimentation, resulting in reduced habitat quality and availability, as well as decreased water quality. Lower Elm Creek is occupied by the Texas pimpleback and contains some of the PBFs essential to the conservation of the species such as presence of host fish. Other PBFs are present but are in degraded condition and would benefit from management actions such as improving water quality and substrate quality. The Lower Elm Creek subunit is influenced by drought, low flows, and elevated chlorides, and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality

degradation, and groundwater withdrawals and surface water diversions. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This unit is also occupied by the Texas fatmucket.

Even though the Elm Creek unit is smaller than 50 miles, which had been determined as the reach length long enough to withstand stochastic events, the populations in the Bluff Creek and Lower Elm Creek subunits (TXPB-1a and TXPB-1b) increase the species' redundancy, making it more likely to withstand catastrophic events that may eliminate one or more of the other populations.

#### Unit TXPB-2: Concho River

*Subunit TXPB-2a: Lower Concho River.* The Lower Concho River subunit consists of approximately 34.6 river mi (55.7 river km) in Concho and Tom Green Counties, Texas. The Lower Concho River subunit extends from the FM 1692 bridge crossing downstream to the FM 1929 crossing. This subunit is occupied, and its adjacent riparian area is privately owned. The Lower Concho River subunit contains some of the PBFs essential to the conservation of the Texas pimpleback, such as some suitable substrate and the presence of host fish. However, the unit does not currently have sufficient water quality (e.g., water temperature is high and dissolved oxygen is low), and instream flow is too low at certain times of the year. Upstream reservoirs, built for flood control and municipal water storage, have contributed to a downward trend in normal river base-flows in recent years. The Lower Concho River subunit is in a mostly rural setting downstream from an urban area, is influenced by reservoir operations and chlorides, and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity.

*Subunit TXPB-2b: Upper Concho River.* Upper Concho River is not currently occupied by the Texas pimpleback, but is essential for the conservation of the species B. The Upper Concho River subunit consists of 15.5 river mi (25.0 river km) of the Concho River in Tom Green County, Texas, from the FM 380 bridge crossing,

downstream of San Angelo, Texas, to the FM 1692 bridge where it adjoins subunit TXPB-2a. Ownership of the adjacent riparian areas is approximately 98 percent private and 2 percent State/local government.

This subunit is essential to the conservation of the Texas pimpleback because it expands one of the smaller populations to a length that will be highly resilient to stochastic events; its loss would shrink the distribution of the Texas pimpleback and reduce redundancy of the species, limiting its viability. The Upper Concho River subunit is in a mostly rural setting with some urbanization downstream from an urban area; is influenced by reservoir operations, wastewater discharges, and chlorides; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs.

Although it is considered unoccupied, portions of this subunit contain some of the PBFs essential for the conservation of the species. Flowing water is not consistently at levels appropriate for Texas pimpleback in this subunit. Several upstream reservoirs divert the already limited flows, and reduced precipitation has resulted in an overall decrease in river flow rates. Management actions to increase stream flows in this subunit may be necessary for the Texas pimpleback population to be reestablished.

Currently, appropriate substrates exist in isolated areas throughout this subunit. These isolated pockets of suitable habitat could allow for expansion and recolonization of the Texas pimpleback. However, future management actions that focus on habitat restoration in this reach to improve connectivity between habitat patches would improve the resiliency of this population, once restored.

Currently, we believe appropriate host fishes occur throughout the subunit and will allow for reproduction of Texas pimpleback when the species is reestablished. Management actions could address any deficit in the abundance and distribution of fish hosts in this area, which would allow for expansion and future reestablishment of this subunit from the adjacent occupied subunit TXPB-2a.

Water quality is degraded in this subunit. The Upper Concho River subunit, due in part to low flows and elevated water temperatures, experiences decreased levels of dissolved oxygen at such a level that could preclude mussel occupancy. We

believe these periods of low dissolved oxygen primarily occur during hot summer months when droughts are common. Therefore, management actions that increase flow rates would also improve water quality in this reach.

Because this reach of the Concho River periodically contains the appropriate substrate conditions and host fish species used by the Texas pimpleback, it is habitat for the Texas pimpleback.

If the Texas pimpleback can be reestablished in this reach, it will expand the occupied reach length in the Concho River to a length that will be more resilient to the stressors that the species is facing. The longer the reach occupied by a species, the more likely it is that the population can withstand stochastic events such as extreme flooding, dewatering, or water contamination. In the SSA report, we identified 50 miles (80 km) as a reach long enough for a population to be able to withstand stochastic events, and the addition of this 15.5-mile reach to the 34.6-mile occupied section of the Concho River expands the existing Texas fawnsfoot population in the Concho River to 50.1 miles, achieving a length that allows for a highly resilient population to be reestablished, increasing the species' future redundancy. This subunit is essential for the conservation of the species because it provides habitat for range expansion in portions of known historical habitat, and thus will increase viability of the species by increasing its resiliency, redundancy, and representation.

Unit TXPB-3: Upper Colorado River and Lower San Saba River

*Subunit TXPB-3a: Upper Colorado River.* The Upper Colorado River subunit consists of approximately 150.4 river mi (242.1 river km) in Brown, Coleman, Lampasas, McCulloch, Mills, and San Saba Counties, Texas. The subunit extends from the Coleman and McCulloch county line downstream to the confluence of the Colorado River and Cherokee Creek. The adjacent riparian area of this subunit is privately owned. The Upper Colorado River subunit is occupied by the Texas pimpleback and contains some of the PBFs essential to the conservation of the species, including host fishes in appropriate abundance and portions of suitable substrate. The subunit does not always provide sufficient flow rate or sufficient water quality (e.g., dissolved oxygen is often low, and temperature reaches unsuitably high levels during summer drought) to support the Texas pimpleback. The Upper Colorado River

subunit is in a mostly rural setting; is influenced by reservoir operations and chlorides; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas fawnsfoot.

*Subunit TXPB-3b: Lower San Saba River.* The Lower San Saba River subunit consists of 49.2 river mi (79.1 river km) of the San Saba River in San Saba County, Texas. This subunit is currently occupied by the species, and the ownership of adjacent riparian areas is approximately 99 percent private and 1 percent State/local government. The Lower San Saba River subunit extends from the Brady Creek confluence in San Saba County, Texas, downstream to the Colorado River confluence where it adjoins the Upper Colorado River subunit (TXPB-3a). This subunit contains all the PBFs essential to the conservation of the Texas pimpleback most of the year. This population contains evidence of recent Texas pimpleback reproduction, which is largely absent from the rest of the species' range.

This subunit is primarily rural, with cattle grazing and irrigated orchards. Summer drought and water withdrawals cause occasional periods of low flow, which result in water quality degradation as water temperatures are high and dissolved oxygen is low. Additionally, high-flow events during flooding can result in habitat scour and sedimentation. The Lower San Saba River subunit is experiencing some urbanization; is influenced by drought, low flows, and wastewater discharges; and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas fawnsfoot and false spike.

Unit TXPB-4: Upper San Saba River

The Upper San Saba River Unit consists of approximately 51.4 river mi (82.7 river km) of the San Saba River in Menard County, Texas. Adjacent

riparian areas are privately owned. The Upper San Saba River Unit extends from the Schleicher County line near Fort McKavett, Texas, downstream to the FM 1311 bridge crossing in Menard, County, Texas. Texas pimpleback occupies the Upper San Saba River Unit in low densities. The Upper San Saba River Unit contains the PBFs essential to the conservation of the Texas pimpleback most of the year, although flows decline to low levels during summer drought. During these low flow periods, the PBFs of sufficient water flow and water quality may not be present, as low-flow conditions can lead to high water temperature and low dissolved oxygen. The Upper San Saba River Unit is in a rural setting; is influenced by drought, low flows, and underlying geology resulting in a losing reach; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and collection. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit is also occupied by the Texas fatmucket.

Unit TXPB-5: Llano River

*Subunit TXPB-5a: Upper Llano River.* The Upper Llano River subunit consists of approximately 37.2 river mi (59.9 river km) in Kimble and Mason Counties, Texas. Adjacent riparian areas are privately owned. This subunit extends from the Ranch Road RR 385 bridge crossing downstream to the U.S. Highway 87 bridge. This reach of the Llano River is largely rural, with much of the land in agricultural use. The Upper Llano River subunit is occupied by the Texas pimpleback and contains all the necessary PBFs essential to the conservation of the species most of the year. However, drought conditions and flooding in the Llano River can be extreme, causing the species to experience either extreme low-flow conditions with related reduced water quality or extreme high flows that mobilize substrate, eroding habitat or depositing sediment on Texas pimpleback populations. The Upper Llano River subunit is in a rural setting; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and collection. Therefore, special management considerations may be



necessary to reduce sedimentation, improve water quality, maintain adequate flows, improve habitat connectivity, and manage collection. This subunit is also occupied by the Texas fatmucket.

*Subunit TXPB-5b: Lower Llano River.*

Lower Llano River is not currently occupied by the Texas pimpleback, but is essential for the conservation of the species. The Lower Llano River subunit consists of 11.8 river mi (19.1 river km) of the Llano River in Mason County, Texas. This subunit extends from the U.S. Highway 87 bridge in Mason County downstream to the Mason and Llano county line. Adjacent riparian lands are privately owned.

This subunit is essential to the conservation of the Texas pimpleback because it expands one of the smaller populations to a length that will be highly resilient to stochastic events in a separate tributary; this subunit increases the distribution of Texas pimpleback and increases redundancy of the species, improving its viability. The Lower Llano River subunit is in a rural setting; is influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development, resulting in excessive sedimentation, water quality degradation, and groundwater withdrawals and surface water diversions.

Although it is considered unoccupied, portions of this subunit contain some or all of the PBFs essential for the conservation of the species. Flowing water is generally sufficient in this subunit during portions of the year. However, in the past decade the Llano River has seen both the highest and lowest flow rates ever recorded, with extremely low water levels and stranding of mussels during low flow conditions and scour and entrainment

of mussels with subsequent deposition over suitable habitat during floods. Spring inputs from the South Llano River help mitigate the effects of drought in the lower portions of the Llano River, although water withdrawals for agricultural operations contribute to decreased flows during drought. Ongoing management actions by resource management agencies and nonprofit organizations are contributing to restoring a natural flow regime.

In the Llano River, suitable substrates exist as isolated riffles between larger pools. Given the hydrology of the Llano River Basin, suitable substrates have been degraded in portions of this subunit and will need restoration.

The Texas pimpleback uses similar host fishes as the closely related Guadalupe orb, including channel catfish, flathead catfish, and tadpole madtom. Sufficiently abundant host fishes are present in the Lower Llano River subunit to support a population of Texas pimpleback.

Water quality in the Lower Llano River subunit is generally sufficient for the species during portions of the year. However, dissolved oxygen declines and water temperature increases during periods of low flow. Management to ensure sufficient flow rates in this reach would improve water quality as well.

Because this reach of the Llano River frequently contains the flowing water conditions, suitable substrates, and host fish species used by the Texas pimpleback, it is adequate habitat for the Texas pimpleback.

If the Texas pimpleback can be reestablished in this reach, it will expand the occupied reach in the Llano River to a length that would be more resilient. The longer the reach occupied by a species, the more likely it is that the population can withstand stochastic events such as extreme flooding,

dewatering, or water contamination. In the SSA report, we identified 50 miles (80 km) as a reach long enough for a population to be able to withstand stochastic events, and the addition of this 11.8-mile reach to the 37.2-mile occupied section of the Llano River expands the existing Texas pimpleback population in the Llano River to 49.0 miles, achieving a length that allows for a highly resilient population to be reestablished, thereby increasing the species' future redundancy. This unit is essential for the conservation of the species because it provides habitat for range expansion in portions of known historical habitat, and thus will increase viability of the species by increasing its resiliency, redundancy, and representation.

This subunit is also occupied by the Texas fatmucket and Balcones spike.

*Balcones Spike*

We are designating approximately 98.1 river mi (157.9 river km) in two units as critical habitat for Balcones spike. Each of the units is currently occupied by the species and contains all of the PBFs essential to the conservation of the species. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for Balcones spike. The two areas we designate as critical habitat are: *BASP-2: San Saba River Unit*; and *BASP-3: Llano River Unit*. We are excluding *Unit BASP-1: Little River* (see Summary of Exclusions, below). Table 14 shows the occupancy of the units, the ownership of adjacent riparian lands, and approximate length of the designated areas for the Balcones spike. We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Balcones spike, below.

TABLE 14—DESIGNATED CRITICAL HABITAT UNITS FOR BALCONES SPIKE

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
BASP-2: San Saba River	.....	Private	Occupied	48.5 (78.0)
	.....	State/Local	.....	0.6 (1.0)
BASP-3: Llano River	.....	Private	Occupied	49.0 (78.9)
Total	.....	.....	.....	98.1 (157.9)

**Note:** Lengths may not sum due to rounding.

We present brief descriptions of all units, and reasons why they meet the definition of critical habitat for Balcones spike, below.

*Unit BASP-2: San Saba River*

The San Saba River Unit consists of 49.1 river mi (79.0 river km) of the San Saba River in San Saba County, Texas. The unit extends from the San Saba River and Brady Creek confluence and continues downstream to the confluence

of the San Saba and Colorado Rivers. Ownership of adjacent riparian area is approximately 99 percent private and 1 percent State/local government. The unit is currently occupied by the species and contains all of the PBFs essential to the conservation of the Balcones spike.

Even though this unit is smaller than 50 miles, which we had determined was the reach length long enough to withstand stochastic events, this population increases the species' redundancy, making it more likely to withstand catastrophic events that may eliminate one or more of the other populations. The San Saba River subunit is in a rural setting; is influenced by drought, low flows, and wastewater discharges; and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. Much of the land use in the watershed is agricultural, and special management considerations or protection may be necessary to address excess nutrients, sediment, and pollutants that enter the San Saba River and reduce instream water quality. Sources of these types of pollution are wastewater, agricultural runoff, and urban stormwater runoff. Additional special management considerations or protection may be necessary in this unit to address low water levels that result from water withdrawals and drought, as

well as excessive erosion. This subunit is also occupied by the Texas pimpleback.

Unit BASP-3: Llano River

The Llano River Unit consists of 49 river mi (78.9 river km) of the Llano River in Kimble and Mason Counties, Texas. The Llano River Unit begins at the Ranch Road 385 bridge crossing in Kimble County and continues downstream to the Mason and Llano County line. The unit is occupied by the species, and surrounding riparian areas are privately owned. Even though this unit is smaller than 50 miles, which we had determined was the reach length long enough to withstand stochastic events, this population increases the species' redundancy, making it more likely to withstand catastrophic events that may eliminate one or more of the other populations. The majority of the Llano River Basin is rural and composed of agricultural operations that were historically used for sheep and goat ranching. During 2018, the Llano River experienced some of the largest floods and most severe drought within the same year. Extreme floods and drought conditions result in both stream bed mobilization, sedimentation, and dewatering. The Llano River Unit contains all the PBFs essential to the conservation of the Balcones spike. The Llano River unit is in a rural setting; is

influenced by drought, low flows, and flooding (leading to scour); and is being affected by ongoing agricultural activities and development resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and collection. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, improve habitat connectivity, and manage collection. This subunit is also occupied by the Texas fatmucket, Texas fawnsfoot, and Texas pimpleback.

False Spike

We are designating approximately 143.6 river mi (231 river km) in one unit, consisting of two subunits, as critical habitat for the false spike. Each of the two subunits is currently occupied by the species and contains all of the PBFs essential to the conservation of the species. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for false spike. The one area we designate as critical habitat is FASP-1: Guadalupe River Unit. Table 15 shows the occupancy of the units, the ownership of adjacent riparian lands, and approximate length of the designated areas for the false spike.

TABLE 15—DESIGNATED CRITICAL HABITAT UNIT FOR FALSE SPIKE

Unit	Subunit	Adjacent riparian ownership	Occupancy	River miles (kilometers)
FASP-1: Guadalupe River .....	FASP-1a: San Marcos River .....	Private .....	Occupied .....	19.4 (31.1)
		State/Local .....	.....	1.8 (2.9)
	FASP-1b: Guadalupe River .....	Private .....	Occupied .....	116.6 (187.7)
		State/Local .....	.....	5.8 (9.3)
Total .....	.....	.....	.....	143.6 (231.0)

Note: Lengths may not sum due to rounding.

We present a brief description of the unit, and reasons why it meets the definition of critical habitat for false spike, below.

Unit FASP-1: Guadalupe River

*Subunit FASP-1a: San Marcos River.* This subunit consists of 21.2 river mi (34 river km) of the San Marcos River in Gonzales County, Texas. The San Marcos River subunit begins at the FM 2091 bridge crossing within Palmetto State Park (Park Road 11) and continues for 21.2 river mi downstream to the San Marcos River confluence with the Guadalupe River. Ownership of the adjacent riparian area is approximately 92 percent private and 8 percent State/

local government; TPWD's Palmetto State Park occurs in the upstream reaches. The San Marcos River drains the City of San Marcos, including the campus of Texas State University, which causes the river to be impacted by urban runoff, wastewater inputs, and altered hydrology. The San Marcos springs complex, the second largest in Texas, contributes significantly to the flows in this river and the lower Guadalupe River. The lower San Marcos River watershed is characterized by agricultural land in the lower portion of the San Marcos River. The subunit is occupied by the false spike and contains all of the PBFs essential to the conservation of the species. Because the

San Marcos River subunit is downstream from an urban area in a rural but urbanizing setting, it is influenced by wastewater discharges and ongoing development in the upper reaches associated with the Austin-Round Rock metropolitan area. It is also being affected by ongoing development and agricultural activities resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. Special management considerations may be

necessary to address riparian bank sloughing, increased sedimentation, and pollutants from upstream urbanization and agricultural practices. This subunit is also occupied by the Guadalupe orb.

*Subunit FASP-1b: Guadalupe River.*

This subunit consists of 122.4 river mi (197 river km) of the Guadalupe River in DeWitt, Gonzales, and Victoria Counties, Texas. The Guadalupe River subunit begins at the confluence of the Guadalupe and San Marcos Rivers and continues downstream for 122.4 river mi to the U.S. Highway 59 bridge near Victoria, Texas. Ownership of adjacent riparian areas is approximately 98 percent private and 2 percent State/local. This subunit is occupied by the false spike and contains all of the PBFs essential to the conservation of the species. The Guadalupe River subunit is in a mostly rural but urbanizing setting; is influenced by reservoir releases (from Canyon and Guadalupe Valley) and flooding (leading to scour); and is being affected by ongoing development and agricultural activities resulting in excessive sedimentation, water quality degradation, groundwater withdrawals and surface water diversions, and wastewater inputs. Therefore, special management considerations may be necessary to reduce sedimentation, improve water quality, maintain adequate flows, and improve habitat connectivity. This subunit contains the most resilient known population of false spike. During times of drought, spring water influence from the Comal and San Marcos Rivers can contribute as much as 50 percent of the flows to the lower Guadalupe River. Continued protections for these spring systems are imperative for protecting mussel beds in the lower Guadalupe River. Special management considerations may be necessary to ensure low flows, sedimentation, and degraded water quality parameters do not worsen and contribute to future population decline. This subunit is also occupied by the Guadalupe orb.

### Effects of Critical Habitat Designation

#### *Section 7 Consultation*

Section 7(a)(2) of the Act requires Federal agencies, including the Service, to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of designated critical habitat of such species.

We published a final rule revising the definition of destruction or adverse modification on August 27, 2019 (84 FR 44976). Destruction or adverse modification means a direct or indirect

alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

Compliance with the requirements of section 7(a)(2) of the Act is documented through our issuance of:

(1) A concurrence letter for Federal actions that may affect, but are not likely to adversely affect, listed species or critical habitat; or

(2) A biological opinion for Federal actions that may affect, and are likely to adversely affect, listed species or critical habitat.

When we issue a biological opinion concluding that a project is likely to jeopardize the continued existence of a listed species and/or destroy or adversely modify critical habitat, we provide reasonable and prudent alternatives to the project, if any are identifiable, that would avoid the likelihood of jeopardy and/or destruction or adverse modification of critical habitat. We define “reasonable and prudent alternatives” (at 50 CFR 402.02) as alternative actions identified during consultation that:

(1) Can be implemented in a manner consistent with the intended purpose of the action,

(2) Can be implemented consistent with the scope of the Federal agency’s legal authority and jurisdiction,

(3) Are economically and technologically feasible, and

(4) Would, in the Service Director’s opinion, avoid the likelihood of jeopardizing the continued existence of the listed species and/or avoid the likelihood of destroying or adversely modifying critical habitat.

Reasonable and prudent alternatives can vary from slight project modifications to extensive redesign or relocation of the project. Costs associated with implementing a reasonable and prudent alternative are similarly variable.

Regulations at 50 CFR 402.16 set forth requirements for Federal agencies to reinstate consultation. Reinitiation of consultation is required and shall be requested by the Federal agency, where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (1) if the amount or extent of taking specified in the incidental take statement is exceeded; (2) if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) if the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written

concurrence; or (4) if a new species is listed or critical habitat designated that may be affected by the identified action. As provided in 50 CFR 402.16, the requirement to reinstate consultations for new species listings or critical habitat designation does not apply to certain agency actions (e.g., land management plans issued by the Bureau of Land Management in certain circumstances).

#### *Destruction or Adverse Modification of Critical Habitat*

The key factor related to the destruction or adverse modification determination is whether implementation of the proposed Federal action directly or indirectly alters the designated critical habitat in a way that appreciably diminishes the value of the critical habitat as a whole for the conservation of the listed species. As discussed above, the role of critical habitat is to support physical or biological features essential to the conservation of a listed species and provide for the conservation of the species.

Section 4(b)(8) of the Act requires that our Federal Register notices “shall, to the maximum extent practicable also include a brief description and evaluation of those activities (whether public or private) which, in the opinion of the Secretary, if undertaken may adversely modify [critical] habitat, or may be affected by such designation.” Activities that may be affected by designation of critical habitat for the Guadalupe fatmucket, Texas fatmucket, Texas fawnsfoot, Guadalupe orb, Texas pimpleback, Balcones spike, and false spike include those that may affect the physical or biological features of these seven central Texas mussels’ critical habitat (see Physical or Biological Features Essential to the Conservation of the Species).

#### **Exemptions**

##### *Application of Section 4(a)(3) of the Act*

Section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) provides that the Secretary shall not designate as critical habitat any lands or other geographical areas owned or controlled by the Department of Defense (DoD), or designated for its use, that are subject to an integrated natural resources management plan (INRMP) prepared under section 101 of the Sikes Act Improvement Act of 1997 (16 U.S.C. 670a), if the Secretary determines in writing that such plan provides a benefit to the species for which critical habitat is proposed for designation. There are no DoD lands with a completed INRMP

within the final critical habitat designation.

#### Consideration of Impacts Under Section 4(b)(2) of the Act

Section 4(b)(2) of the Act states that the Secretary shall designate and make revisions to critical habitat on the basis of the best available scientific data after taking into consideration the economic impact, national security impact, and any other relevant impact of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. Exclusion decisions are governed by the regulations at 50 CFR 424.19 and the Policy Regarding Implementation of Section 4(b)(2) of the Endangered Species Act (hereafter, the “2016 Policy”; 81 FR 7226, February 11, 2016)—both of which were developed jointly with the National Marine Fisheries Service (NMFS). We also refer to a 2008 Department of the Interior Solicitor’s opinion entitled, “The Secretary’s Authority to Exclude Areas from a Critical Habitat Designation under Section 4(b)(2) of the Endangered Species Act” (M–37016). We explain each decision to exclude areas, as well as decisions not to exclude, to demonstrate that the decision is reasonable.

The Secretary may exclude any particular area if she determines that the benefits of such exclusion outweigh the benefits of including such area as part of the critical habitat, unless she determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species. In making the determination to exclude a particular area, the statute on its face, as well as the legislative history, are clear that the Secretary has broad discretion regarding which factor(s) to use and how much weight to give to any factor.

We describe below the process that we undertook for deciding whether to exclude any areas—taking into consideration each category of impacts and our analysis of the relevant impacts.

#### Exclusions Based on Economic Impacts

Section 4(b)(2) of the Act and its implementing regulations require that we consider the economic impact that may result from a designation of critical habitat. In order to consider economic impacts, we prepared an incremental effects memorandum (IEM) and screening analysis which, together with our narrative and interpretation of effects, we consider our economic

analysis of the critical habitat designation and related factors (IEc 2019, entire). The analysis, dated December 4, 2019, was made available for public review from August 26, 2021, through October 25, 2021 (see 86 FR 47916). The economic analysis addressed probable economic impacts of critical habitat designation for the central Texas mussels. Following the close of the comment period, we reviewed and evaluated all information submitted during the comment period that may pertain to our consideration of the probable incremental economic impacts of this critical habitat designation. Additional information relevant to the probable incremental economic impacts of critical habitat designation for the seven central Texas mussels is summarized below and available in the screening analysis (IEc 2019, entire), available at <https://www.regulations.gov>.

Executive Orders (E.O.s) 12866 and 13563 direct Federal agencies to assess the costs and benefits of available regulatory alternatives in quantitative (to the extent feasible) and qualitative terms. Executive Order 14094 reaffirms the principles of E.O. 12866 and E.O. 13563 and states that regulatory analysis should facilitate agency efforts to develop regulations that serve the public interest, advance statutory objectives, and are consistent with E.O. 12866, E.O. 13563, and the Presidential Memorandum of January 20, 2021 (Modernizing Regulatory Review). Consistent with the E.O. regulatory analysis requirements, our effects analysis under the Act may take into consideration impacts to both directly and indirectly affected entities, where practicable and reasonable. If sufficient data are available, we assess to the extent practicable the probable impacts to both directly and indirectly affected entities. As part of our screening analysis, we considered the types of economic activities that are likely to occur within the areas affected by the critical habitat designations. In our December 4, 2019, IEM describing probable incremental economic impacts that may result from the designations, we first identified probable incremental economic impacts associated with each of the following categories of activities: (1) Federal lands management (National Park Service, U.S. Forest Service, Department of Defense); (2) agriculture; (3) forest management/silviculture/timber; (4) development; (5) recreation; (6) restoration activities; and (7) transportation. We considered each industry or category individually. Additionally, we considered whether

the activities have any Federal involvement. Critical habitat designation generally will not affect activities that do not have any Federal involvement; under the Act, designation of critical habitat only affects activities conducted, funded, permitted, or authorized by Federal agencies. When this rule is effective (see **DATES**, above), in areas where the central Texas mussels are present, under section 7 of the Act, Federal agencies will be required to consult with the Service on activities they fund, permit, or implement that may affect the species. Consultations to avoid the destruction or adverse modification of critical habitat will be incorporated into the existing consultation process.

In our IEM, we attempted to clarify the distinction between the effects that result from the species being listed and those attributable to the critical habitat designations (*i.e.*, difference between the jeopardy and adverse modification standards) for the central Texas mussels. Because the designation of critical habitat is being promulgated concurrently with the listing, it has been our experience that it is more difficult to discern which conservation efforts are attributable to the species being listed and those which will result solely from the designation of critical habitat. However, the following specific circumstances in this case help to inform our evaluation: (1) The essential physical or biological features identified for critical habitat are the same features essential for the life requisites of the species, and (2) any actions that would result in sufficient harm or harassment to constitute jeopardy to the central Texas mussels would also likely adversely affect the essential physical or biological features of critical habitat. The IEM outlines our rationale concerning this limited distinction between baseline conservation efforts and incremental impacts of the designations of critical habitat for these species. This evaluation of the incremental effects has been used as the basis to evaluate the probable incremental economic impacts of these designations of critical habitat.

The critical habitat designations for the central Texas mussels total approximately 1,577.5 river mi (2,538.7 river km) in 20 units with a combination of occupied and unoccupied areas. In occupied areas, any actions that may affect the species or their habitat would likely also affect critical habitat, and it is unlikely that any additional conservation efforts would be required to address the adverse modification standard over and above those recommended as necessary to avoid

jeopardizing the continued existence of the species. Therefore, the only additional costs that are expected in the occupied critical habitat designations are administrative costs, due to the fact that this additional analysis will require time and resources by both the Federal action agency and the Service. However, it is believed that, in most circumstances, these costs will not reach the threshold of “significant” under E.O. 12866. We anticipate incremental costs of section 7 consultations in occupied critical habitat to total less than \$75,000 per year.

In unoccupied critical habitat, any costs of section 7 consultations will not be incurred due to the listing of the species, but instead due to the critical habitat designation. We are designating four subunits that are currently unoccupied by the central Texas mussels. We anticipate approximately five new formal section 7 consultations to occur in the next 10 years in these subunits. Considering the costs of formal consultation as well as project modifications that arise from consultation, we project consultations in unoccupied critical habitat to cost approximately \$15,000 per consultation.

In total, in both occupied and unoccupied critical habitat, we expect the total cost of critical habitat designations not to exceed \$82,500 per year.

We considered the economic impacts of the critical habitat designation. The Secretary is not exercising her discretion to exclude any areas from this designation of critical habitat for the seven central Texas mussels based on economic impacts.

#### *Exclusions Based on Impacts on National Security and Homeland Security*

In preparing this rule, we determined that there are no lands within the designated critical habitat for the central Texas mussels that are owned or managed by the DoD or Department of Homeland Security, and, therefore, we anticipate no impact on national security or homeland security. We did not receive any additional information during the public comment period for the proposed designation regarding impacts of the designation on national security or homeland security that would support excluding any specific areas from the final critical habitat designation under authority of section 4(b)(2) and our implementing regulations at 50 CFR 424.19, as well as the 2016 Policy.

#### *Exclusions Based on Other Relevant Impacts*

Under section 4(b)(2) of the Act, we consider any other relevant impacts, in addition to economic impacts and impacts on national security discussed above. To identify other relevant impacts that may affect the exclusion analysis, we consider a number of factors, including whether there are permitted conservation plans covering the species in the area such as HCPs, safe harbor agreements, or CCAAs, or whether there are non-permitted conservation agreements and partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at whether Tribal conservation plans or partnerships, Tribal resources, or government-to-government relationships of the United States with Tribal entities may be affected by the designation. We also consider any State, local, social, or other impacts that might occur because of the designation.

When identifying the benefits of inclusion for an area, we consider the additional regulatory benefits that area would receive due to the protection from destruction or adverse modification as a result of actions with a Federal nexus, the educational benefits of mapping essential habitat for recovery of the listed species, and any benefits that may result from a designation due to State or Federal laws that may apply to critical habitat.

In the case of Texas fawnsfoot, Texas pimpleback, and Balcones spike, the benefits of critical habitat include public awareness of the presence of these species and the importance of habitat protection, and, where a Federal nexus exists, increased habitat protection for Texas fawnsfoot, Texas pimpleback, and Balcones spike due to protection from destruction or adverse modification of critical habitat.

When identifying the benefits of exclusion, we consider, among other things, whether exclusion of a specific area is likely to result in conservation, or in the continuation, strengthening, or encouragement of partnerships. Additionally, continued implementation of an ongoing management plan that provides conservation equal to or more than the protections that result from a critical habitat designation would reduce those benefits of including that specific area in the critical habitat designation.

We evaluate the existence of a conservation plan when considering the benefits of inclusion. We consider a variety of factors, including, but not limited to, whether the plan is finalized;

how it provides for the conservation of the essential physical or biological features; whether there is a reasonable expectation that the conservation management strategies and actions contained in a management plan will be implemented into the future; whether the conservation strategies in the plan are likely to be effective; and whether the plan contains a monitoring program or adaptive management to ensure that the conservation measures are effective and can be adapted in the future in response to new information.

After identifying the benefits of inclusion and the benefits of exclusion, we carefully weigh the two sides to evaluate whether the benefits of exclusion outweigh those of inclusion. If our analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, we then determine whether exclusion would result in extinction of the species. If exclusion of an area from critical habitat will result in extinction, we will not exclude it from the designation.

Based on the information provided by entities seeking exclusion, as well as additional public comments we received, and the best scientific data available, we evaluated whether certain river mi in units TXFF-3, TXFF-4, TXFF-6, TXFF-7, TXFF-8, TXPB-6, and BASP-1 (see table 16, below) are appropriate for exclusion from this final designation under section 4(b)(2) of the Act. This analysis indicates that the benefits of excluding areas from the final designation outweigh the benefits of designating those areas as critical habitat; thus, the Secretary is exercising her discretion to exclude the areas from the final designation. In the paragraphs below, we provide a detailed balancing analysis of the areas being excluded under section 4(b)(2) of the Act.

#### *Private or Other Non-Federal Conservation Plans Related to Permits Under Section 10 of the Act*

Habitat conservation plans (HCPs) for incidental take permits under section 10(a)(1)(B) of the Act provide for partnerships with non-Federal entities to minimize and mitigate impacts to listed species and their habitats. In some cases, HCP permittees agree to do more for the conservation of the species and their habitats on private lands than designation of critical habitat would provide alone. We place great value on the partnerships that are developed during the preparation and implementation of HCPs.

Candidate conservation agreements with assurances (CCAAs) and safe harbor agreements (SHAs) are voluntary agreements designed to conserve

candidate and listed species, respectively, on non-Federal lands. In exchange for actions that contribute to the conservation of species on non-Federal lands, participating property owners are covered by an “enhancement of survival” permit under section 10(a)(1)(A) of the Act, which authorizes incidental take of the covered species that may result from implementation of conservation actions, specific land uses, and, in the case of SHAs, the option to return to a baseline condition under the agreements. We also provide enrollees assurances that we will not impose further land-, water-, or resource-use restrictions, or require additional commitments of land, water, or finances, beyond those agreed to in the agreements.

When we undertake a discretionary section 4(b)(2) exclusion analysis based on permitted conservation plans such as CCAAs, SHAs, and HCPs, we anticipate consistently excluding such areas if incidental take caused by the activities in those areas is covered by the permit under section 10 of the Act and the CCAA/SHA/HCP meets all of the following three factors (see the 2016 Policy for additional details):

a. The permittee is properly implementing the CCAA/SHA/HCP and is expected to continue to do so for the term of the agreement. A CCAA/SHA/HCP is properly implemented if the permittee is, and has been, fully implementing the commitments and provisions in the CCAA/SHA/HCP, implementing agreement, and permit.

b. The species for which critical habitat is being designated is a covered species in the CCAA/SHA/HCP, or very similar in its habitat requirements to a covered species. The recognition that we extend to such an agreement depends on the degree to which the conservation measures undertaken in the CCAA/SHA/HCP would also protect the habitat features of the similar species.

c. The CCAA/SHA/HCP specifically addresses that species’ habitat and meets the conservation needs of the species in the planning area.

We conducted exclusion analyses on the BRA Agreement, LCRA Agreement, and TRA Agreement, which are presented below.

The Brazos River Authority Candidate Conservation Agreement With Assurances for the Balcones Spike and Texas Fawnsfoot in the Brazos River Basin

We have determined that the BRA Agreement fulfills the above criteria, through the following actions:

(i) The permittee (BRA) has implemented or is in the process of implementing conservation measures agreed upon as part of the CCAA, including, but not limited to, conducting knowledge gap surveys, providing public comment on projects in the basin that may affect the covered species or their habitats, and preparing appropriate drought contingency and long-term monitoring plans.

(ii) The finalized CCAA includes the Balcones spike and Texas fawnsfoot as covered species.

(iii) The CCAA specifically identifies conservation measures to be implemented within habitats included within proposed critical habitat stream reaches. This includes the implementation of avoidance and minimization measures as well as applied research to inform future stream and habitat management efforts.

Therefore, we are excluding certain non-Federal lands covered by this plan that provide for the conservation of the Texas fawnsfoot and Balcones spike, as further explained below.

In 2021, the Brazos River Authority submitted the BRA Agreement as part of an application for an enhancement-of-survival permit under section 10(a)(1)(A) of the Act. The BRA Agreement benefits freshwater mussels and concurrently other native aquatic species in the Brazos River Basin through facilitating studies, minimizing impacts, and conserving populations and habitat. The BRA Agreement is between the Brazos River Authority and the Service (collectively, “the Parties”). The BRA Agreement covers eligible, non-Federal lands within the Brazos River Authority management area in the Brazos River Basin. Non-Federal lands are those lands owned by non-Federal landowners, which include, but are not limited to, State, Tribal, regional, or local governments; private or nonprofit organizations; or private citizens.

The conservation goals of the BRA Agreement are to improve the health of existing populations of the Texas fawnsfoot and Balcones spike in the Brazos River Basin. Under the BRA Agreement, cooperators will avoid construction or other development impacts to instream habitat used by the Texas fawnsfoot and Balcones spike, will complete applied research and advocate for increased water quality and water quantity protections for these covered species, and will assist with habitat conservation for the remainder of the term of the BRA Agreement.

Expected outcomes of implementing the BRA Agreement include the protection and study of instream habitat; completion of modeling that

will guide future efforts to improve water quality and quantity; reduction of erosion and sedimentation; and research and monitoring to gain further understanding of existing Texas fawnsfoot and Balcones spike populations and the threats to them throughout the term of the BRA Agreement. The propagation activities included in the BRA Agreement will also increase probability that the Texas fawnsfoot, Balcones spike, and other covered species will expand their ranges and survive and recruit new cohorts in reintroduced areas. The BRA Agreement in its entirety can be found at: <https://www.fws.gov/library/collections/candidate-conservation-agreement-assurances-balcones-spike-and-texas-fawnsfoot>.

*Benefits of Inclusion—BRA Agreement Proposed Units TXFF-3, TXFF-4, and BASP-1:* The principal benefit of including an area in critical habitat designation is the requirement of Federal agencies to ensure that actions that they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, which is the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. In areas where a listed species occurs, Federal agencies must consult with the Service on actions that may affect a listed species, and refrain from actions that are likely to jeopardize the continued existence of such species. The analysis of effects to critical habitat is a separate and different analysis from that of the effects to the species. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. For some cases, the outcome of these analyses will be similar, because effects to habitat will often result in effects to the species. This situation applies to proposed Units TXFF-3 and TXFF-4 for the Texas fawnsfoot and Unit BASP-1 for the Balcones spike because the species currently occupy the units considered for exclusion. Additionally, the areas that we considered for exclusion do not contain any land where such a nexus would exist. Therefore, the benefit of including these areas in the critical habitat designation to further protect the species and their habitats via consultation is minimal.

In section 9.4 of the CCAA, BRA agrees to conservation measures that implement avoidance and minimization measures in streams reaches included in the proposed critical habitat segments. These measures include: (1) The agreement to not construct additional dams in the mainstem Brazos River or Little River; (2) the agreement to not

sponsor any infrastructure or diversion projects in Zone A (includes portions of the Little River, San Gabriel River, or Brushy Creek); and (3) the agreement to conduct the necessary mussel surveys in Zones B and C to guide placement of infrastructure to minimize disturbance to populations of covered species and their habitats. The CCAA also notes that if new populations of covered species are discovered in the basin, conservation zones and the associated avoidance and minimization measures will be reevaluated. Due to the implementation of these avoidance and minimization measures for the covered species and their habitats, the benefit of including these proposed units in the final critical habitat designation to further protect the species and its habitat via consultation is minimal.

Another possible benefit of designating lands as critical habitat is public education regarding the potential conservation value of an area that may help focus conservation efforts on areas of high conservation value for certain species. We consider any information about the Texas fawnsfoot, Balcones spike, and their habitats that reaches a wide audience, including parties engaged in conservation activities, to be valuable. Designation of critical habitat would provide educational benefits by informing Federal agencies and the public about the presence of listed species for all units.

In summary, we find that the benefits of inclusion of approximately 413.8 river mi (666.0 river km) in proposed Units TXFF-3 and TXFF-4 of waterways within the Brazos River Basin for the Texas fawnsfoot and approximately 79.2 river mi (127.5 river km) in proposed Unit BASP-1 of waterways within the Brazos River Basin for the Balcones spike are educational benefits for the Texas fawnsfoot, Balcones spike, and their habitats.

*Benefits of Exclusion—BRA Agreement Proposed Units TXFF-3, TXFF-4, and BASP-1:* The benefits of excluding 413.8 river mi (666.0 river km) in the Brazos River Basin for the Texas fawnsfoot and 79.2 river mi (127.5 river km) in the Brazos River Basin for the Balcones spike under the BRA Agreement from the designation of critical habitat are substantial and include: (1) Continuance and strengthening of our effective working relationship with partners to promote voluntary, proactive conservation of the Texas fawnsfoot, Balcones spike, and their habitats; (2) allowance for continued meaningful collaboration and cooperation in working toward species recovery, including conservation

benefits that might not otherwise occur; and (3) encouragement of developing additional conservation and management plans in the future for other federally listed and sensitive species.

Partnerships with non-Federal landowners are vital to the conservation of at-risk species, especially on non-Federal lands; therefore, the Service is committed to supporting and encouraging such partnerships through the recognition of positive conservation contributions. TPWD reviewed the BRA Agreement while it was in development and has ensured the identified conservation activities are necessary and advisable. In the case considered here, excluding these areas from critical habitat will help foster the partnerships the landowners and land managers in question have developed with Federal and State agencies and local conservation organizations; will encourage the continued implementation of voluntary conservation actions for the benefit of the Texas fawnsfoot, Balcones spike, and their habitats on these lands; and may also serve as a model and aid in fostering future cooperative relationships with other parties here and in other locations for the benefit of other endangered or threatened species. Therefore, we consider the positive effect of excluding from critical habitat areas managed by active conservation partners to be a significant benefit of exclusion.

*Benefits of Exclusion Outweigh the Benefits of Inclusion—BRA Agreement Proposed Units TXFF-3, TXFF-4, and BASP-1:* We evaluated the exclusion of 413.8 river mi (666.0 river km) of waterways adjacent to private land for the Texas fawnsfoot and 79.2 river mi (127.5 river km) of waterways adjacent to private land for the Balcones spike within the areas covered by the BRA Agreement from our designation of critical habitat, and we determined the benefits of excluding these lands outweigh the benefits of including them as critical habitat for the Texas fawnsfoot and Balcones spike.

The BRA CCAA includes a variety of management, communication and education, and applied research conservation measures targeting these excluded critical habitat units. Some of these measures include, but are not limited to, the completion of additional hydrologic modeling on a repeating 5-year basis in the basin to identify the areas of the basin that are at highest risk of drought-associated low flow conditions and associated water management scenarios. As part of the CCAA, the BRA also implemented an

extensive public outreach campaign to inform and educate private landowners of their covered species, the threats that they are experiencing in the basin, and ways in which they can promote the conservation of these species and their habitats. Most importantly, the BRA will maintain environmental flows included in their Water Management Plan and incorporate data from proposed applied research into the thermal tolerances of their covered species into an adaptive management process to provide conservation benefits to the species. The agreement also states that as new data become available regarding the flow needs of the covered species, they will work with the TCEQ to integrate these data into future updates of the Texas Environmental Flow Standards for Surface Water.

We conclude that the additional regulatory and educational benefits of including these lands in the critical habitat designation are relatively small, because of the low likelihood of a Federal nexus occurring on private lands. These benefits are further reduced by the existence of the BRA Agreement and the conservation measures described above, which address many of the threats the species face in this area. We anticipate that there would be little additional Federal regulatory benefit to designating critical habitat for the species on private land because there is a low likelihood that these areas will have Federal activities requiring section 7 consultation. Additionally ongoing management activities as a result of the BRA Agreement obviate any additional requirements pursuant to a consultation that addresses critical habitat. Because any conservation actions that do result from consultations would already be required due to the presence of the species, there would be few or no additional actions required from the presence of critical habitat. Furthermore, the potential educational and informational benefits of critical habitat designation on areas containing the PBFs essential to the conservation of the Texas fawnsfoot and Balcones spike would be minimal, because the Brazos River Authority has demonstrated their knowledge of the species and its habitat needs in the process of developing their partnership with the Service.

In contrast, the benefits derived from excluding the areas managed by these owners and enhancing our partnership with the Brazos River Authority are significant. Because voluntary conservation efforts for the benefit of the species on non-Federal lands are so valuable, the Service considers the maintenance and encouragement of



conservation partnerships to be a significant benefit of exclusion. The development and maintenance of effective working partnerships with non-Federal partners for the conservation of at-risk species is particularly important in areas such as Texas, a State with relatively little Federal landownership but many species of conservation concern. Excluding these areas from critical habitat will help foster the partnerships in question that have been developed with Federal and State agencies and local conservation organizations and will encourage the continued implementation of voluntary conservation actions for the benefit of the Texas fawnsfoot, Balcones spike, and their habitats in the Brazos River Basin. The current active conservation efforts on some of these areas contribute to our knowledge of the species through monitoring and scientific research. In addition, these partnerships not only provide a benefit for the conservation of these species but may also serve as a model and aid in fostering future cooperative relationships with other parties in Texas and in other locations for the benefit of other endangered or threatened species.

We find that excluding areas from critical habitat that are receiving both long-term conservation and management for the purpose of protecting the habitat that supports the Texas fawnsfoot and Balcones spike will preserve our external partnerships in Texas and will encourage future collaboration towards conservation and recovery of listed species. The partnership benefits are significant and outweigh the small potential regulatory, educational, and ancillary benefits of including the land in the final critical habitat designation for the Texas fawnsfoot or Balcones spike. Therefore, the BRA Agreement provides greater protection of habitat for the Texas fawnsfoot and Balcones spike than could be gained through the project-by-project analysis of a critical habitat designation.

*Exclusion Will Not Result in Extinction of the Species—BRA Agreement Proposed Units TXFF-3, TXFF-4, and BASP-1:* We determined that the exclusion of 413.8 river mi (666.0 river km) of waterways adjacent to private land for the Texas fawnsfoot and 79.2 river mi (127.5 river km) of waterways adjacent to private land for the Balcones spike within the boundaries of the Brazos River Basin covered by the BRA Agreement will not result in extinction of the taxa. Protections afforded to the species and their habitat by the BRA Agreement

provide assurances that the species will not go extinct as a result of excluding these lands from the critical habitat designation.

An important consideration as we evaluate these exclusions and their potential effect on the species in question is that critical habitat does not carry with it a regulatory requirement to restore or actively manage habitat for the benefit of listed species; the regulatory effect of critical habitat is only the avoidance of destruction or adverse modification of critical habitat should an action with a Federal nexus occur. It is, therefore, advantageous for the conservation of the species to support the proactive efforts of non-Federal landowners who are contributing to the enhancement of essential habitat features for listed species through exclusion. The jeopardy standard of section 7 of the Act will also provide protection in these occupied areas when there is a Federal nexus. Therefore, based on the above discussion, the Secretary is exercising her discretion to exclude approximately 413.8 river mi (666.0 river km) of waterways from the designation of critical habitat for the Texas fawnsfoot and approximately 79.2 river mi (127.5 river km) of waterways from the designation of critical habitat for the Balcones spike.

Candidate Conservation Agreement With Assurances for the Texas Pimpleback, Texas Fawnsfoot, Texas Fatmucket, and Balcones Spike in the Lower Colorado River Basin Below O.H. Ivie Reservoir

We have determined that the LCRA Agreement fulfills the above criteria, through the following actions:

(i) The permittees (LCRA and LCRA Transmission Services Corporation (TSC)) have implemented or are in the process of implementing conservation measures agreed upon as part of the CCAA, including, but not limited to, the continuation of water-quality monitoring in key reaches of the basin, providing adequate water for environmental flows protection, and funding of applied mussel restoration assessment research for the Texas pimpleback.

(ii) The finalized CCAA includes the Texas pimpleback and Texas fawnsfoot, as well as the Texas fatmucket and Balcones spike, as covered species.

(iii) The CCAA specifically identifies conservation measures to be implemented within habitats included within proposed critical habitat stream reaches. This includes the implementation of avoidance and minimization measures, maintenance of

flows ensuring environmental flows protection, and applied research to inform future population restoration and stream and habitat management efforts.

Therefore, we are excluding certain non-Federal lands covered by this plan that provide for the conservation of the Texas pimpleback and Texas fawnsfoot.

In 2023, the Lower Colorado River Authority (LCRA) and Lower Colorado River Authority Transmission Services Corporation (LCRA TSC) submitted the LCRA Agreement as part of an application for an enhancement-of-survival permit under section 10(a)(1)(A) of the Act. The LCRA Agreement benefits freshwater mussels and concurrently other native aquatic species in the lower Colorado River Basin through facilitating studies, minimizing impacts, and conserving populations and habitat. The LCRA Agreement is between the Lower Colorado River Authority, the Lower Colorado River Authority Transmission Services Corporation, and the Service (collectively, “the Parties”). The LCRA Agreement covers eligible non-Federal lands within the Lower Colorado River Authority management area in the lower Colorado River Basin. Non-Federal lands are those lands owned by non-Federal landowners which include, but are not limited to, State, Tribal, regional, or local governments; private or nonprofit organizations; or private citizens.

The conservation goals of the LCRA Agreement are to improve the health of existing populations of the Texas pimpleback, Texas fawnsfoot, Texas fatmucket, and Balcones spike populations in the lower Colorado River Basin and to reestablish one population of each of the covered species in the lower Colorado River Basin. Under the LCRA Agreement, cooperators will avoid construction or other development impacts to instream habitat available to the Texas pimpleback, Texas fawnsfoot, Texas fatmucket, and Balcones spike; will complete applied research and advocate for increased water quality and water quantity protections for the Texas pimpleback, Texas fawnsfoot, Texas fatmucket, and Balcones spike; and will assist with habitat conservation for the remainder of the term of the LCRA Agreement.

Expected outcomes of implementing the LCRA Agreement include protection and study of instream habitat, completion of studies to guide future efforts to improve water quality and quantity, reduction of erosion and sedimentation, and research and monitoring to gain further

understanding of existing Texas pimpleback, Texas fawnsfoot, Texas fatmucket, and Balcones spike populations and the threats to them throughout the term of the LCRA Agreement. The conservation activities included in the LCRA Agreement increase the probability that the Texas pimpleback, Texas fawnsfoot, Texas fatmucket, and Balcones spike will expand their ranges, survive, and recruit new cohorts. The Agreement in its entirety can be found at: <https://www.fws.gov/media/signed-ccaa-six-species-trinity-river-basin>.

**Benefits of Inclusion—LCRA Agreement Proposed Units TXPB-6 and TXFF-6:** The principal benefit of including an area in a critical habitat designation is the requirement of Federal agencies to ensure that actions that they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, which is the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. In areas where a listed species occurs, Federal agencies must consult with the Service on actions that may affect a listed species, and refrain from actions that are likely to jeopardize the continued existence of such species. The analysis of effects to critical habitat is a separate and different analysis from that of the effects to the species. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. For some cases, the outcome of these analyses will be similar, because effects to habitat will often result in effects to the species. This situation applies to Unit TXPB-6 for the Texas pimpleback and Unit TXFF-6 for the Texas fawnsfoot because the species currently occupy the units considered for exclusion. Critical habitat designation may provide a regulatory benefit for the Texas pimpleback or the Texas fawnsfoot on lands covered under the LCRA Agreement when there is a Federal nexus present for a project that might adversely modify critical habitat. However, the areas that are considered for exclusion do not contain any land where such a Federal nexus would exist.

In section 7.2 of the CCAA, LCRA and LCRA TSC agree to implement avoidance and minimization measures in designated management zones that include reaches of the proposed critical habitat segments. These measures include (1) completing appropriate mussel surveys and relocations in intermittent or perennial Zone A or Zone B stream reaches prior to initiating any disturbances associated with

covered activities; (2) avoiding the placement of any new infrastructure in areas that are occupied by mussel beds unless agreed upon by the Service that the placement is necessary for the implementation of other conservation measures; and (3) implementing appropriate erosion and sediment control measures, minimizing vegetation clearing in riparian zones, and restoring streambanks, streambeds, and vegetation following site-level disturbances. Due to the implementation of these avoidance and minimization measures for the covered species and their habitats as well as the agreement to complete appropriate mussel survey and relocation efforts, the benefit of including these proposed units in the critical habitat designation to further protect the species and its habitat via consultation is minimal.

Another possible benefit of designating lands as critical habitat is public education regarding the potential conservation value of an area that may help focus conservation efforts on areas of high conservation value for certain species. We consider any information about the Texas pimpleback, the Texas fawnsfoot, and their habitats that reaches a wide audience, including parties engaged in conservation activities, to be valuable. Designation of critical habitat would provide educational benefits by informing Federal agencies and the public about the presence of listed species for all units.

In summary, we find that the benefits of inclusion of approximately 108.9 river mi (175.2 river km) in proposed Unit TXPB-6 of waterways within the lower Colorado River Basin for the Texas pimpleback and approximately 121.8 river mi (196.0 river km) in proposed Unit TXFF-6 of waterways within the lower Colorado River Basin for the Texas fawnsfoot are: (1) A regulatory benefit when there is a Federal nexus present for a project that might adversely modify critical habitat; and (2) educational benefits for the Texas pimpleback, Texas fawnsfoot, and their habitats.

**Benefits of Exclusion—LCRA Agreement Proposed Units TXPB-6 and TXFF-6:** The benefits of excluding 108.9 river mi (175.2 river km) in the lower Colorado River Basin for the Texas pimpleback and 121.8 river mi (196.0 river km) in the lower Colorado River Basin for the Texas fawnsfoot under the LCRA Agreement from the designation of critical habitat are substantial and include: (1) Continuance and strengthening of our effective working relationship with partners to promote voluntary, proactive conservation of the

Texas pimpleback, Texas fawnsfoot, and their habitats as opposed to reactive regulation; (2) allowance for continued meaningful collaboration and cooperation in working toward species recovery, including conservation benefits that might not otherwise occur; and (3) encouragement of developing additional conservation and management plans in the future for other federally listed and sensitive species. Additionally, partnerships with non-Federal landowners are vital to the conservation of at-risk species, especially on non-Federal lands; therefore, the Service is committed to supporting and encouraging such partnerships through the recognition of positive conservation contributions. In the case considered here, excluding these areas from critical habitat will help foster the partnerships the landowners and land managers in question have developed with Federal and State agencies and local conservation organizations; will encourage the continued implementation of voluntary conservation actions for the benefit of the Texas pimpleback, the Texas fawnsfoot, and their habitats on these lands; and may also serve as a model and aid in fostering future cooperative relationships with other parties here and in other locations for the benefit of other endangered or threatened species. Therefore, we consider the positive effect of excluding from critical habitat areas managed by active conservation partners to be a significant benefit of exclusion.

**Benefits of Exclusion Outweigh the Benefits of Inclusion—LCRA Agreement Proposed Units TXPB-6 and TXFF-6:** We evaluated the exclusion of 108.9 river mi (175.2 river km) of waterways adjacent to private land for the Texas pimpleback and 121.8 river mi (196.0 river km) of waterways adjacent to private land for the Texas fawnsfoot within the areas covered by the LCRA Agreement from our designation of critical habitat, and we determined the benefits of excluding these areas outweigh the benefits of including them as critical habitat for the Texas pimpleback and the Texas fawnsfoot.

The LCRA CCAA includes a variety of management, communication and education, and applied research conservation measures targeting these excluded critical habitat units. Some of these measures include, but are not limited to, the preparation of a drought management plan and facilitation of a water quality monitoring program in the basin to identify potential areas of stress or stranding of covered mussel species during low flow conditions. As part of

the CCAA, the LCRA and LCRA TSC also committed to providing comments to notifications of proposed construction projects occurring in Conservation Zones A and B where covered mussel species may be present. In these comments, the LCRA and LCRA TSC will include language notifying the responsible parties of the likelihood of presence of the covered species and encourage avoidance of disturbance of the covered species and their habitats. Most importantly, the LCRA and LCRA TSC will maintain environmental flows included in their Water Management Plan and incorporate data from proposed applied research into the thermal tolerances of the covered species into an adaptive management process to provide conservation benefits to the species. The agreement also states that as new data become available regarding the flow needs of the covered species, the LCRA and LCRA TSC will integrate new scientific information in future amendments of their Water Management Plan.

We conclude that the additional regulatory and educational benefits of including these lands in the critical habitat designation are few, because the Act's requirements under section 7 will already apply on these private lands due to the known presence of the species. These benefits are further reduced by the existence of the LCRA Agreement. We anticipate that there would be little additional Federal regulatory benefit to the taxa on private land because there is a low likelihood that those parcels will be negatively affected to any significant degree by Federal activities requiring section 7 consultation, and ongoing management activities indicate there would be no additional requirements pursuant to a consultation that addresses critical habitat that would not already be in place due to the species' presence.

Furthermore, the potential educational and informational benefits of critical habitat designation on areas containing the PBFs essential to the conservation of the Texas pimpleback and the Texas fawnsfoot would be minimal, because the Lower Colorado River Authority has demonstrated their knowledge of the species and their habitat needs in the process of developing their partnerships with the Service.

In contrast, the benefits derived from excluding the areas managed by these owners and enhancing our partnership with the Lower Colorado River Authority is significant. Because voluntary conservation efforts for the benefit of species on non-Federal lands are so valuable, the Service considers

the maintenance and encouragement of conservation partnerships to be a significant benefit of exclusion. The development and maintenance of effective working partnerships with non-Federal partners for the conservation of at-risk species is particularly important in areas such as Texas, a State with relatively little Federal landownership and many species of conservation concern. Excluding these areas from critical habitat will help foster the partnerships in question that have been developed with Federal and State agencies and local conservation organizations and will encourage the continued implementation of voluntary conservation actions for the benefit of the Texas pimpleback, Texas fawnsfoot, and their habitats in the lower Colorado River Basin. The current active conservation efforts on some of these areas contribute to our knowledge of the species through monitoring and scientific research. In addition, these partnerships not only provide a benefit for the conservation of these species but may also serve as a model and aid in fostering future cooperative relationships with other parties in Texas and in other locations for the benefit of other endangered or threatened species.

We find that excluding areas from this critical habitat designation that are receiving both long-term conservation and management for the purpose of protecting the habitat that supports the Texas pimpleback and Texas fawnsfoot will preserve our external partnerships in Texas and will encourage future collaboration towards conservation and recovery of listed species. The partnership benefits are significant and outweigh the small potential regulatory, educational, and ancillary benefits of including the land in the final critical habitat designation for the Texas pimpleback or Texas fawnsfoot. Therefore, the LCRA Agreement provides greater protection of habitat for the Texas pimpleback and the Texas fawnsfoot than could be gained through the project-by-project analysis under a critical habitat designation.

*Exclusion Will Not Result in Extinction of the Species—LCRA Agreement Proposed Units TXPB-6 and TXFF-6:* We determined that the exclusion of 108.9 river mi (175.2 river km) of waterways adjacent to private land for the Texas pimpleback and 121.8 river mi (196.0 river km) of waterways adjacent to private land for the Texas fawnsfoot within the boundaries of the lower Colorado River Basin covered by the LCRA Agreement will not result in extinction of the taxa. Protections afforded to the species and

its habitat by the LCRA Agreement provide assurances that the species will not go extinct as a result of excluding these lands from the critical habitat designation.

An important consideration as we evaluate these exclusions and their potential effect on the species in question is that critical habitat does not carry with it a regulatory requirement to restore or actively manage habitat for the benefit of listed species; the regulatory effect of critical habitat is only the avoidance of destruction or adverse modification of critical habitat should an action with a Federal nexus occur. It is, therefore, advantageous for the conservation of the species to support the proactive efforts of non-Federal landowners who are contributing to the enhancement of essential habitat features for listed species through exclusion. The jeopardy standard of section 7 of the Act will also provide protection in these occupied areas when there is a Federal nexus. Therefore, based on the above discussion, the Secretary is exercising her discretion to exclude approximately 108.9 river mi (175.2 river km) of waterways from the designation of critical habitat for the Texas pimpleback and approximately 121.8 river mi (196.0 river km) of waterways from the designation of critical habitat for the Texas fawnsfoot.

#### Candidate Conservation Agreement With Assurances for Six Species in the Trinity River Basin

We have determined that the TRA Agreement fulfills the above criteria, through the following actions:

(i) The permittees (TRA, North Texas Municipal Water District, City of Dallas, City of Fort Worth) have implemented or are in the process of implementing conservation measures agreed upon as part of the CCAA, including, but not limited to, the continued implementation of large-scale watershed protection plans, participation in the U.S. Army Corps of Engineers Sustainable Rivers Project, and making proactive efforts to protect the aquatic environment. An example of this effort is the implementation of capital improvement programs that include watershed and sewer system modeling to ensure existing infrastructure meets future wastewater needs and reduces the risk of instream habitat degradation.

(ii) The finalized CCAA includes the Texas fawnsfoot as a covered species.

(iii) The CCAA specifically identifies conservation measures to be implemented within habitats included within proposed critical habitat stream reaches. This includes the

implementation of avoidance and minimization measures, maintenance of flows ensuring environmental flows protection, and applied research to inform future population restoration and stream and habitat management efforts.

Therefore, we have determined that the TRA Agreement fulfills the above criteria, and we are excluding certain Federal and non-Federal lands impacted or covered by this plan that provide for the conservation of the Texas fawnsfoot, as further explained below.

In 2023, the Trinity River Authority (TRA) and other permit applicants submitted the TRA Agreement as part of an application for an enhancement-of-survival permit under section 10(a)(1)(A) of the Act. The TRA Agreement benefits freshwater mussels and concurrently other native aquatic species in the Trinity River Basin through research and monitoring, minimization and avoidance of impacts, and conservation of Texas fawnsfoot populations and habitat. The Agreement is between the Trinity River Authority and the Service (collectively “the Parties”). The TRA Agreement covers eligible, non-Federal lands within the Trinity River Basin that are under the control of the Trinity River Authority, or their partners enrolled through certificates of inclusion (covered parties). Non-Federal lands are those lands owned by non-Federal landowners which include, but are not limited to, State, Tribal, regional, or local governments; private or nonprofit organizations; or private citizens. There are 3.4 river mi (5.5 river km) within the larger covered area of the TRA Agreement that are enrolled in the Wetland Reserve Enhancement Partnership (WREP) through the U.S. Department of Agriculture Natural Resources Conservation Service (USDA NRCS). While these river miles are outside of TRA’s authority and are not directly covered under the TRA Agreement, we anticipate that the TRA Agreement’s conservation benefits, in addition to the on-site conservation management activities implemented through the WREP will remain throughout those areas. This is because conservation actions implemented under the TRA Agreement are occurring directly upstream and downstream of those enrolled areas. These stream segments are 2 percent of the total area excluded from critical habitat designation.

The conservation goals of the TRA Agreement include reducing threats to freshwater mussels and improving the viability of Texas fawnsfoot. Under the TRA Agreement, covered parties will

avoid or minimize impacts to instream habitat used by the Texas fawnsfoot, will complete applied research and monitoring, will advocate for increased water quality and water quantity protections for the Texas fawnsfoot, and will assist with habitat conservation and restoration for the 10-year term of the TRA Agreement.

Expected outcomes of implementing the TRA Agreement include the conservation, restoration, and study of instream habitat; completion of studies that will guide future efforts to improve water quality and quantity and to reduce erosion and sedimentation; and research and monitoring to gain further understanding of existing Texas fawnsfoot populations and the threats to them throughout the term of the TRA Agreement. The conservation activities included in the TRA Agreement will increase the viability of Texas fawnsfoot by increasing the resiliency of Texas fawnsfoot populations in the Trinity River Basin. The TRA Agreement in its entirety can be found at: <https://www.fws.gov/media/20231026usfws-final-lcra-ccard-signedlcra-signedpdf>.

**Benefits of Inclusion—TRA Agreement Proposed Units TXFF-7 and TXFF-8:** The principal benefit of including an area in a critical habitat designation is the requirement of Federal agencies to ensure that actions that they fund, authorize, or carry out are not likely to result in the destruction or adverse modification of any designated critical habitat, which is the regulatory standard of section 7(a)(2) of the Act under which consultation is completed. In areas where a listed species occurs, Federal agencies must consult with the Service on actions that may affect a listed species, and refrain from actions that are likely to jeopardize the continued existence of such species. The analysis of effects to critical habitat is a separate and different analysis from that of the effects to the species. Therefore, the difference in outcomes of these two analyses represents the regulatory benefit of critical habitat. For some cases, the outcome of these analyses will be similar, because effects to habitat will often result in effects to the species. This situation applies to Units TXFF-7 and TXFF-8 for the Texas fawnsfoot because the species currently occupies the units considered for exclusion. Critical habitat designation may provide a regulatory benefit for the Texas fawnsfoot on areas covered under the TRA Agreement when there is a Federal nexus present for a project that might adversely modify critical habitat. The WREP program conservation activities focus on wetland restoration in areas that occur

adjacent to the river and do not include instream components. While there may be a Federal nexus for consultation on restoration activities, these activities will not occur within the Ordinary High Water Mark of the river, and therefore will not overlap the areas considered for exclusion.

In section 8.10 of the CCAA, TRA and the other applicants agree to implement avoidance and minimization measures for areas that include the covered species, which include reaches of the proposed critical habitat segments. These measures include (1) the avoidance of mussel beds within defined Conservation Priority Areas when the implementation of covered activities requires Clean Water Act (33 U.S.C. 1251 *et seq.*) section 404 permitting and consultation between the USACE and Service; (2) the completion of appropriate mussel surveys and relocations consistent with the latest Service and TPWD sampling protocols prior to initiating any site-level disturbances; and (3) implementation of appropriate erosion and sediment control measures, minimization of vegetation clearing in riparian zones and streambed disturbances (as feasible), and implementation of natural channel design into stream construction projects. Due to the implementation of these avoidance and minimization measures for the covered species and their habitats, as well as the agreement to complete appropriate mussel survey and relocation efforts, the benefit of including the proposed units in the critical habitat designation to further protect the species and its habitat via consultation is minimal.

Another possible benefit of designating lands as critical habitat is public education regarding the potential conservation value of an area that may help focus conservation efforts on areas of high conservation value. We consider any information about the Texas fawnsfoot and its habitats that reaches a wide audience, including parties engaged in conservation activities, to be valuable. Designation of critical habitat would provide educational benefits by informing Federal agencies and the public about the presence of Texas fawnsfoot in each unit. In summary, we find that the benefits of inclusion of approximately 169.3 river mi (272.5 river km) in proposed Units TXFF-7 and Unit TXFF-8 of waterways within the Trinity River Basin for the Texas fawnsfoot are: (1) A regulatory benefit when there is a Federal nexus present for a project that might adversely modify critical habitat; and (2) educational benefits for the Texas fawnsfoot and its habitat.

*Benefits of Exclusion—TRA Agreement Proposed Units TXFF-7 and TXFF-8:* The benefits of excluding 169.3 river mi (272.5 river km) in the Trinity River Basin for the Texas fawnsfoot under the TRA Agreement from the designation of critical habitat are substantial and include: (1) Continuance and strengthening of our effective working relationship with partners to promote voluntary, proactive conservation of the Texas fawnsfoot and its habitats as opposed to reactive regulation; (2) allowance for continued meaningful collaboration and cooperation in working toward species recovery, including conservation benefits that might not otherwise occur; and (3) encouragement of developing additional conservation and management plans in the future for other federally listed and sensitive species.

According to some, the designation of critical habitat on (or adjacent to) private lands may reduce the likelihood that landowners will support and carry out conservation actions (Main et al. 1999, pp. 1,263–1265; Bean 2002, p. 412). The magnitude of this negative outcome is greatly amplified in situations where active management measures (such as reintroduction, fire management, and control of invasive species) are necessary for species conservation (Bean 2002, pp. 412–414). We find that the exclusion of these specific areas from the critical habitat designation for the Texas fawnsfoot can contribute to the species' recovery and provide a superior level of conservation than critical habitat can provide alone. We find that, where consistent with the discretion provided by the Act, it is necessary to implement policies that provide positive incentives to private landowners to voluntarily conserve natural resources and remove or reduce disincentives to conservation (Wilcove et al. 1996, pp. 1–15; Bean 2002, entire).

Additionally, partnerships with non-Federal landowners are vital to the conservation of at-risk species, especially on non-Federal lands; therefore, the Service is committed to supporting and encouraging such partnerships through the recognition of positive conservation contributions. In the case considered here, excluding these areas from critical habitat will help foster the partnerships that landowners and land managers have developed with Federal and State agencies and local conservation organizations; will encourage the continued implementation of voluntary conservation actions for the benefit of the Texas fawnsfoot and its habitat on these lands; and may also serve as a

model and aid in fostering future cooperative relationships with other parties here and in other locations for the benefit of other endangered or threatened species. Therefore, we consider the positive effect of excluding from critical habitat designation those areas managed by active conservation partners to be a significant benefit of exclusion.

*Benefits of Exclusion Outweigh the Benefits of Inclusion—TRA Agreement Proposed Units TXFF-7 and TXFF-8:* We evaluated the exclusion of 169.3 river mi (272.5 river km) of waterways for the Texas fawnsfoot within the areas covered by the TRA Agreement from our designation of critical habitat, and we determined the benefits of excluding these areas outweigh the benefits of including them as critical habitat for the Texas fawnsfoot.

The TRA CCAA includes a variety of management, communication and education, and applied research conservation measures targeting these excluded critical habitat units. Some of these measures include, but are not limited to, the guaranteed continuation of an instream water quality sampling program that can aid in identifying potential external threats to the covered species or opportunities to implement operational changes that would improve water quality conditions for the covered species. As part of the CCAA, the TRA and other permit applicants also committed to increasing public awareness of the covered species and the threats they face through the development and dissemination of a conservation message, materials, and curricula. These will include language notifying the responsible parties of the likelihood of the presence of the covered species and will encourage avoidance of disturbance of the covered species and their habitats. Most importantly, the TRA Agreement commits to maintaining environmental flows within the basin and includes the implementation of instream flow protections between Lake Livingston and the Coastal Water Authority canal. This targeted effort will ensure there are adequate flows for an 86.5-mile stretch of the Trinity River during times of drought conditions. The TRA Agreement also states that as new data become available regarding the flow needs of the covered species, they will integrate new scientific information in future amendments of their Water Management Plan.

We conclude that the additional regulatory and educational benefits of including these lands in the critical habitat designation are few, because the Act's requirements under section 7 will

already apply on these private lands due to the known presence of the species. These benefits are further reduced by the existence of the TRA Agreement. We anticipate that there would be little additional Federal regulatory benefit to the species on private land because there is a low likelihood that those parcels will be negatively affected to any significant degree by Federal activities requiring section 7 consultation, and ongoing management activities indicate there would be no additional requirements pursuant to a consultation that addresses critical habitat that would not already be in place due to the species' presence.

Furthermore, the potential educational and informational benefits of critical habitat designation on areas containing the PBFs essential to the conservation of the Texas fawnsfoot would be minimal, because the Trinity River Authority has demonstrated its knowledge of the species and the species' habitat needs in the process of developing its partnership with the Service.

In contrast, the benefits derived from excluding the areas managed by TRA and enhancing our partnership with TRA is significant. Because voluntary conservation efforts for the benefit of species on non-Federal lands are so valuable, the Service considers the maintenance and encouragement of conservation partnerships to be a significant benefit of exclusion. The development and maintenance of effective working partnerships with non-Federal partners for the conservation of at-risk species is particularly important in areas such as Texas, a State with relatively little Federal land ownership and many species of conservation concern. Excluding these areas from critical habitat will help foster the partnerships that have been developed with Federal and State agencies and local conservation organizations and will encourage the continued implementation of voluntary conservation actions for the benefit of the Texas fawnsfoot and its habitats in the Trinity River Basin. The current active conservation efforts on these areas contribute to our knowledge of the species through monitoring and scientific research. In addition, these partnerships not only provide a benefit for the conservation of the Texas fawnsfoot but may also serve as a model and aid in fostering future cooperative relationships with other parties in Texas and in other locations for the benefit of other endangered or threatened species.

We find that excluding areas from critical habitat designation that are

receiving both long-term conservation and management for the purpose of protecting the habitat that supports the Texas fawnsfoot will preserve our external partnerships in Texas and will encourage future collaboration towards conservation and recovery of listed species. The partnership benefits are significant and outweigh the small potential regulatory, educational, and ancillary benefits of including the areas in the final critical habitat designation for the Texas fawnsfoot. Therefore, the TRA Agreement provides greater protection of habitat for the Texas fawnsfoot than could be gained through the project-by-project analysis under a critical habitat designation.

*Exclusion Will Not Result in Extinction of the Species—TRA Agreement Proposed Units TXFF-7 and TXFF-8:* We determined that the exclusion of 169.3 river mi (272.5 river km) of waterways for the Texas fawnsfoot within the boundaries of the Trinity River Basin covered by the TRA Agreement will not result in extinction

of the species. Protections afforded to the species and its habitat by the TRA Agreement provide assurances that the species will not go extinct as a result of excluding these lands from the critical habitat designation.

An important consideration as we evaluate these exclusions and their potential effect on the species in question is that critical habitat does not carry with it a regulatory requirement to restore or actively manage habitat for the benefit of listed species; the regulatory effect of critical habitat is only the avoidance of destruction or adverse modification of critical habitat should an action with a Federal nexus occur. It is, therefore, advantageous for the conservation of the species to support the proactive efforts of non-Federal landowners who are contributing to the enhancement of essential habitat features for listed species through exclusion. The jeopardy standard of section 7 of the Act will also provide protection in these occupied areas when there is a Federal nexus.

Therefore, based on the above discussion, the Secretary is exercising her discretion to exclude approximately 169.3 river mi (272.5 river km) of waterways from the designation of critical habitat for the Texas fawnsfoot.

*Summary of Exclusions*

As discussed above, based on the information provided by entities seeking exclusion, existence of private or non-Federal conservation plans, as well as any additional public comments we received, we evaluated whether certain lands in the proposed critical habitat were appropriate for exclusion from this final designation pursuant to section 4(b)(2) of the Act. We are excluding certain areas from critical habitat designation for the Texas fawnsfoot, Texas pimpleback, and Balcones spike; table 16, below, provides the approximate areas (mi, km) that meet the definition of critical habitat but which we are excluding under section 4(b)(2) of the Act from the final critical habitat designation.

TABLE 16—AREAS EXCLUDED BY CRITICAL HABITAT UNIT FOR TEXAS FAWNSFOOT, TEXAS PIMPLEBACK, AND BALCONES SPIKE

Species	Unit	Subunit	Proposed critical habitat (mi (km))	Area excluded (mi (km))	Final critical habitat (mi (km))	
Texas fawnsfoot	TXFF-3: Lower Brazos River	TXFF-3a: Lower Brazos River	340.5 (548.0)	340.5 (548.0)s	0	
		TXFF-3b: Navasota River	38.5 (62.0)	38.5 (62.0)	0	
	TXFF-4: Little River		34.8 (56.0)	34.8 (56.0)	0	
	TXFF-6: Lower Colorado River		121.8 (196.0)	121.8 (196.0)	0	
	TXFF-7: East Fork Trinity River		15.4 (24.8)	15.4 (24.8)	0	
	TXFF-8: Trinity River		153.9 (247.7)	153.9 (247.7)	0	
	Texas pimpleback	TXPB-6: Lower Colorado River		108.9 (175.2)	108.9 (175.2)	0
			BASP-1a: Little River	34.8 (56.0)	34.8 (56.0)	0
Balcones spike	BASP-1: Little River	BASP-1b: San Gabriel River	30.7 (49.4)	30.7 (49.4)	0	
		BASP-1c: Brushy Creek	13.7 (22.1)	13.7 (22.1)	0	

**Required Determinations**

*Regulatory Planning and Review (Executive Orders 12866, 13563, and 14094)*

Executive Order (E.O.) 12866, as reaffirmed by E.O. 13563 and E.O. 14094, provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) will review all significant rules. OIRA has determined that this rule is not significant.

Executive Order 14094 reaffirms the principles of E.O. 12866 and E.O. 13563 and states that regulatory analysis should facilitate agency efforts to develop regulations that serve the public interest, advance statutory objectives, and are consistent with E.O. 12866, E.O. 13563, and the Presidential Memorandum of January 20, 2021 (Modernizing Regulatory Review). Regulatory analysis, as practicable and

appropriate, shall recognize distributive impacts and equity, to the extent permitted by law. E.O. 13563 emphasizes further that regulations must be based on the best available science and that the rulemaking process must allow for public participation and an open exchange of ideas. We have developed this rule in a manner consistent with these requirements.

*Regulatory Flexibility Act (5 U.S.C. 601 et seq.)*

Under the Regulatory Flexibility Act (RFA; 5 U.S.C. 601 et seq.), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA; 5 U.S.C. 801 et seq.), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effects of the rule on small

entities (i.e., small businesses, small organizations, and small government jurisdictions). However, no regulatory flexibility analysis is required if the head of the agency certifies the rule will not have a significant economic impact on a substantial number of small entities. The SBREFA amended the RFA to require Federal agencies to provide the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

According to the Small Business Administration, small entities include small organizations such as independent nonprofit organizations; small governmental jurisdictions, including school boards and city and town governments that serve fewer than 50,000 residents; and small businesses (13 CFR 121.201). Small businesses include manufacturing and mining concerns with fewer than 500

employees, wholesale trade entities with fewer than 100 employees, retail and service businesses with less than \$5 million in annual sales, general and heavy construction businesses with less than \$27.5 million in annual business, special trade contractors doing less than \$11.5 million in annual business, and agricultural businesses with annual sales less than \$750,000. To determine if potential economic impacts to these small entities are significant, we considered the types of activities that might trigger regulatory impacts under this designation as well as types of project modifications that may result. In general, the term “significant economic impact” is meant to apply to a typical small business firm’s business operations.

Under the RFA, as amended, as understood in light of recent court decisions, Federal agencies are required to evaluate the potential incremental impacts of rulemaking on those entities directly regulated by the rulemaking itself; in other words, the RFA does not require agencies to evaluate the potential impacts to indirectly regulated entities. The regulatory mechanism through which critical habitat protections are realized is section 7 of the Act, which requires Federal agencies, in consultation with the Service, to ensure that any action authorized, funded, or carried out by the agency is not likely to destroy or adversely modify critical habitat. Therefore, under section 7, only Federal action agencies are directly subject to the specific regulatory requirement (avoiding destruction and adverse modification) imposed by critical habitat designation. Consequently, it is our position that only Federal action agencies will be directly regulated by this designation. The RFA does not require evaluation of the potential impacts to entities not directly regulated. Moreover, Federal agencies are not small entities. Therefore, because no small entities will be directly regulated by this rulemaking, we certify that this critical habitat designation will not have a significant economic impact on a substantial number of small entities.

During the development of this final rule, we reviewed and evaluated all information submitted during the comment period on the proposed rule (86 FR 47916; August 26, 2021) that may pertain to our consideration of the probable incremental economic impacts of this critical habitat designation. Based on this information, we affirm our certification that this critical habitat designation will not have a significant economic impact on a substantial

number of small entities, and a regulatory flexibility analysis is not required.

#### *Energy Supply, Distribution, or Use—Executive Order 13211*

Executive Order 13211 (Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use) requires agencies to prepare Statements of Energy Effects “to the extent permitted by law” when undertaking actions identified as significant energy actions (66 FR 28355; May 22, 2001). E.O. 13211 defines a “significant energy action” as an action that (i) is a significant regulatory action under E.O. 12866 (or any successor order, including most recently E.O. 14094 (88 FR 21879; Apr. 11, 2023)); and (ii) is likely to have a significant adverse effect on the supply, distribution, or use of energy. This rule is not a significant regulatory action under E.O. 12866 or 14094. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required.

#### *Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.)*

In accordance with the Unfunded Mandates Reform Act (2 U.S.C. 1501 et seq.), we make the following finding:

(1) This rule will not produce a Federal mandate. In general, a Federal mandate is a provision in legislation, statute, or regulation that would impose an enforceable duty upon State, local, or Tribal governments, or the private sector, and includes both “Federal intergovernmental mandates” and “Federal private sector mandates.” These terms are defined in 2 U.S.C. 658(5)–(7). “Federal intergovernmental mandate” includes a regulation that “would impose an enforceable duty upon State, local, or Tribal governments” with two exceptions. It excludes “a condition of Federal assistance.” It also excludes “a duty arising from participation in a voluntary Federal program,” unless the regulation “relates to a then-existing Federal program under which \$500,000,000 or more is provided annually to State, local, and Tribal governments under entitlement authority,” if the provision would “increase the stringency of conditions of assistance” or “place caps upon, or otherwise decrease, the Federal Government’s responsibility to provide funding,” and the State, local, or Tribal governments “lack authority” to adjust accordingly. At the time of enactment, these entitlement programs were: Medicaid; Aid to Families with Dependent Children work programs; Child Nutrition; Food Stamps; Social

Services Block Grants; Vocational Rehabilitation State Grants; Foster Care, Adoption Assistance, and Independent Living; Family Support Welfare Services; and Child Support Enforcement. “Federal private sector mandate” includes a regulation that “would impose an enforceable duty upon the private sector, except (i) a condition of Federal assistance or (ii) a duty arising from participation in a voluntary Federal program.”

The designation of critical habitat does not impose a legally binding duty on non-Federal Government entities or private parties. Under the Act, the only regulatory effect is that Federal agencies must ensure that their actions are not likely to destroy or adversely modify critical habitat under section 7. While non-Federal entities that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency. Furthermore, to the extent that non-Federal entities are indirectly impacted because they receive Federal assistance or participate in a voluntary Federal aid program, the Unfunded Mandates Reform Act would not apply, nor would critical habitat shift the costs of the large entitlement programs listed above onto State governments.

(2) We do not believe that this rule will significantly or uniquely affect small governments because many of the public lands being designated as critical habitat are owned by the State of Texas. This government entity does not fit the definition of “small governmental jurisdiction.” Therefore, a Small Government Agency Plan is not required. Additionally, the public areas not owned by the State of Texas that are being designated as critical habitat are not likely to have a Federal nexus requiring section 7 consultation on designated critical habitat.

#### *Takings—Executive Order 12630*

In accordance with E.O. 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we have analyzed the potential takings implications of designating critical habitat for the central Texas mussels in a takings implications assessment. The Act does not authorize us to regulate private actions on private lands or confiscate private property as a result of critical habitat designation. Designation of critical habitat does not affect land



ownership, or establish any closures, or restrictions on use of or access to the designated areas. Furthermore, the designation of critical habitat does not affect landowner actions that do not require Federal funding or permits, nor does it preclude development of habitat conservation programs or issuance of incidental take permits to permit actions that do require Federal funding or permits to go forward. However, Federal agencies are prohibited from carrying out, funding, or authorizing actions that would destroy or adversely modify critical habitat. A takings implications assessment has been completed and concludes that this designation of critical habitat for the central Texas mussels does not pose significant takings implications for lands within or affected by the designation.

#### *Federalism—Executive Order 13132*

In accordance with E.O. 13132 (Federalism), this rule does not have significant federalism effects. A federalism summary impact statement is not required. In keeping with Department of the Interior and Department of Commerce policy, we requested information from, and coordinated development of this critical habitat designation with, appropriate State resource agencies. From a federalism perspective, the designation of critical habitat directly affects only the responsibilities of Federal agencies. The Act imposes no other duties with respect to critical habitat, either for States and local governments, or for anyone else. As a result, this final rule does not have substantial direct effects either on the States, or on the relationship between the national government and the States, or on the distribution of powers and responsibilities among the various levels of government. The designation may have some benefit to these governments because the areas that contain the features essential to the conservation of the species are more clearly defined, and the physical or biological features of the habitat necessary for the conservation of the species are specifically identified. This information does not alter where and what federally sponsored activities may occur. However, it may assist State and local governments in long-range planning because they no longer have to wait for case-by-case section 7 consultations to occur.

Where State and local governments require approval or authorization from a Federal agency for actions that may affect critical habitat, consultation under section 7(a)(2) of the Act will be required. While non-Federal entities

that receive Federal funding, assistance, or permits, or that otherwise require approval or authorization from a Federal agency for an action, may be indirectly impacted by the designation of critical habitat, the legally binding duty to avoid destruction or adverse modification of critical habitat rests squarely on the Federal agency.

#### *Civil Justice Reform—Executive Order 12988*

In accordance with Executive Order 12988 (Civil Justice Reform), the Office of the Solicitor has determined that this rule will not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We are designating critical habitat in accordance with the provisions of the Act. To assist the public in understanding the habitat needs of the species, this final rule identifies the physical or biological features essential to the conservation of the species. The designated areas of critical habitat are presented on maps, and the rule provides several options for the interested public to obtain more detailed location information, if desired.

#### *Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.)*

This rule does not contain information collection requirements, and a submission to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.) is not required. We may not conduct or sponsor and you are not required to respond to a collection of information unless it displays a currently valid OMB control number.

#### *National Environmental Policy Act (42 U.S.C. 4321 et seq.)*

Regulations adopted pursuant to section 4(a) of the Act are exempt from the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 et seq.) and do not require an environmental analysis under NEPA. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This includes listing, delisting, and reclassification rules, as well as critical habitat designations and species-specific protective regulations promulgated concurrently with a decision to list or reclassify a species as threatened. The courts have upheld this position (e.g., *Douglas County v. Babbitt*, 48 F.3d 1495 (9th Cir. 1995) (critical habitat); *Center for Biological Diversity v. U.S. Fish and Wildlife Service*, 2005 WL 2000928 (N.D. Cal. Aug. 19, 2005) (concurrent 4(d) rule)).

#### *Government-to-Government Relationship With Tribes*

In accordance with the President's memorandum of April 29, 1994 (Government-to-Government Relations with Native American Tribal Governments; 59 FR 22951), Executive Order 13175 (Consultation and Coordination with Indian Tribal Governments), and the Department of the Interior's manual at 512 DM 2, we readily acknowledge our responsibility to communicate meaningfully with federally recognized Tribes on a government-to-government basis. In accordance with Secretaries' Order 3206 of June 5, 1997 (American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the Endangered Species Act), we readily acknowledge our responsibilities to work directly with Tribes in developing programs for healthy ecosystems, to acknowledge that Tribal lands are not subject to the same controls as Federal public lands, to remain sensitive to Indian culture, and to make information available to Tribes. We have determined that no Tribal lands fall within the boundaries of the critical habitat designation for the central Texas mussels, so no Tribal lands will be affected by this designation.

#### **References Cited**

A complete list of references cited in this rulemaking is available on the internet at <https://www.regulations.gov> and upon request from the Austin Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

#### **Authors**

The primary authors of this final rule are the staff members of the Fish and Wildlife Service's Species Assessment Team and the Austin Ecological Services Field Office.

#### **List of Subjects in 50 CFR Part 17**

Endangered and threatened species, Exports, Imports, Plants, Reporting and recordkeeping requirements, Transportation, Wildlife.

#### **Regulation Promulgation**

Accordingly, we amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

#### **PART 17—ENDANGERED AND THREATENED WILDLIFE AND PLANTS**

■ 1. The authority citation for part 17 continues to read as follows:

**Authority:** 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

■ 2. In § 17.11, in paragraph (h), amend the List of Endangered and Threatened Wildlife by adding entries for “Fatmucket, Guadalupe”; “Fatmucket, Texas”; “Fawnsfoot, Texas”; “Orb,

Guadalupe”; “Pimpleback, Texas”; “Spike, Balcones”; and “Spike, False” in alphabetical order under CLAMS to read as follows:

**§ 17.11 Endangered and threatened wildlife.**  
\* \* \* \* \*  
(h) \* \* \*

Common name	Scientific name	Where listed	Status	Listing citations and applicable rules
<b>CLAMS</b>				
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
Fatmucket, Guadalupe .....	<i>Lampsilis bergmanni</i> .....	Wherever found .....	E	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.95(f). <sup>CH</sup>
Fatmucket, Texas .....	<i>Lampsilis bracteata</i> .....	Wherever found .....	E	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.95(f). <sup>CH</sup>
Fawnsfoot, Texas .....	<i>Truncilla macrodon</i> .....	Wherever found .....	T	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.45(c); <sup>4d</sup> 50 CFR 17.95(f). <sup>CH</sup>
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
Orb, Guadalupe .....	<i>Cyclonaias necki</i> .....	Wherever found .....	E	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.95(f). <sup>CH</sup>
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
Pimpleback, Texas .....	<i>Cyclonaias petrina</i> .....	Wherever found .....	E	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.95(f). <sup>CH</sup>
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *
Spike, Balcones .....	<i>Fusconaia iheringi</i> .....	Wherever found .....	E	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.95(f). <sup>CH</sup>
Spike, false .....	<i>Fusconaia mitchelli</i> .....	Wherever found .....	E	89 FR [INSERT <b>Federal Register</b> PAGE WHERE THE DOCUMENT BEGINS], June 4, 2024; 50 CFR 17.95(f). <sup>CH</sup>
* * * * *	* * * * *	* * * * *	* * * * *	* * * * *

■ 3. Amend § 17.45 by adding a paragraph (c) to read as follows:

**§ 17.45 Species-specific rules—snails and clams.**

\* \* \* \* \*

(c) Texas fawnsfoot (*Truncilla macrodon*).

(1) *Prohibitions.* The following prohibitions that apply to endangered wildlife also apply to Texas fawnsfoot. Except as provided under paragraph (c)(2) of this section and §§ 17.4 and 17.5, it is unlawful for any person subject to the jurisdiction of the United States to commit, to attempt to commit, to solicit another to commit, or cause to

be committed, any of the following acts in regard to the Texas fawnsfoot:

- (i) Import or export, as set forth at § 17.21(b) for endangered wildlife.
  - (ii) Take, as set forth at § 17.21(c)(1) for endangered wildlife.
  - (iii) Possession and other acts with unlawfully taken specimens, as set forth at § 17.21(d)(1) for endangered wildlife.
  - (iv) Interstate or foreign commerce in the course of commercial activity, as set forth at § 17.21(e) for endangered wildlife.
  - (v) Sale or offer for sale, as set forth at § 17.21(f) for endangered wildlife.
- (2) *Exceptions from prohibitions.* In regard to this species, you may:

- (i) Conduct activities as authorized by a permit under § 17.32.
- (ii) Take, as set forth at § 17.21(c)(2) through (c)(4) for endangered wildlife.
- (iii) Take as set forth at § 17.31(b).
- (iv) Possess and engage in other acts with unlawfully taken Texas fawnsfoot, as set forth at § 17.21(d)(2) for endangered wildlife.
- (v) Take incidental to an otherwise lawful activity caused by:
  - (A) Channel restoration projects that create natural, physically stable, ecologically functioning streams (or stream and wetland systems) that are reconnected with their groundwater aquifers. To qualify for the exception in this paragraph (c)(2)(v)(A), a channel

restoration project must satisfy all applicable Federal, State, and local permitting requirements. In addition, at least 30 days prior to commencing actual construction within an area designated as critical habitat for the Texas fawnsfoot (see 50 CFR 17.95(f)), notice must be provided to the Service, through the Austin Ecological Services Field Office, of the location and nature of the proposed work to allow the Service to make arrangements for surveys and potential relocation of any mussels that might be adversely affected. You may obtain field office contact information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(B) Bioengineering methods for streambank stabilization using native live stakes (live, vegetative cuttings inserted or tamped into the ground in a manner that allows the stake to take root and grow), native live fascines (live branch cuttings, usually willows, bound together into long, cigar-shaped bundles), or native brush layering (cuttings or branches of easily rooted tree species layered between successive lifts of soil fill). Methods that include the use of quarried rock (riprap) for more than 25 percent of the area within the streambanks or include the use of rock baskets or gabion structures do not qualify for the exception in this paragraph (c)(2)(v)(B). In addition, to reduce streambank erosion and sedimentation into the stream, work using these bioengineering methods qualifies for the exception in this paragraph (c)(2)(v)(B) only if it is performed during base-flow or low-water conditions and when significant rainfall likely to result in significant runoff is not predicted at or upstream of the area where work is proposed for a period of at least 3 days after the work is scheduled to be undertaken. Further, streambank stabilization projects that involve the placement or use of equipment in the stream channels or water do not qualify for the exception in this paragraph (c)(2)(v)(B). To qualify for the exception in this paragraph (c)(2)(v)(B), a project using bioengineering methods must satisfy all applicable Federal, State, and local permitting requirements.

(C) Soil and water conservation practices and riparian and adjacent upland habitat management activities that restore in-stream habitats for the species, restore adjacent riparian habitats that enhance stream habitats for the species, stabilize degraded and eroding stream banks to limit sedimentation and scour of the species' habitats, restore or enhance nearby

upland habitats to limit sedimentation of the species' habitats, and comply with conservation practice standards and specifications and with technical guidelines developed by the Natural Resources Conservation Service for application of the affected habitat types. In addition, at least 30 days prior to commencing soil and water conservation practices within an area designated as critical habitat for the Texas fawnsfoot (see 50 CFR 17.95(f)), notice must be provided to the Service, through the Austin Ecological Services Field Office, of the location and nature of the proposed work to allow the Service to make arrangements for surveys and potential relocation of any mussels that might be adversely affected. You may obtain field office contact information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(D) Presence or abundance surveys for Texas fawnsfoot conducted by individuals who successfully complete and show proficiency by passing the end-of-course test with a score equal to or greater than 90 percent, with 100 percent accuracy in identification of mussel species listed under the Endangered Species Act, in an approved freshwater mussel identification and sampling course (specific to the species and basins in which the Texas fawnsfoot is known to occur), such as that administered by the Service, a State wildlife agency, or qualified university experts. Those individuals exercising the exemption in this paragraph (c)(2)(v)(D) should provide reports to the Service annually on number, location, and date of collection. The exemption in this paragraph (c)(2)(v)(D) does not apply if lethal take or collection is anticipated. The exemption in this paragraph (c)(2)(v)(D) only applies for 5 years from the date of successful course completion.

\* \* \* \* \*

■ 4. In § 17.95, amend paragraph (f) by:

- a. Adding entries for “Guadalupe Fatmucket (*Lampsilis bergmanni*)”, “Texas Fatmucket (*Lampsilis bracteata*)”, and “Texas Fawnsfoot (*Truncilla macrodon*)” immediately following the entry for “Appalachian Elktoe (*Alasmidonta raveneliana*)”;
- b. Adding an entry for “Guadalupe Orb (*Cyclonaias necki*)” immediately following the entry for “Carolina Heelsplitter (*Lasmigona decorata*)”; and
- c. Adding entries for “Texas Pimpleback (*Cyclonaias petrina*)”, “Balcones Spike (*Fusconaia iheringi*)”, and “False Spike (*Fusconaia mitchelli*)” immediately following the entry for

“Georgia Pigtoe (*Pleurobema hanleyianum*)”.

The additions read as follows:

**§ 17.95 Critical habitat—fish and wildlife.**

\* \* \* \* \*  
(f) *Clams and Snails.*

\* \* \* \* \*  
Guadalupe Fatmucket (*Lampsilis bergmanni*)

(1) A critical habitat unit is depicted for Kendall and Kerr Counties, Texas, on the map in this entry.

(2) Within this area, the physical or biological features essential to the conservation of Guadalupe fatmucket consist of the following components within waters and streambeds up to the ordinary high-water mark:

(i) Flowing water at moderate to high rates with sufficient depth to remain sufficiently cool and oxygenated during low-flow periods;

(ii) Substrate including bedrock and boulder crevices, point bars, and vegetated run habitat comprising sand, gravel, and larger cobbles;

(iii) Green sunfish (*Lepomis cyanellus*), bluegill (*L. macrochirus*), largemouth bass (*Micropterus salmoides*), and Guadalupe bass (*M. treculii*) present; and

(iv) Water quality parameters within the following ranges:

(A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);

(B) Salinity less than 2 parts per thousand;

(C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;

(D) Water temperature below 29 °C (84.2 °F); and

(E) Low levels of contaminants.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

(4) Data layers defining the map unit were created on a base of U.S. Geological Survey digital ortho-photo quarter-quadrangles, and the critical habitat unit was then mapped using Universal Transverse Mercator (UTM) Zone 14N coordinates. The map in this entry, as modified by any accompanying regulatory text, establishes the boundaries of the critical habitat designation. The coordinates or plot points or both on which the map is based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by

contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Unit GUFM-1: Guadalupe River Unit; Kendall and Kerr Counties, Texas.

(i) Unit GUFM-1 consists of three subunits:

(A) Subunit GUFM-1a (North Fork Guadalupe River) consists of 6.9 river miles (mi) (11.0 kilometers (km)) in Kerr County, Texas. All of the riparian lands

that border this subunit are in private ownership.

(B) Subunit GUFM-1b (Johnson Creek) consists of 10.1 river mi (16.3 km) in Kerr County, Texas. All of the riparian lands that border this subunit are in private ownership.

(C) Subunit GUFM-1c (Guadalupe River) consists of 35.2 river mi (56.7 km) in Kendall and Kerr Counties, Texas. This subunit is composed of lands in

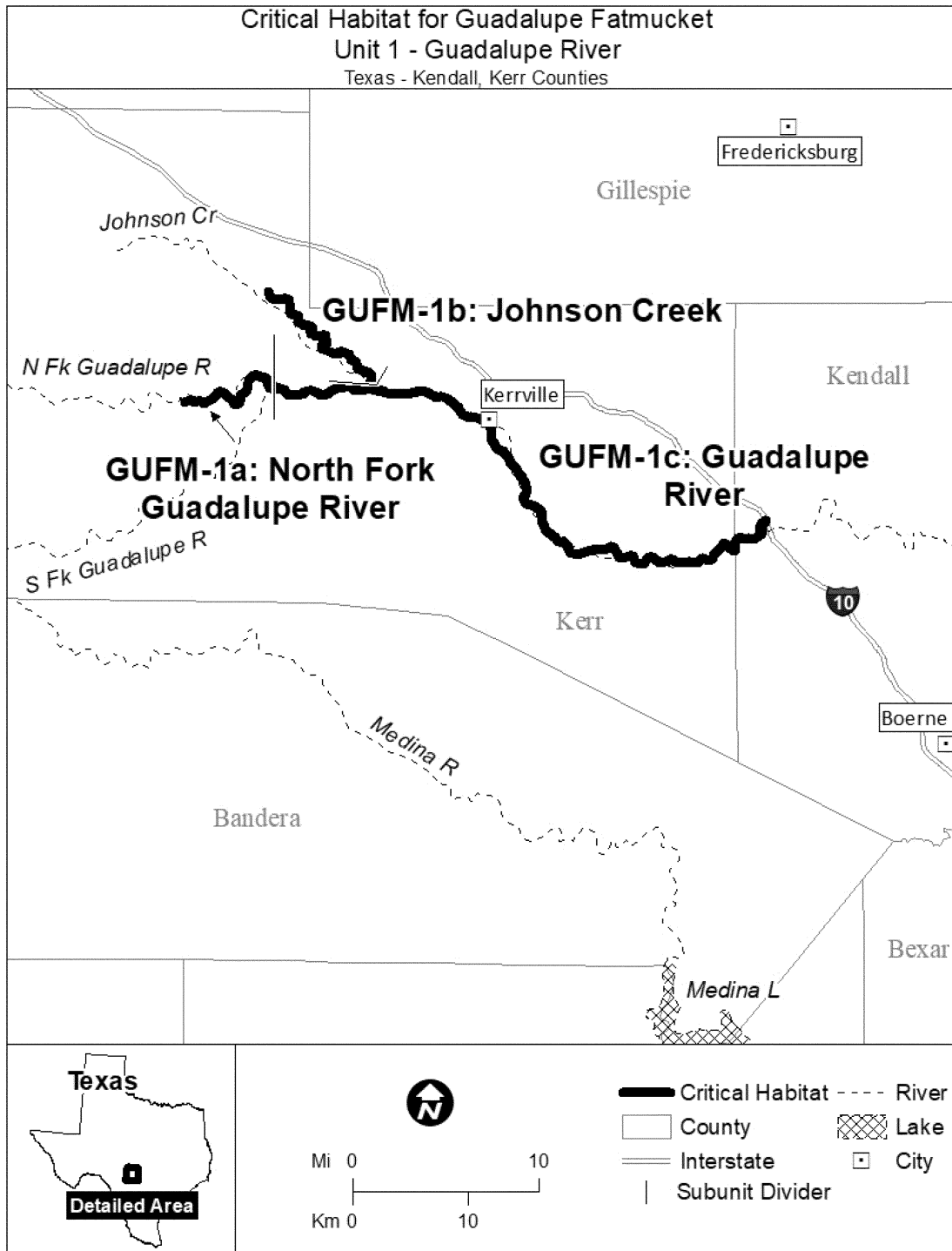
State/local government (7 percent) and private (93 percent) ownership.

(ii) Unit GUFM-1 includes stream channel up to bankfull height.

(iii) Map of Unit GUFM-1 follows:

Figure 1 to Guadalupe Fatmucket (*Lampsilis bergmanni*) paragraph (5)(iii)

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## BILLING CODE 4333-15-C

Texas Fatmucket (*Lampsilis bracteata*)

(1) Critical habitat units are depicted for Blanco, Gillespie, Hays, Kimble, Llano, Mason, McCulloch, Menard, Runnels, San Saba, Sutton, and Travis Counties, Texas, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the conservation of Texas fatmucket consist of the following components within waters and streambeds up to the ordinary high-water mark:

(i) Flowing water at moderate to high rates with sufficient depth to remain sufficiently cool and oxygenated during low-flow periods;

(ii) Substrate including bedrock and boulder crevices, point bars, and vegetated run habitat comprising sand, gravel, and larger cobbles;

(iii) Green sunfish (*Lepomis cyanellus*), bluegill (*L. macrochirus*),

largemouth bass (*Micropterus salmoides*), and Guadalupe bass (*M. treculii*) present; and

(iv) Water quality parameters within the following ranges:

(A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);

(B) Salinity less than 2 parts per thousand;

(C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;

(D) Water temperature below 29 °C (84.2 °F); and

(E) Low levels of contaminants.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

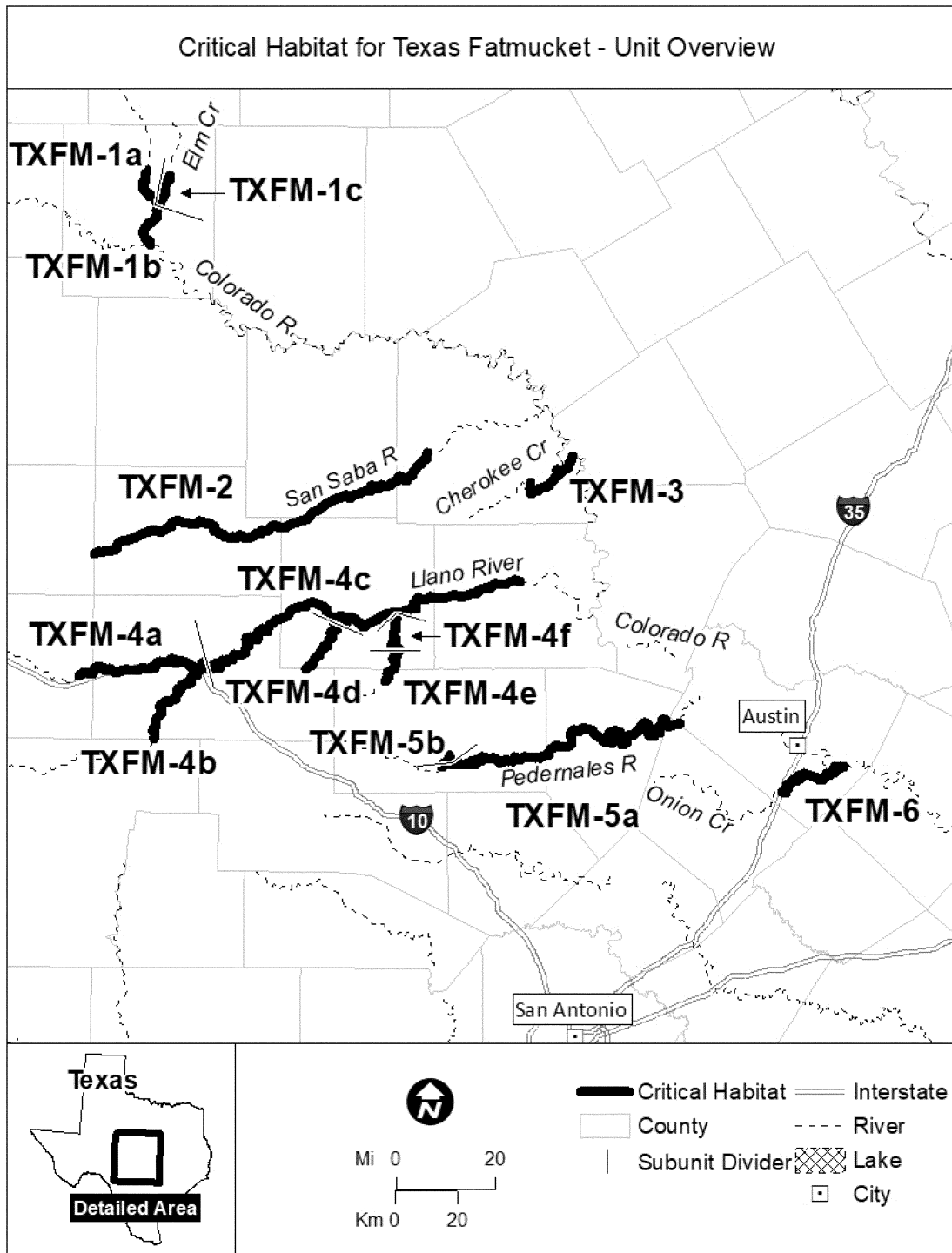
(4) Data layers defining the map units were created on a base of U.S. Geological Survey digital ortho-photo quarter-quadrangles, and the critical

habitat units were then mapped using Universal Transverse Mercator (UTM) Zone 14N coordinates. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which the maps are based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Index map of critical habitat units for the Texas fatmucket follows:

Figure 1 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (5)

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(6) Unit TXFM-1: Elm Creek Unit; Runnels County, Texas.

(i) Unit TXFM-1 consists of three subunits:

(A) Subunit TXFM-1a (Bluff Creek) consists of 11.6 river miles (mi) (18.7 river kilometers (km)) in Runnels County, Texas. All of the riparian lands that border this subunit are in private ownership.

(B) Subunit TXFM-1b (Lower Elm Creek) consists of 12.3 river mi (19.8 km) in Runnels County, Texas. This subunit is composed of lands in State/local government (3 percent) and private (97 percent) ownership.

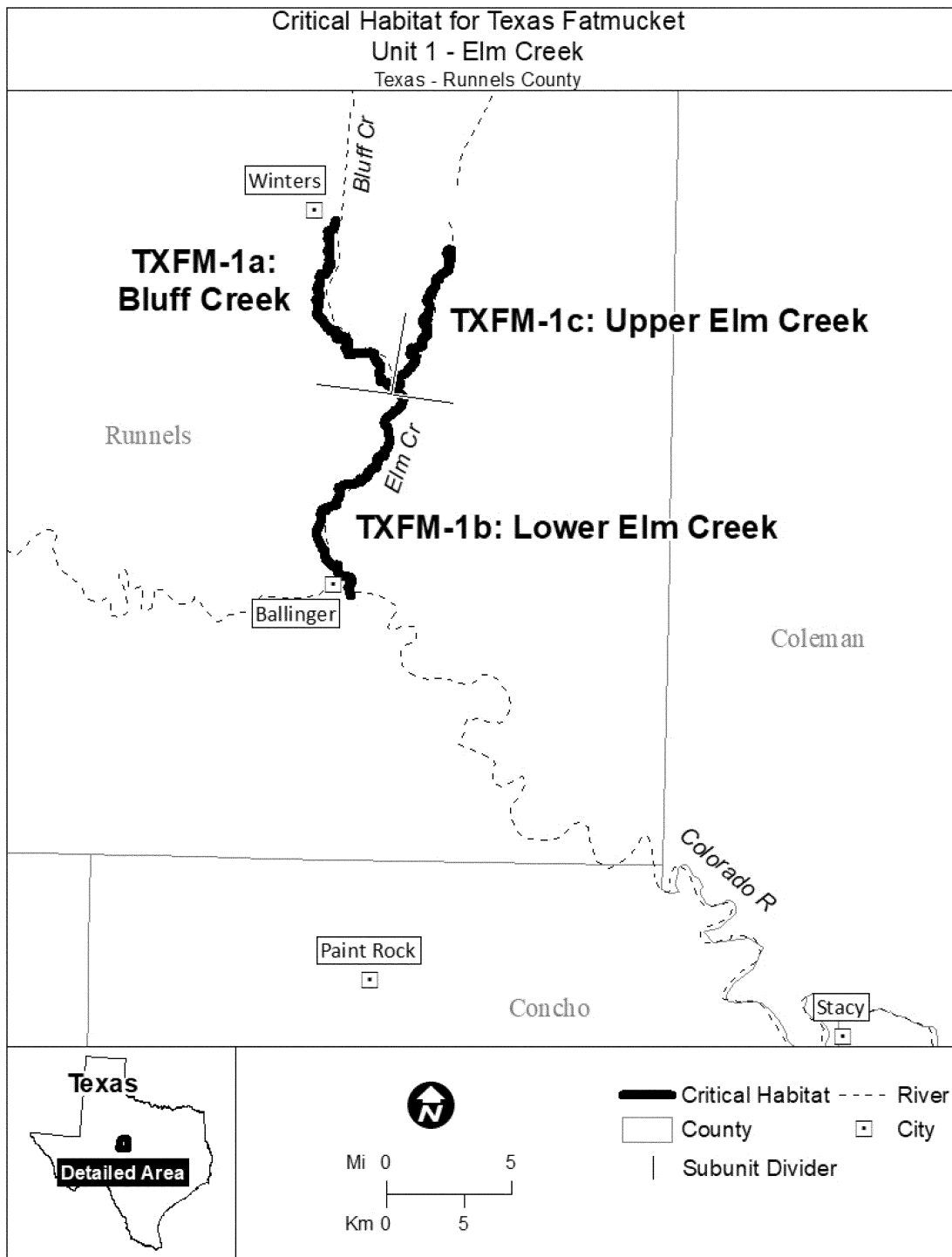
(C) Subunit TXFM-1c (Upper Elm Creek) consists of 8.9 river mi (14.4 km) in Runnels County, Texas. All of the

riparian lands that border this subunit are in private ownership.

(ii) Unit TXFM-1 includes stream channel up to bankfull height.

(iii) Map of Unit TXFM-1 follows:

Figure 2 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (6)(iii)



(7) Unit TxFM-2: San Saba River Unit; Mason, McCulloch, Menard, and San Saba Counties, Texas.

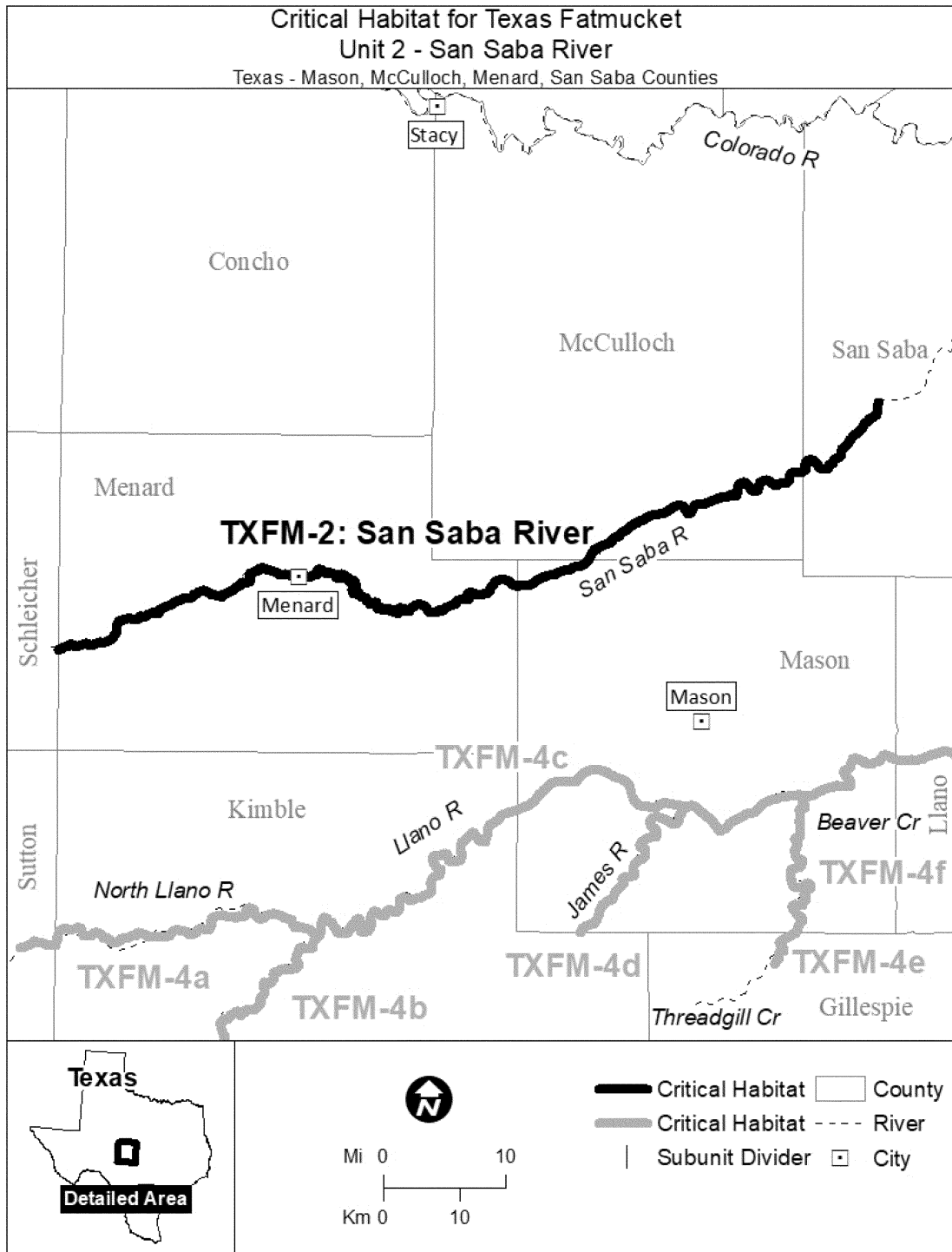
(i) Unit TxFM-2 consists of 90.8 river mi (146.1 km) in Mason, McCulloch,

Menard, and San Saba Counties, Texas. All of the riparian lands that border this unit are in private ownership.

(ii) Unit TxFM-2 includes stream channel up to bankfull height.

(iii) Map of TxFM-2 follows: Figure 3 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (7)(iii)





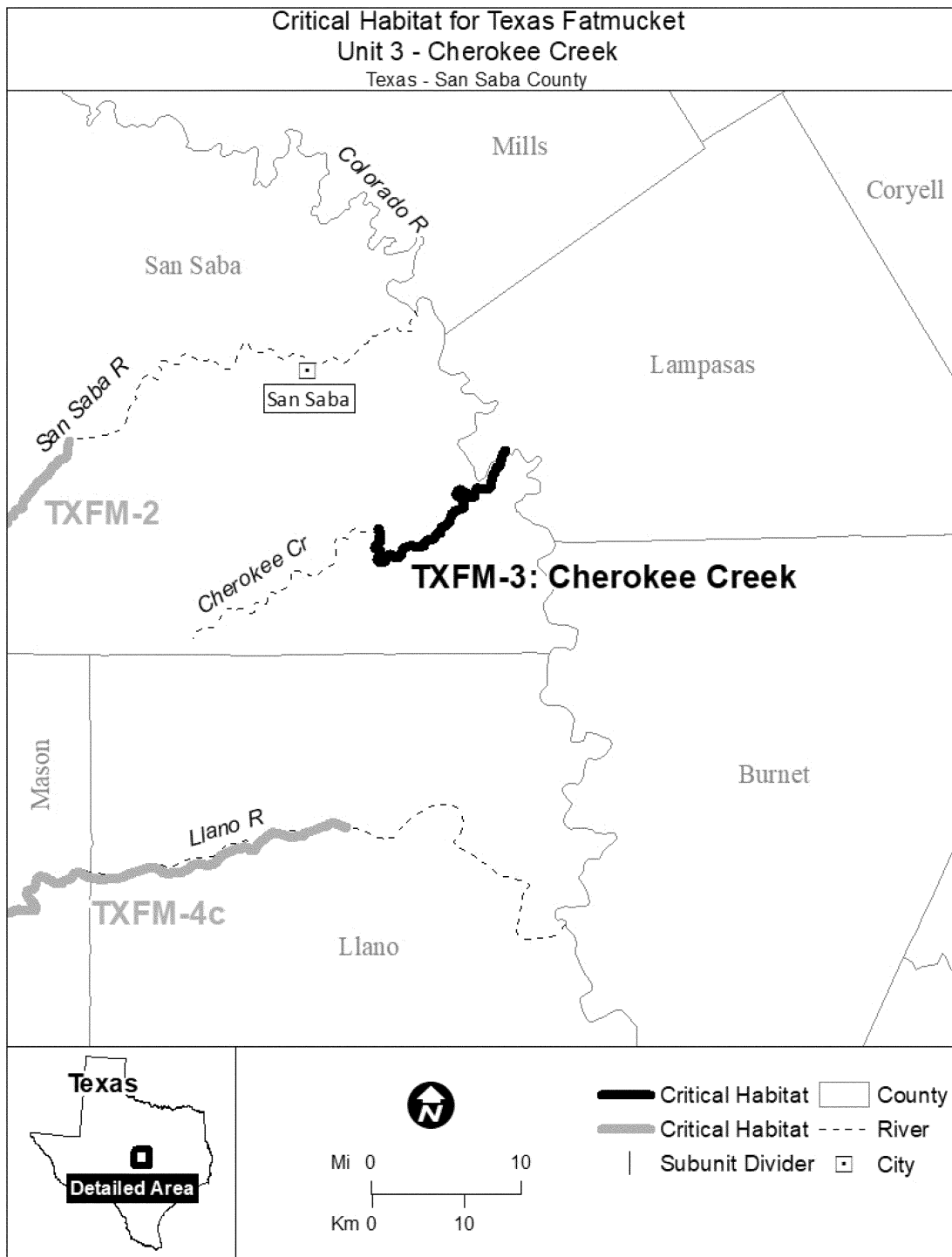
(8) Unit TxFM-3: Cherokee Creek Unit; San Saba County, Texas.

(i) Unit TxFM-3 consists of 17.8 river mi (28.6 km) in San Saba County, Texas.

All of the riparian lands that border this unit are in private ownership.

(ii) Unit TxFM-3 includes stream channel up to bankfull height.

(iii) Map of Unit TxFM-3 follows: Figure 4 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (8)(iii)



(9) Unit TxFM-4: Llano River Unit; Gillespie, Kimble, Llano, Mason, and Sutton Counties, Texas.

(i) Unit TxFM-4 consists of six subunits:

(A) Subunit TxFM-4a (North Llano River) consists of 30.2 river mi (48.7 km) in Sutton and Kimble Counties, Texas. All of the riparian lands that border this subunit are in private ownership.

(B) Subunit TxFM-4b (South Llano River) consists of 22.5 river mi (36.2 km)

in Kimble County, Texas. This subunit is composed of lands in State/local government (10 percent) and private (90 percent) ownership.

(C) Subunit TxFM-4c (Llano River) consists of 90.9 river mi (146.4 km) in Kimble, Llano, and Mason Counties, Texas. This subunit is composed of lands in State/local government (0.5 percent) and private (99.5 percent) ownership.

(D) Subunit TxFM-4d (James River) consists of 18.3 river mi (29.4 km) in Kimble and Mason Counties, Texas. All of the riparian lands that border this subunit are in private ownership.

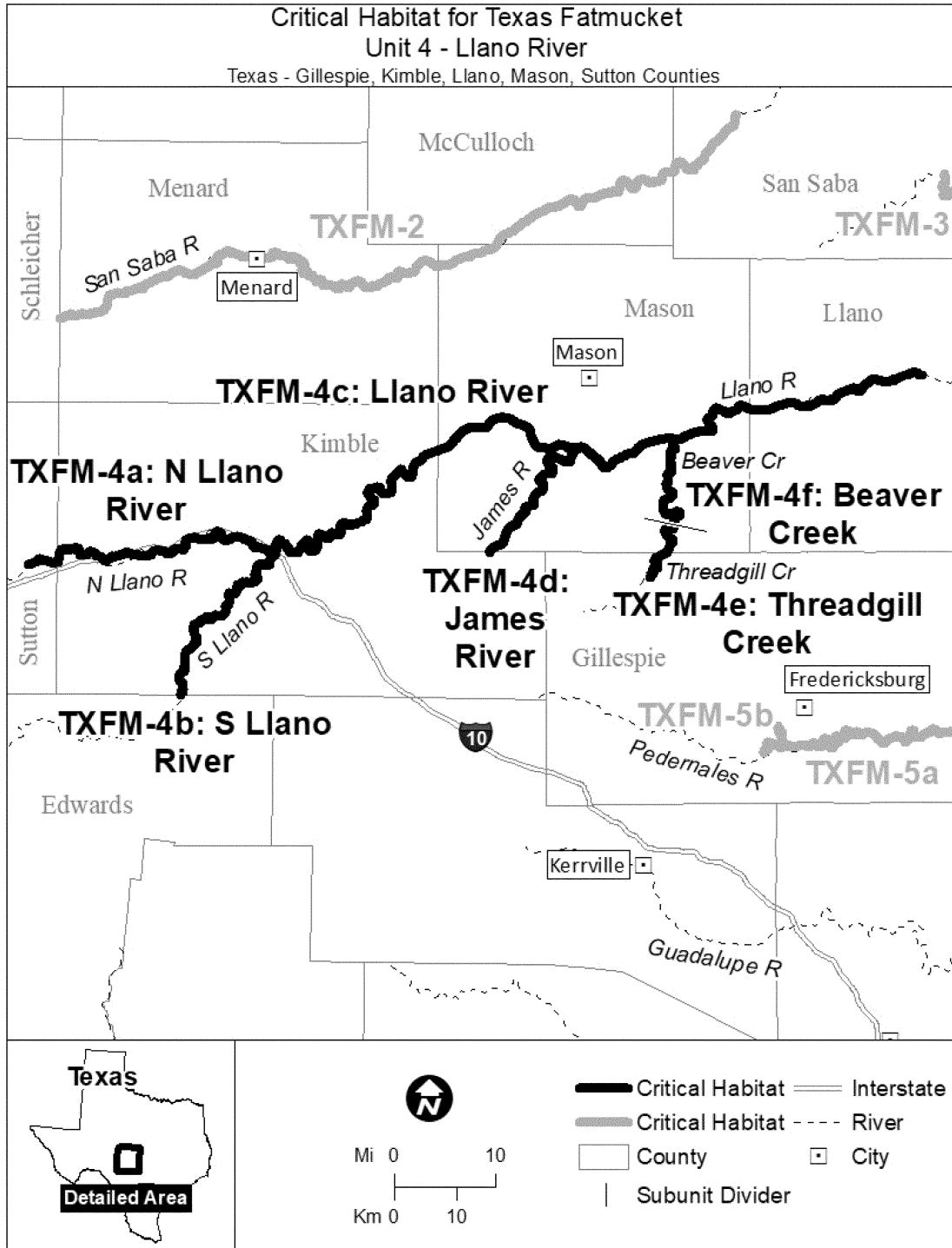
(E) Subunit TxFM-4e (Threadgill Creek) consists of 8.1 river mi (13.1 km) in Gillespie and Mason Counties, Texas. All of the riparian lands that border this subunit are in private ownership.

(F) Subunit TxFM-4f (Beaver Creek) consists of 12.7 river mi (20.5 km) in

Mason County, Texas. All of the riparian lands that border this subunit are in private ownership.

- (ii) Unit TXFM-4 includes stream channel up to bankfull height.
- (iii) Map of Unit TXFM-4 follows:

Figure 5 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (9)(iii)



(10) Unit TXFM-5: Pedernales River Unit: Blanco, Gillespie, Hays, and Travis Counties, Texas.

(i) Unit TXFM-5 consists of two subunits:

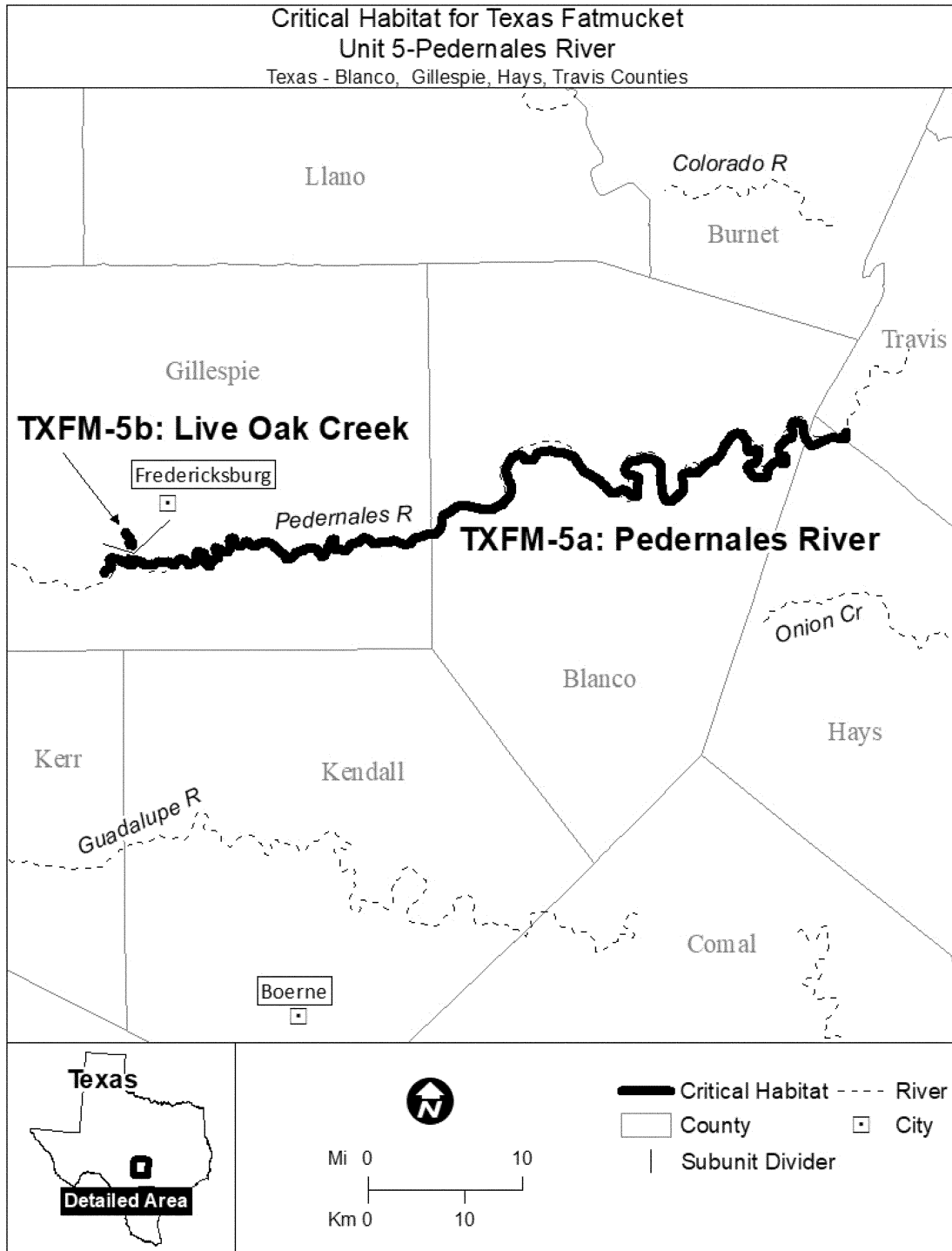
(A) Subunit TXFM-5a (Pedernales River) consists of 78.2 river mi (125.8

km) in Blanco, Gillespie, Hays, and Travis Counties, Texas. This subunit is composed of lands in State/local government (10 percent), Federal Government (3 percent), and private (87 percent) ownership.

(B) Subunit TXFM-5b (Live Oak Creek) consists of 2.6 river mi (4.2 km) in Gillespie County, Texas. This subunit is composed of lands in State/local government (54 percent) and private (46 percent) ownership.

- (ii) Unit TXXM-5 includes stream channel up to bankfull height.
- (iii) Map of Unit TXXM-5 follows:

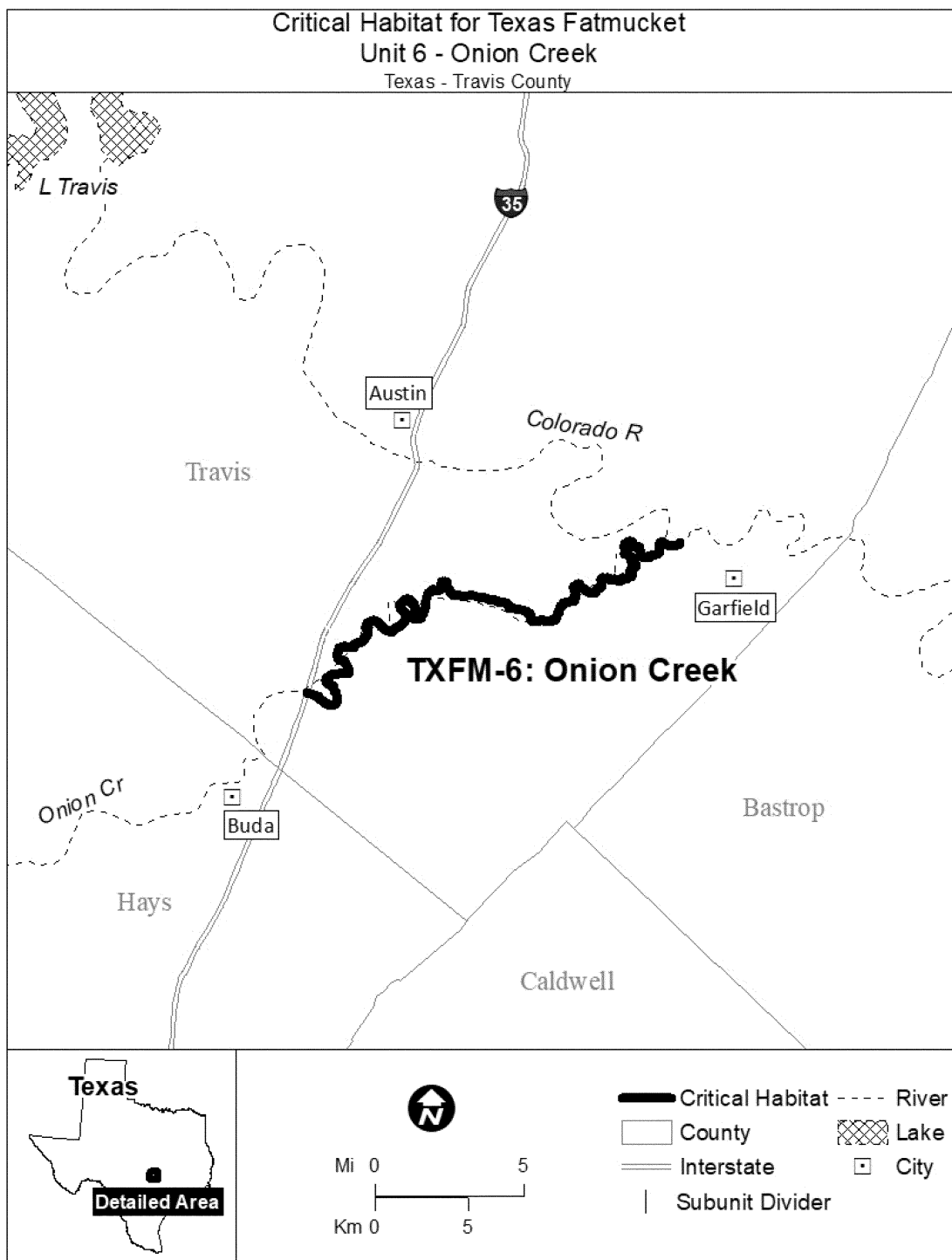
Figure 6 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (10)(iii)



- (11) Unit TXXM-6: Onion Creek Unit; Travis County, Texas.
- (i) Unit TXXM-6 consists of 23.5 river mi (37.8 km) in Travis County, Texas. This subunit is composed of lands in

- State/local government (56 percent) and private (44 percent) ownership.
- (ii) Unit TXXM-6 includes stream channel up to bankfull height.
- (iii) Map of Unit TXXM-6 follows:

Figure 7 to Texas Fatmucket (*Lampsilis bracteata*) paragraph (11)(iii)



**Texas Fawnsfoot (*Truncilla macrodon*)**

(1) Critical habitat units are depicted for Lampasas, Mills, Palo Pinto, Parker, San Saba, Shackelford, Stephens, and Throckmorton Counties, Texas, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the conservation of Texas fawnsfoot consist of the following components within

waters and streambeds up to the ordinary high-water mark:

- (i) Flowing water at rates suitable to prevent excess sedimentation but not so high as to dislodge individuals or sediment;
- (ii) Stable bank and riffle habitats with gravel, sand, silt, and mud substrates that are clean swept by flushing flows;
- (iii) Freshwater drum (*Aplodinotus grunniens*) present; and

(iv) Water quality parameters within the following ranges:

- (A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);
- (B) Salinity less than 2 parts per thousand;
- (C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;
- (D) Water temperature below 29 °C (84.2 °F); and
- (E) Low levels of contaminants.

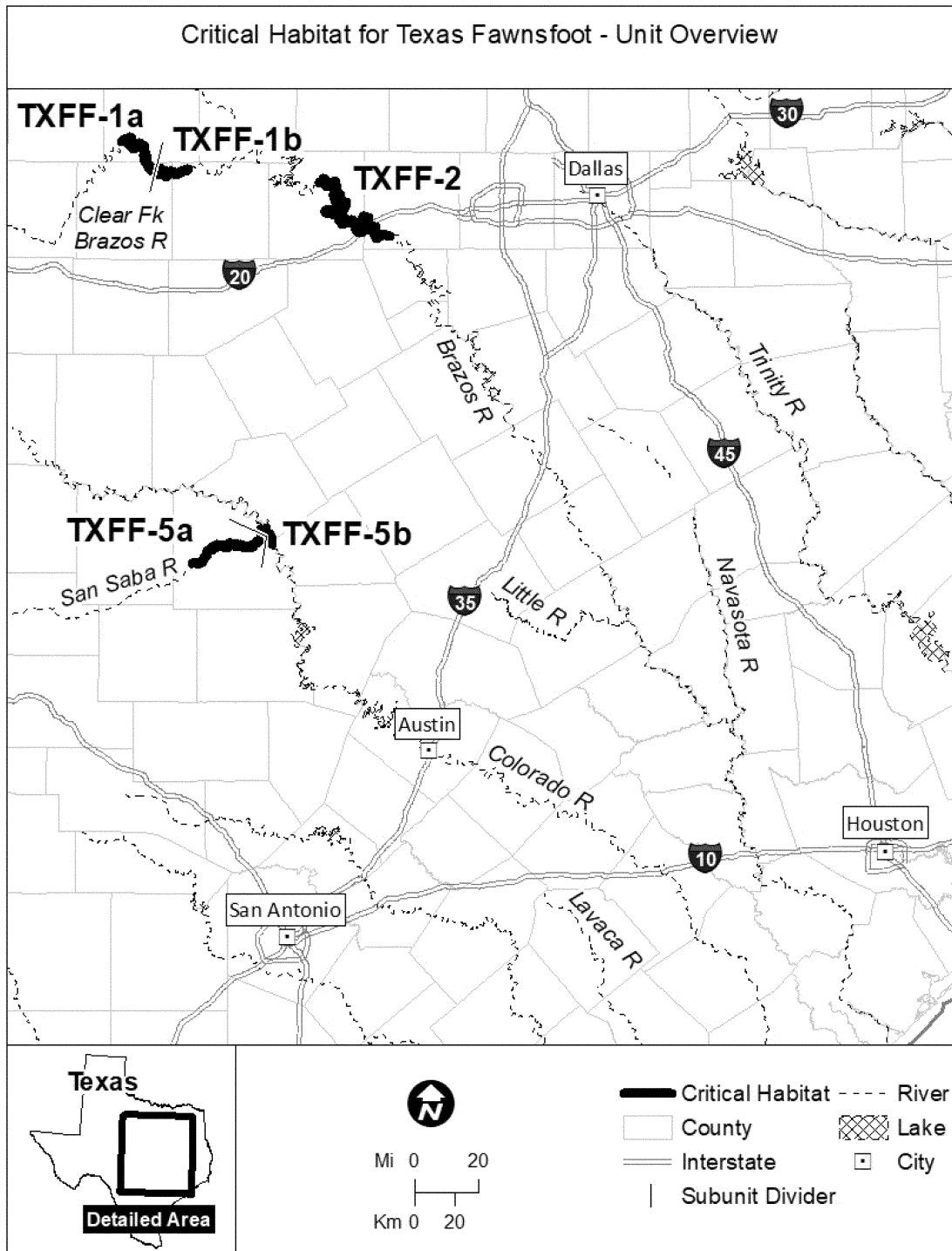
(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

(4) Data layers defining the map units were created on a base of U.S. Geological Survey digital ortho-photo quarter-quadrangles, and the critical habitat units were then mapped using

Universal Transverse Mercator (UTM) Zone 14N coordinates. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which the maps are based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at <https://www.regulations.gov> at Docket No.

FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Index map of critical habitat units for the Texas fawnsfoot follows: Figure 1 to Texas Fawnsfoot (*Truncilla macrodon*) paragraph (5)



(6) Unit TXFF-1: Clear Fork of the Brazos River Unit; Shackelford, Stephens, and Throckmorton Counties, Texas.

(i) Unit TXFF-1 consists of two subunits:

(A) Subunit TXFF-1a (Upper Clear Fork Brazos River) consists of 27.3 river miles (mi) (44.0 kilometers (km)) in

Shackelford and Throckmorton Counties, Texas. All of the riparian lands that border this subunit are in private ownership.

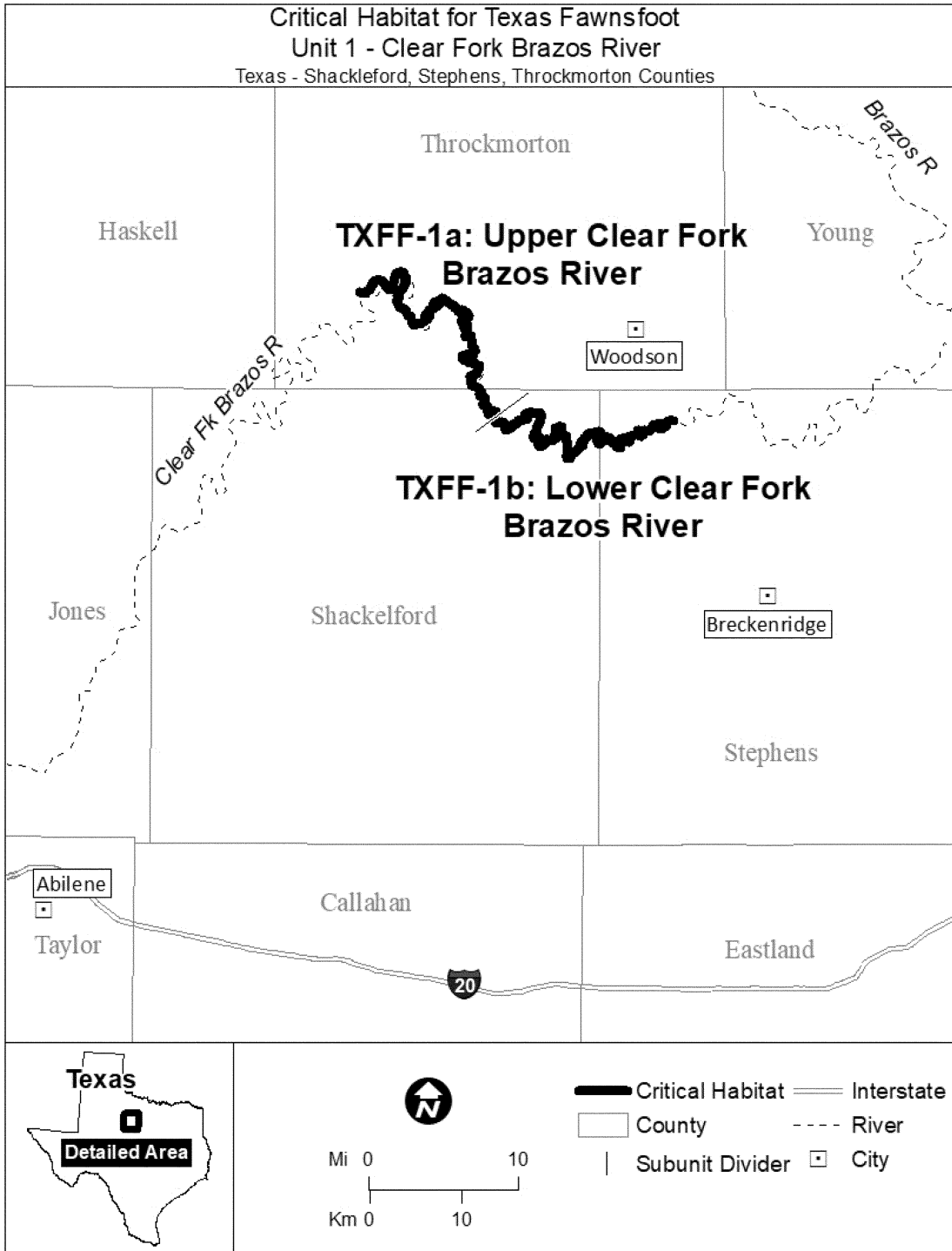
(B) Subunit TXFF-1b (Lower Clear Fork Brazos River) consists of 27.9 river mi (45.0 km) in Shackelford and Stephens Counties, Texas. This subunit is composed of lands in State/local

government (1 percent) and private (99 percent) ownership.

(ii) Unit TXFF-1 includes stream channel up to bankfull height.

(iii) Map of Unit TXFF-1 follows:

Figure 2 to Texas Fawnsfoot (*Truncilla macrodon*) paragraph (6)(iii)





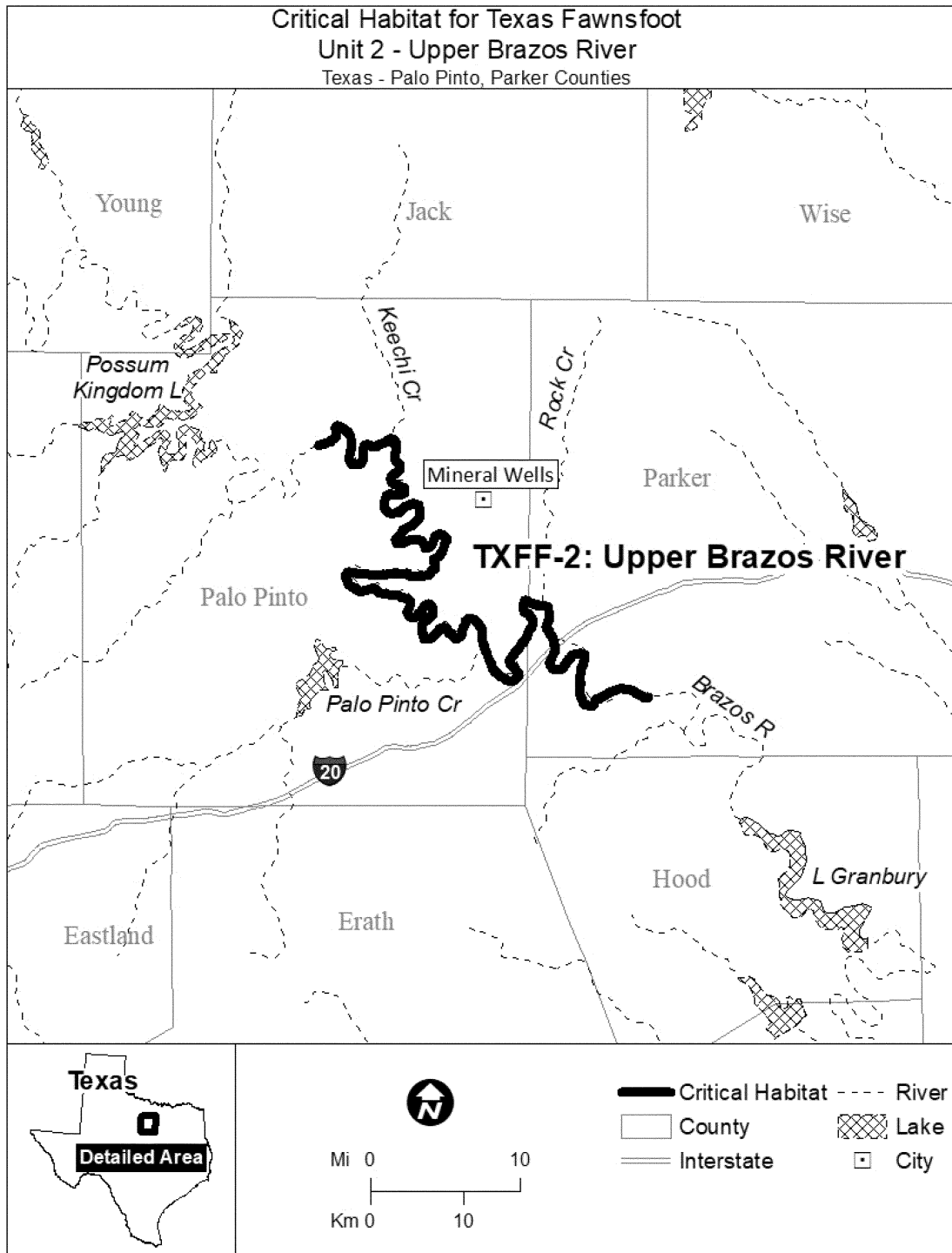
(7) Unit TXFF-2: Upper Brazos River Unit; Palo Pinto and Parker Counties, Texas.

(i) Unit TXFF-2 consists of 78.0 river mi (125.5 km) in Palo Pinto and Parker

Counties, Texas. All of the riparian lands that border this unit are in private ownership.

(ii) Unit TXFF-2 includes stream channel up to bankfull height.

(iii) Map of Unit TXFF-2 follows: Figure 3 to Texas Fawnsfoot (*Truncilla macrodon*) paragraph (7)(iii)



(8) Units TXFF-3 and TXFF-4 are excluded from the designation pursuant to section 4(b)(2) of the Act.

(9) Unit TXFF-5: Lower San Saba River and Upper Colorado River Unit;

Lampasas, Mills, and San Saba Counties, Texas.

(i) Unit TXFF-5 consists of two subunits:

(A) Subunit TXFF-5a (Lower San Saba River) consists of 49.2 river mi (79.1 km) in San Saba County, Texas. The riparian lands that border this subunit are in State/local government (1

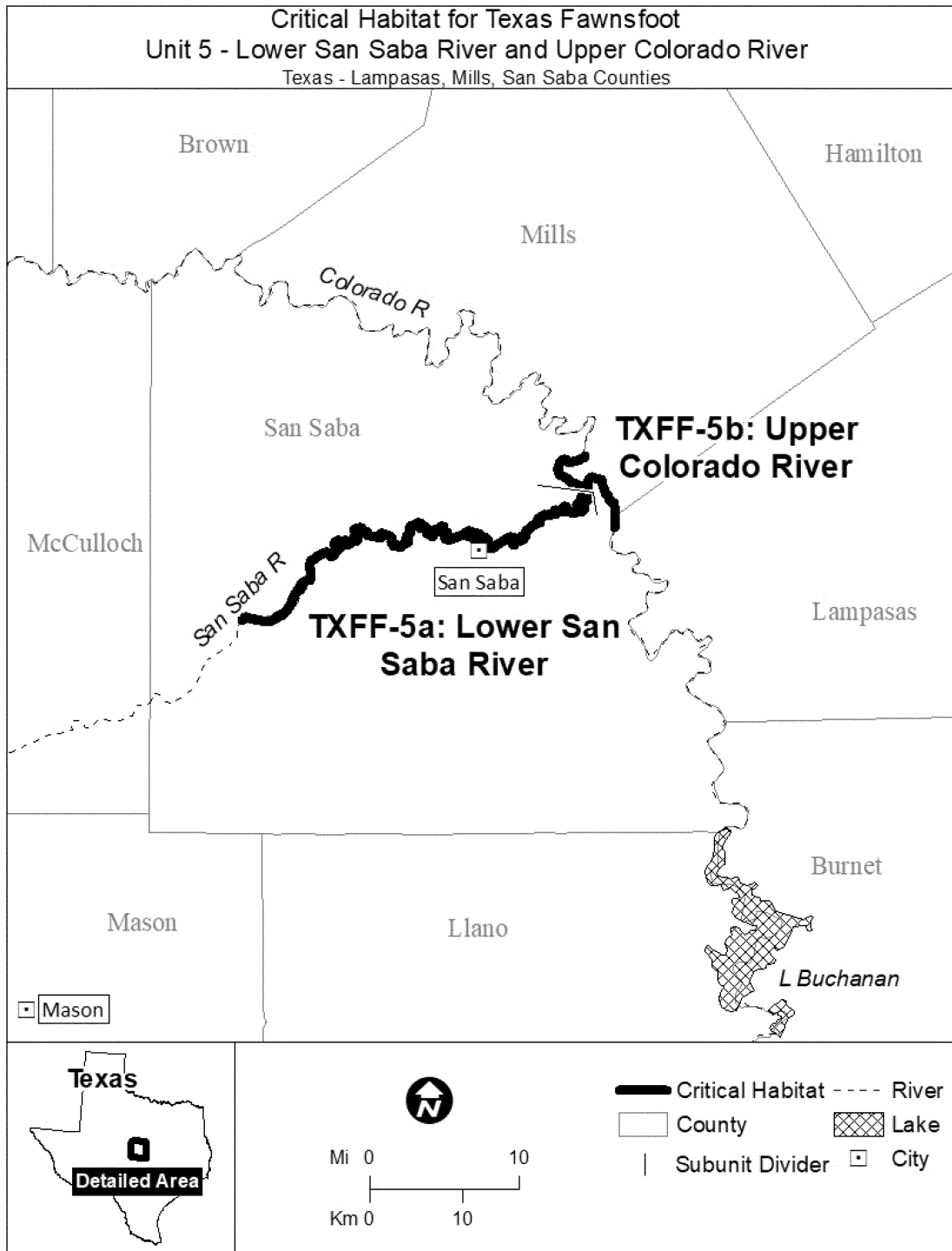
percent) and private (99 percent) ownership.

(B) Subunit TXFF-5b (Upper Colorado River) consists of 10.3 river mi (16.6 km) in Lampasas, Mills, and San

Saba Counties, Texas. All of the riparian lands that border this unit are in private ownership.

(ii) Unit TXFF-5 includes stream channel up to bankfull height.

(iii) Map of Unit TXFF-5 follows: Figure 4 to Texas Fawnsfoot (*Truncilla macrodon*) paragraph (9)(iii)



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(10) Units TXFF-6, TXFF-7, and TXFF-8 are excluded from the

designation pursuant to section 4(b)(2) of the Act.

\* \* \* \* \*

Guadalupe Orb (*Cyclonaias necki*)

(1) Critical habitat units are depicted for Caldwell, Comal, DeWitt, Gonzales, Guadalupe, Kendall, Kerr, and Victoria

Counties, Texas, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the conservation of Guadalupe orb consist of the following components within waters and streambeds up to the ordinary high-water mark:

(i) Flowing water at rates suitable to keep riffle habitats wetted and well-oxygenated and to prevent excess sedimentation or scour during high-flow events but not so high as to dislodge individuals;

(ii) Stable riffles and runs with substrate composed of cobble, gravel, and fine sediments;

(iii) Channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), and tadpole madtom (*Noturus gyrinus*) present; and

(iv) Water quality parameters within the following ranges:

(A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);

(B) Salinity less than 2 parts per thousand;

(C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;

(D) Water temperature below 29 °C (84.2 °F); and

(E) Low levels of contaminants.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

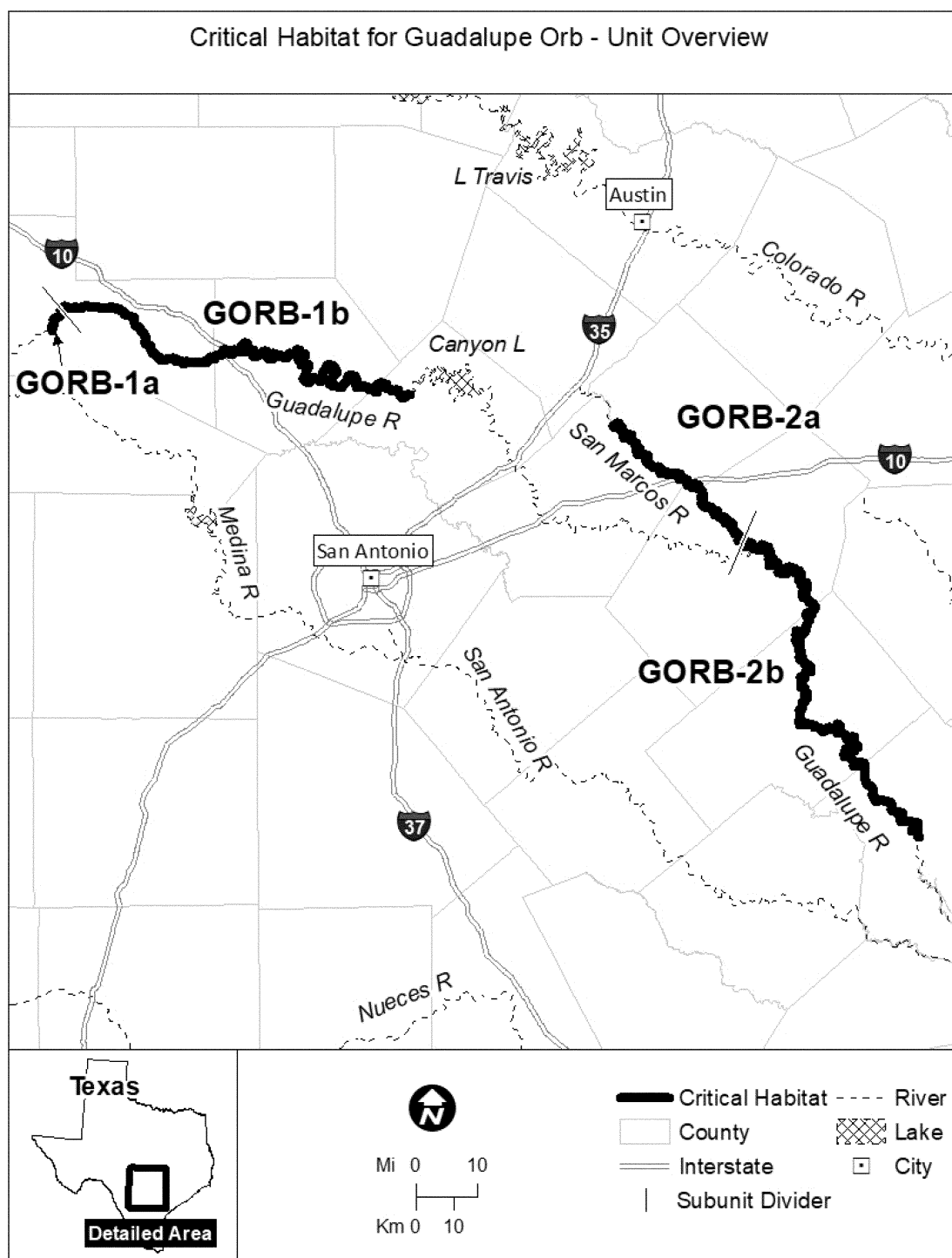
(4) Data layers defining the map units were created on a base of U.S. Geological Survey digital ortho-photo quarter-quadrangles, and the critical habitat units were then mapped using Universal Transverse Mercator (UTM)

Zone 14N coordinates. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which the maps are based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Index map of critical habitat units for the Guadalupe orb follows:

Figure 1 to Guadalupe Orb (*Cyclonaias necki*) paragraph (5)

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(6) Unit GORB-1: Upper Guadalupe River; Comal, Kendall, and Kerr Counties, Texas.

(i) Unit GORB-1 consists of two subunits:

(A) Subunit GORB-1a (South Fork Guadalupe River) consists of 5.1 river miles (mi) (8.2 kilometers (km)) in Kerr

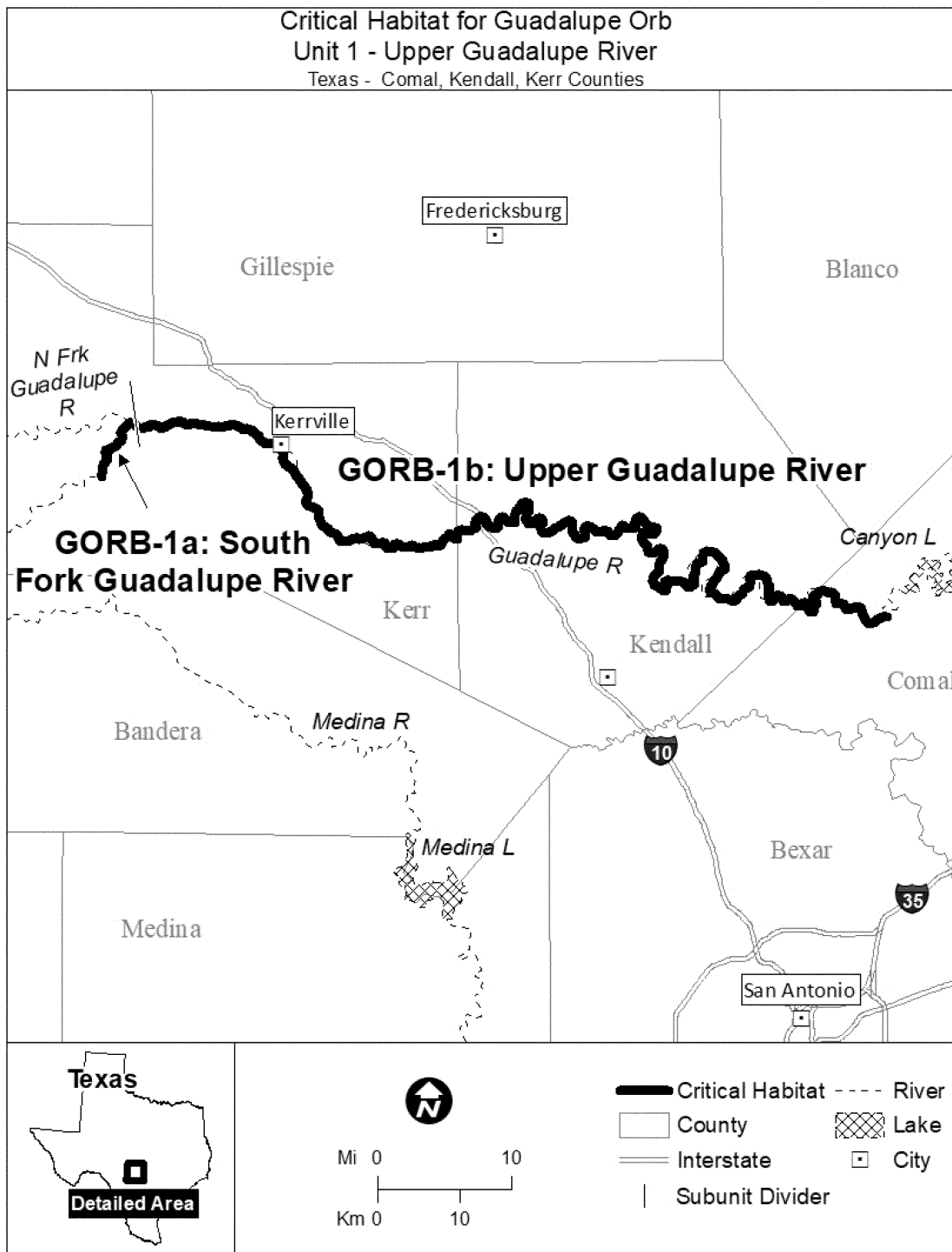
County, Texas. All of the riparian lands that border this unit are in private ownership.

(B) Subunit GORB-1b (Upper Guadalupe River) consists of 97.1 river mi (156.3 km) of the Guadalupe River in Comal, Kendall, and Kerr Counties, Texas. The riparian lands that border

this subunit are in State/local government (5 percent) and private (95 percent) ownership.

(ii) Unit GORB-1 includes stream channel up to bankfull height.

(iii) Map of Unit GORB-1 follows: Figure 2 to Guadalupe Orb (*Cyclonaias necki*) paragraph (6)(iii)



(7) Unit GORB-2: Lower Guadalupe River; Caldwell, DeWitt, Gonzales, Guadalupe, and Victoria Counties, Texas.

(i) Unit GORB-2 consists of two subunits:

(A) Subunit GORB-2a (San Marcos River) consists of 63.9 river mi (102.8 km) in Caldwell, Gonzales, and

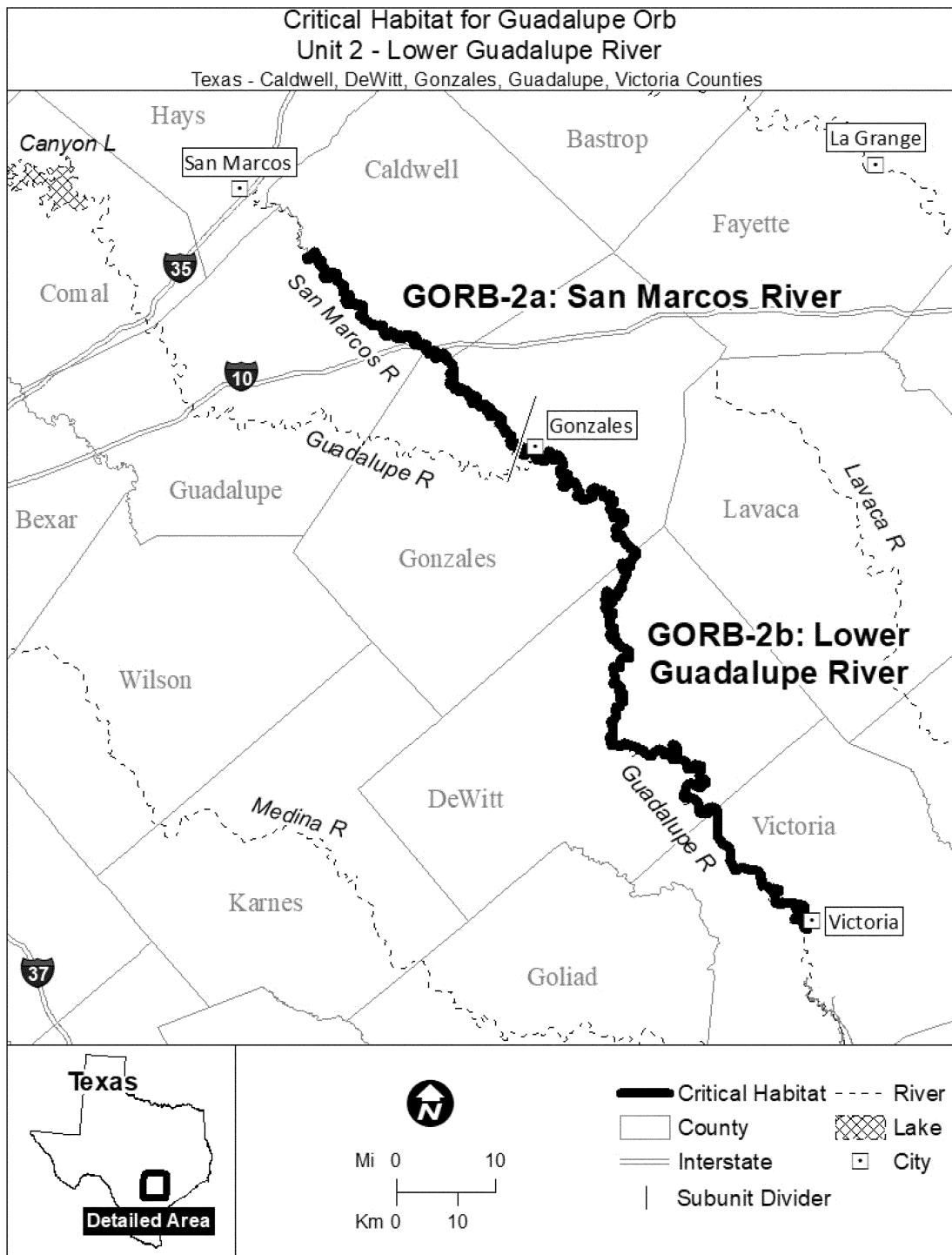
Guadalupe Counties, Texas. The riparian lands that border this subunit are in State/local government (6 percent) and private (94 percent) ownership.

(B) Subunit GORB-2b (Lower Guadalupe River) consists of 122.4 river mi (197.0 km) in DeWitt, Gonzales, and Victoria Counties, Texas. The riparian

lands that border this subunit are in State/local government (5 percent) and private (95 percent) ownership.

(ii) Unit GORB-2 includes stream channel up to bankfull height.

(iii) Map of Unit GORB-2 follows: Figure 3 to Guadalupe Orb (*Cyclonaias necki*) paragraph (7)(iii)



\* \* \* \* \*

Texas Pimpleback (*Cyclonaias petrina*)

(1) Critical habitat units are depicted for Brown, Coleman, Concho, Kimble, Lampasas, Mason, McCulloch, Menard, Mills, Runnels, San Saba, and Tom Green Counties, Texas, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the conservation of Texas pimpleback

consist of the following components within waters and streambeds up to the ordinary high-water mark:

(i) Flowing water at rates suitable to keep riffle habitats wetted and well-oxygenated and to prevent excess sedimentation or scour during high-flow events but not so high as to dislodge individuals;

(ii) Stable riffles and runs with substrate composed of cobble, gravel, and fine sediments;

(iii) Channel catfish (*Ictalurus punctatus*), flathead catfish (*Pylodictis olivaris*), and tadpole madtom (*Noturus gyrinus*) present; and

(iv) Water quality parameters within the following ranges:

(A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);

(B) Salinity less than 2 parts per thousand;

(C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;

(D) Water temperature below 29 °C (84.2 °F); and

(E) Low levels of contaminants.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

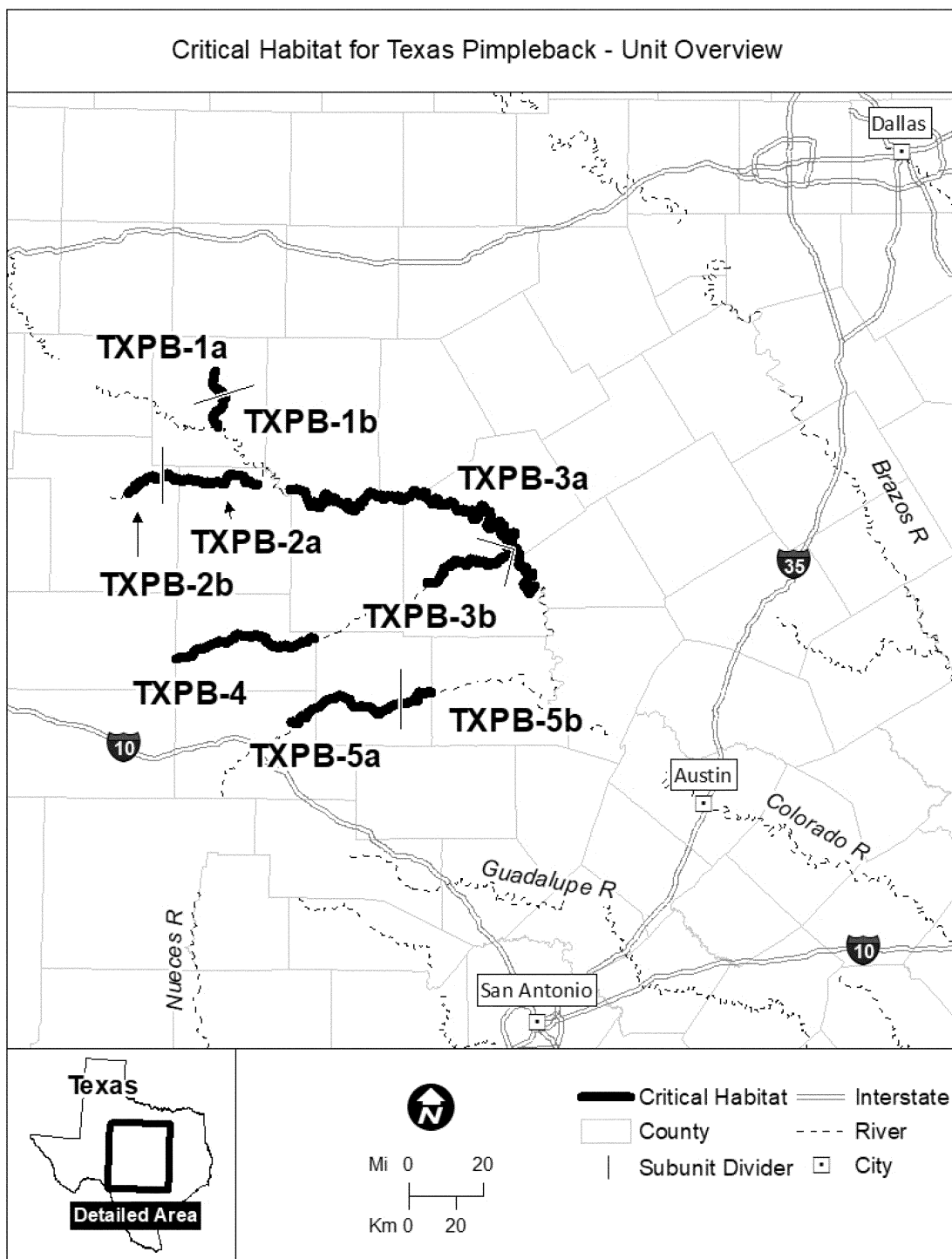
(4) Data layers defining the map units were created on a base of U.S. Geological Survey digital ortho-photo

quarter-quadrangles, and the critical habitat units were then mapped using Universal Transverse Mercator (UTM) Zone 14N coordinates. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which the maps are based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at [\[www.regulations.gov\]\(http://www.regulations.gov\) at Docket No. FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.](https://</a></p></div><div data-bbox=)

(5) Index map of critical habitat units for the Texas pimpleback follows:

Figure 1 to Texas Pimpleback (*Cyclonaias petrina*) paragraph (5)





(6) Unit TXPB-1: Elm Creek; Runnels County, Texas.

(i) Unit TXPB-1 consists of two subunits:

(A) Subunit TXPB-1a (Bluff Creek) consists of 11.6 river miles (mi) (18.7 kilometers (km)) in Runnels County, Texas. All of the riparian lands that

border this unit are in private ownership.

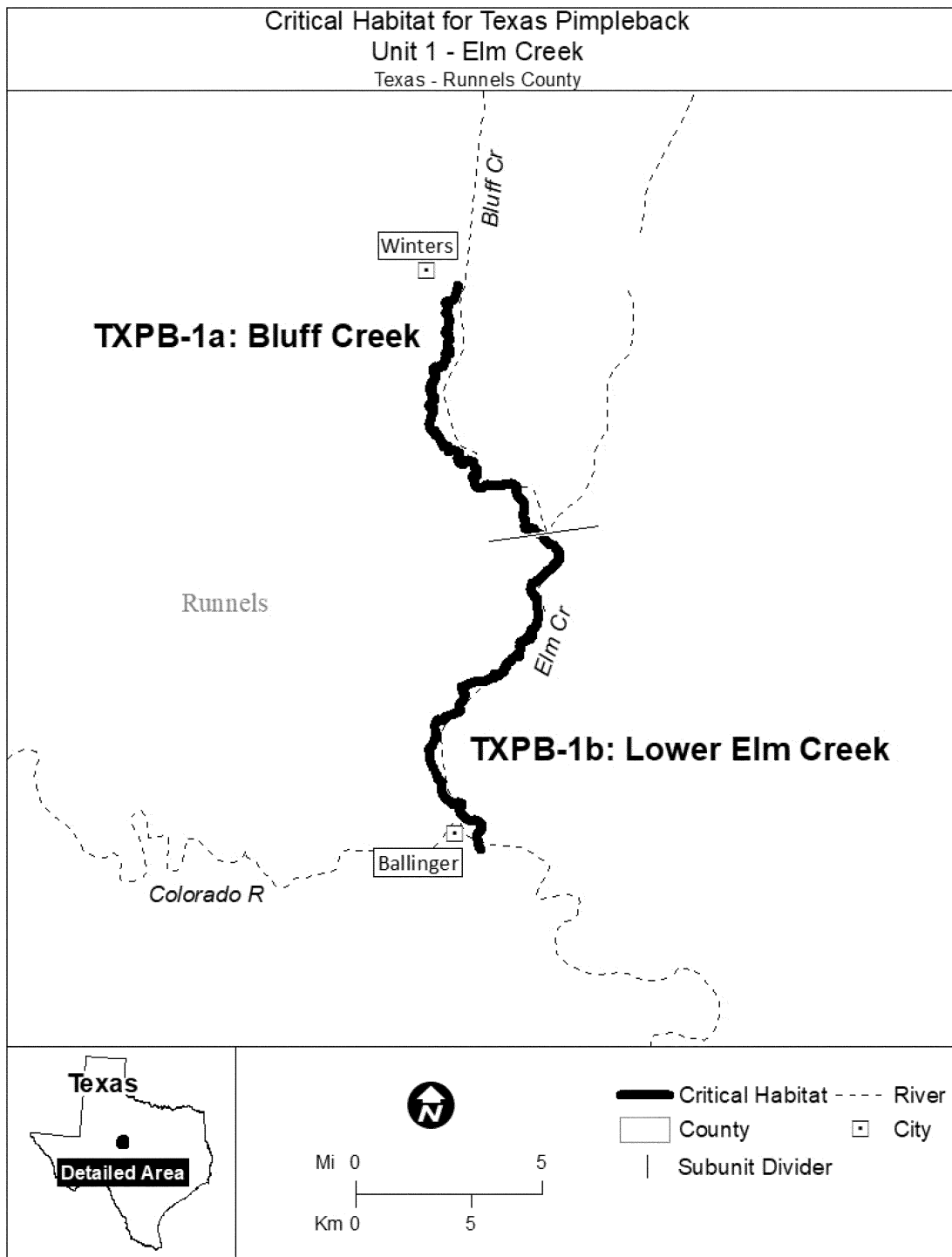
(B) Subunit TXPB-1b (Lower Elm Creek) consists of 12.3 river mi (19.8 km) in Runnels County, Texas. The riparian lands that border this subunit are in State/local government (3

percent) and private (97 percent) ownership.

(ii) Unit TXPB-1 includes stream channel up to bankfull height.

(iii) Map of Unit TXPB-1 follows:

Figure 2 to Texas Pimpleback (*Cyclonaias petrina*) paragraph (6)(iii)



(7) Unit TXPB-2: Concho River; Concho and Tom Green Counties, Texas.

(i) Unit TXPB-2 consists of two subunits:

(A) Subunit TXPB-2a (Lower Concho River) consists of 34.6 river mi (55.7 km) in Concho and Tom Green Counties,

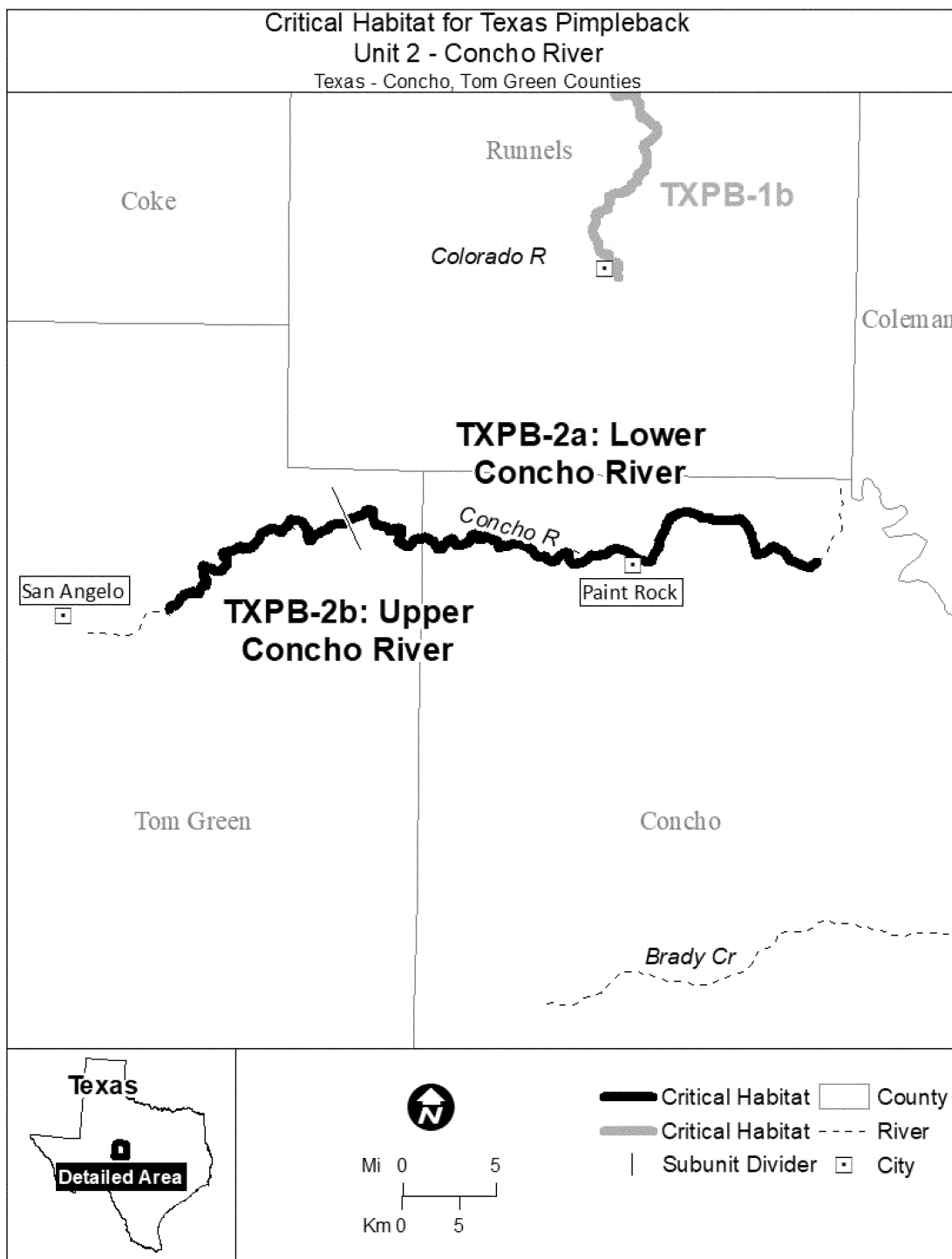
Texas. All of the riparian lands that border this subunit are in private ownership.

(B) Subunit TXPB-2b (Upper Concho River) consists of 15.5 river mi (25.0 km) of the Concho River in Tom Green County, Texas. The riparian lands that border this subunit are in State/local

government (2 percent) and private (98 percent) ownership.

(ii) Unit TXPB-2 includes stream channel up to bankfull height.

(iii) Map of Unit TXPB-2 follows: Figure 3 to Texas Pimpleback (*Cyclonaias petrina*) paragraph (7)(iii)



(8) Unit TXPB-3: Upper Colorado River and Lower San Saba River; Brown, Coleman, Lampasas, McCulloch, Mills, and San Saba Counties, Texas.

(i) Unit TXPB-3 consists of two subunits:

(A) Subunit TXPB-3a (Upper Colorado River) consists of 150.4 river mi (242.1 km) in Brown, Coleman,

Lampasas, McCulloch, Mills, and San Saba Counties, Texas. All of the riparian lands that border this subunit are in private ownership.

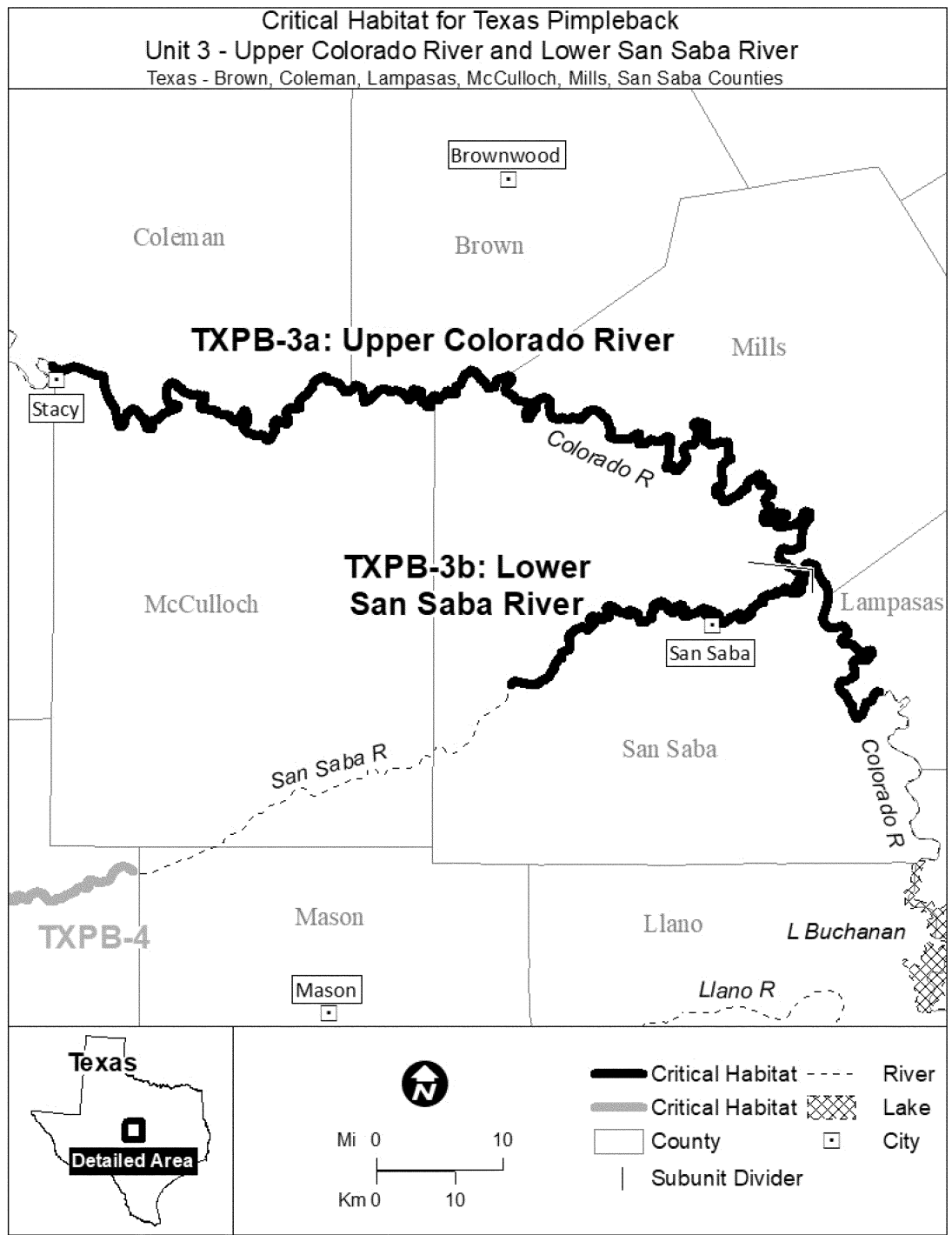
(B) Subunit TXPB-3b (Lower San Saba River) consists of 49.2 river mi (79.1 km) in San Saba County, Texas. The riparian lands that border this subunit are in State/local government (1

percent) and private (99 percent) ownership.

(ii) Unit TXPB-3 includes stream channel up to bankfull height.

(iii) Map of Unit TXPB-3 follows:

Figure 4 to Texas Pimpleback (*Cyclonaias petrina*) paragraph (8)(iii)



(9) Unit TXPB-4: Upper San Saba River; Menard County, Texas.

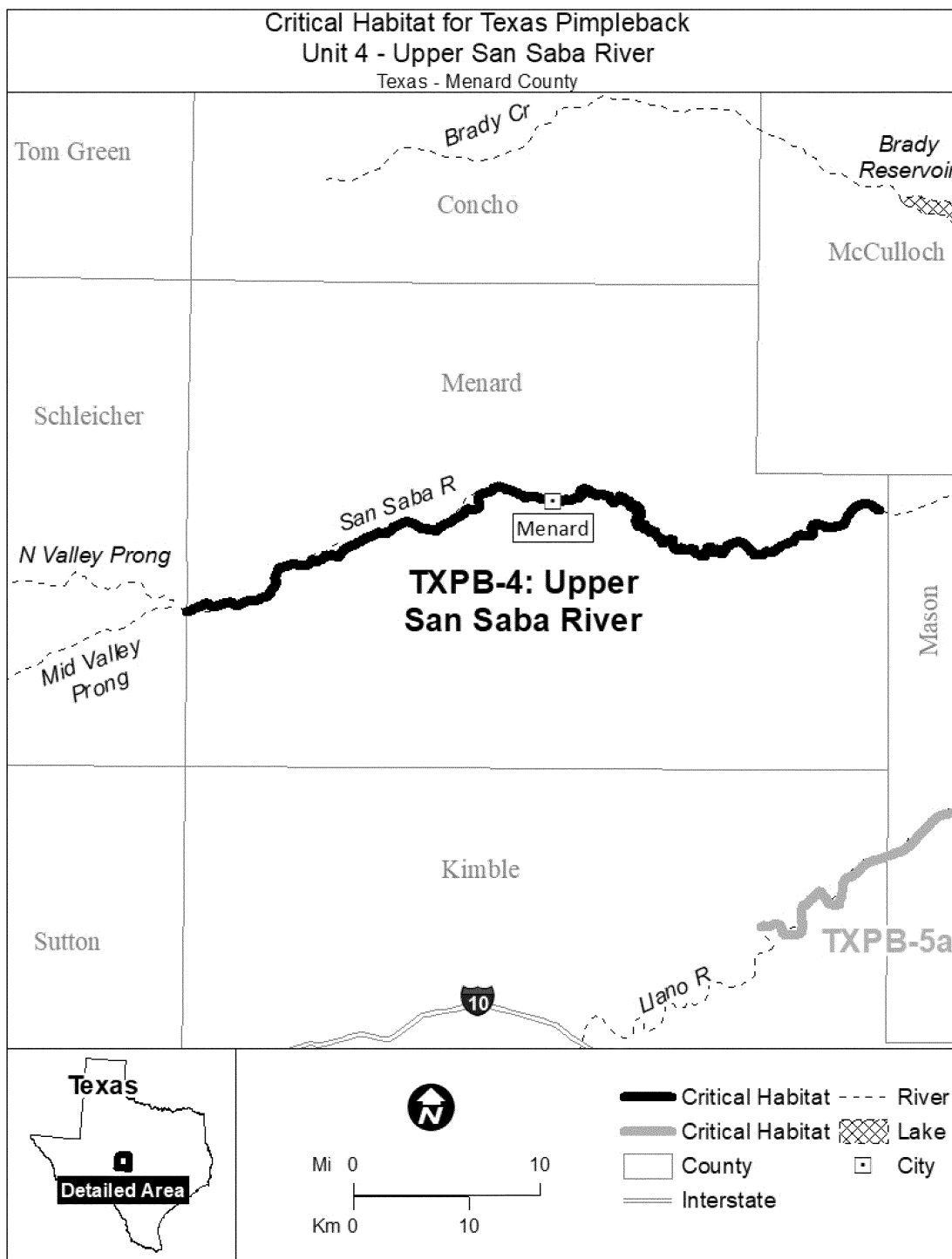
(i) Unit TXPB-4 consists of approximately 51.4 river mi (82.7 km) in Menard County, Texas. All of the

riparian lands that border this subunit are in private ownership.

(ii) Unit TXPB-4 includes stream channel up to bankfull height.

(iii) Map of Unit TXPB-4: Upper San Saba River follows:

Figure 5 to Texas Pimpleback (*Cyclonaias petrina*) paragraph (9)(iii)



(10) Unit TXPB-5: Llano River; Kimble and Mason Counties, Texas.

(i) Unit TXPB-5 consists of two subunits.

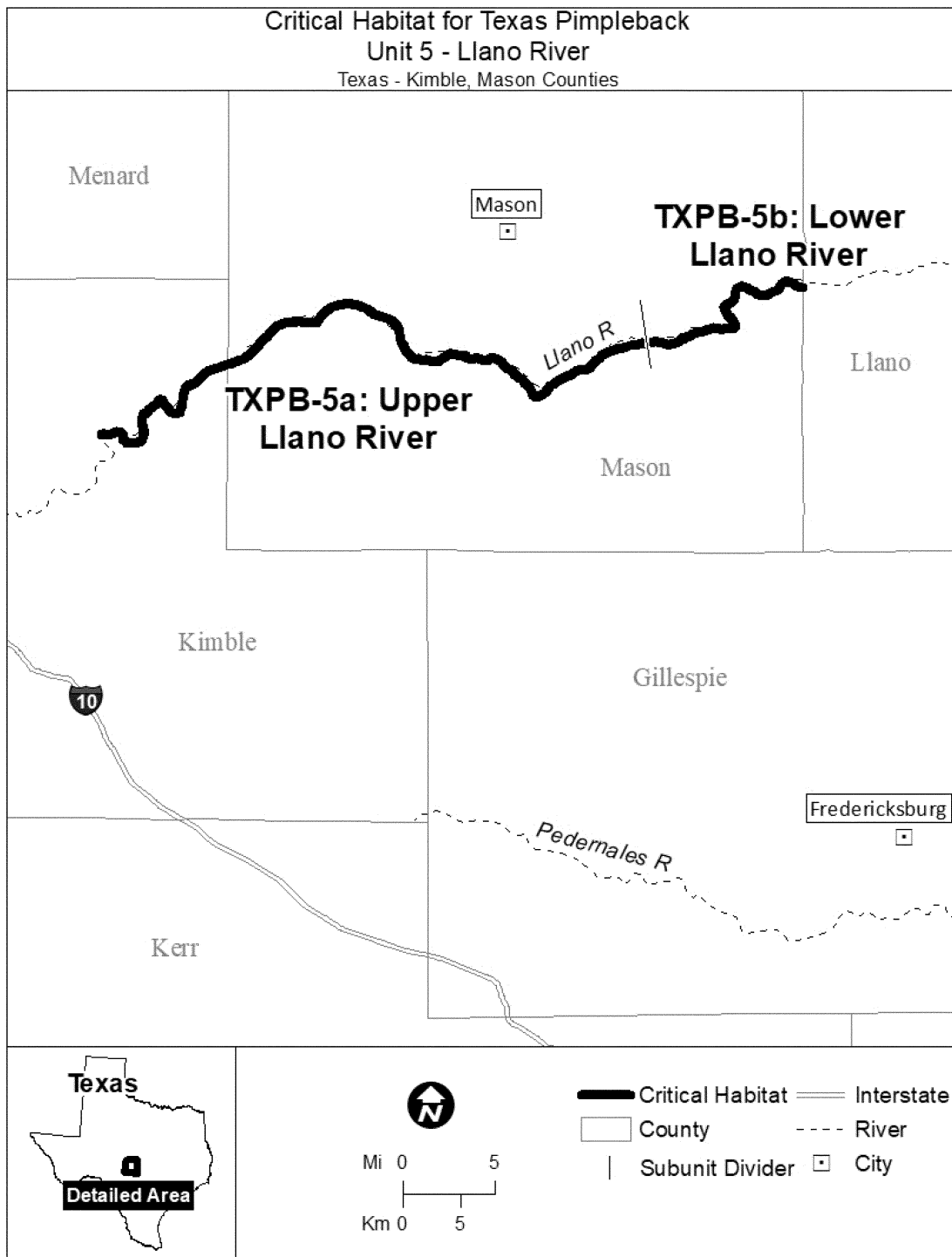
(A) Subunit TXPB-5a (Upper Llano River) consists of 37.2 river mi (59.9 km) in Kimble and Mason Counties, Texas.

All of the riparian lands that border this subunit are in private ownership.

(B) Subunit TXPB-5b (Lower Llano River) consists of 11.8 river mi (19.1 km) in Mason County, Texas. All of the riparian lands that border this subunit are in private ownership.

(ii) Unit TXPB-5 includes stream channel up to bankfull height.

(iii) Map of Unit TXPB-5 follows: Figure 6 to Texas Pimpleback (*Cyclonaias petrina*) paragraph (10)(iii)



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(11) Unit TXPB-6 is excluded from the designation pursuant to section 4(b)(2) of the Act.

**Balcones Spike (*Fusconaia iheringi*)**

(1) Critical habitat units are depicted for Kimble, Mason, and San Saba Counties, Texas, on the maps in this entry.

(2) Within these areas, the physical or biological features essential to the

conservation of Balcones spike consist of the following components within waters and streambeds up to the ordinary high-water mark:

(i) Flowing water at rates suitable to keep riffle habitats wetted and well-oxygenated and to prevent excess sedimentation but not so high as to dislodge individuals;

(ii) Stable riffles and runs with cobble, gravel, and fine sediments;

(iii) Blacktail shiner (*Cyprinella venusta*) and red shiner (*C. lutrensis*) present; and

(iv) Water quality parameters within the following ranges:

(A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);

(B) Salinity less than 2 parts per thousand;

(C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;

(D) Water temperature below 29 °C (84.2 °F); and

(E) Low levels of contaminants.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

(4) Data layers defining the map units were created on a base of U.S. Geological Survey digital ortho-photo quarter-quadrangles, and the critical

habitat units were then mapped using Universal Transverse Mercator (UTM) Zone 14N coordinates. The maps in this entry, as modified by any accompanying regulatory text, establish the boundaries of the critical habitat designation. The coordinates or plot points or both on which the maps are based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at <https://www.regulations.gov> at Docket No.

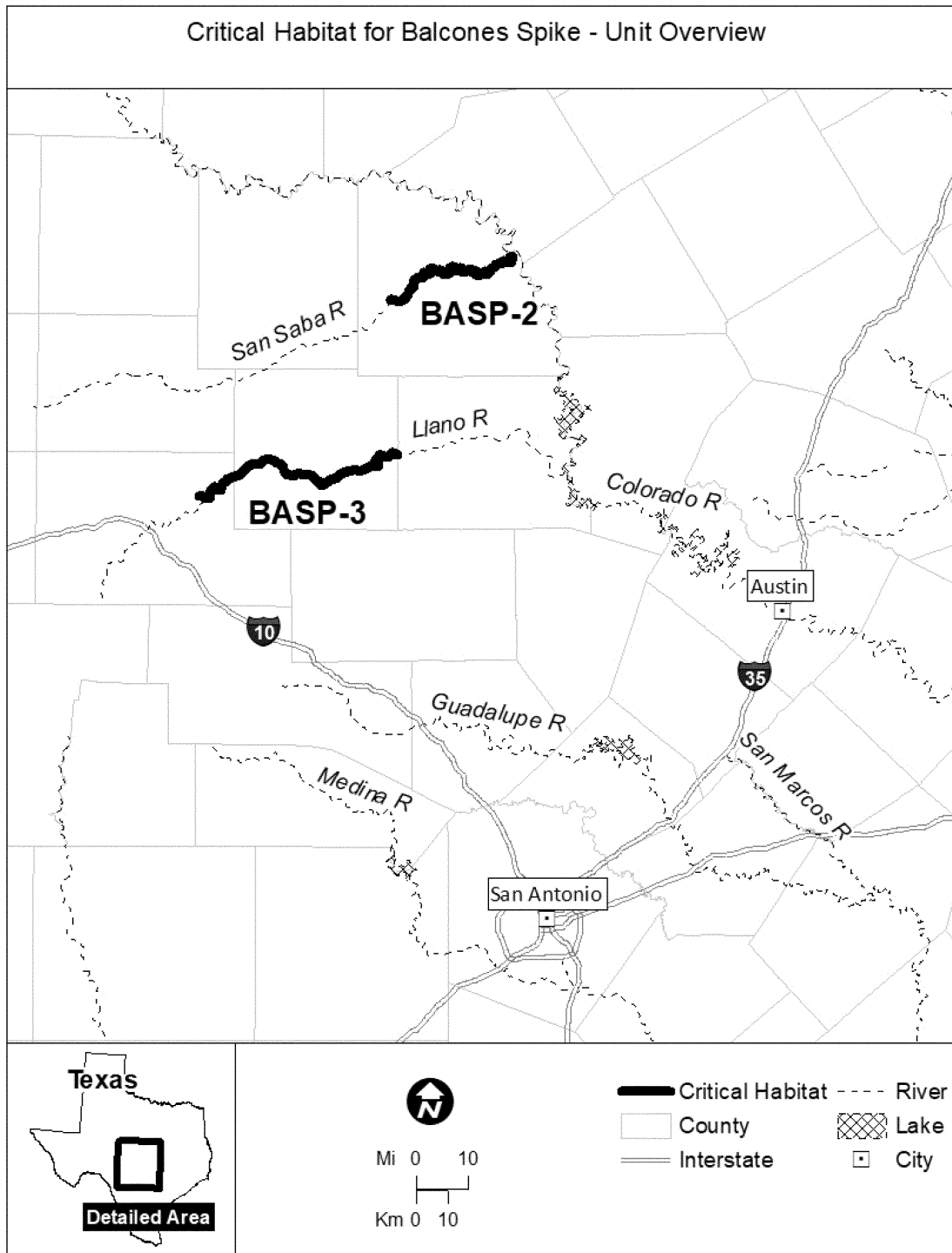
FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Index map of critical habitat units for the Balcones spike follows:

Figure 1 to Balcones Spike (*Fusconaia iheringi*) paragraph (5)

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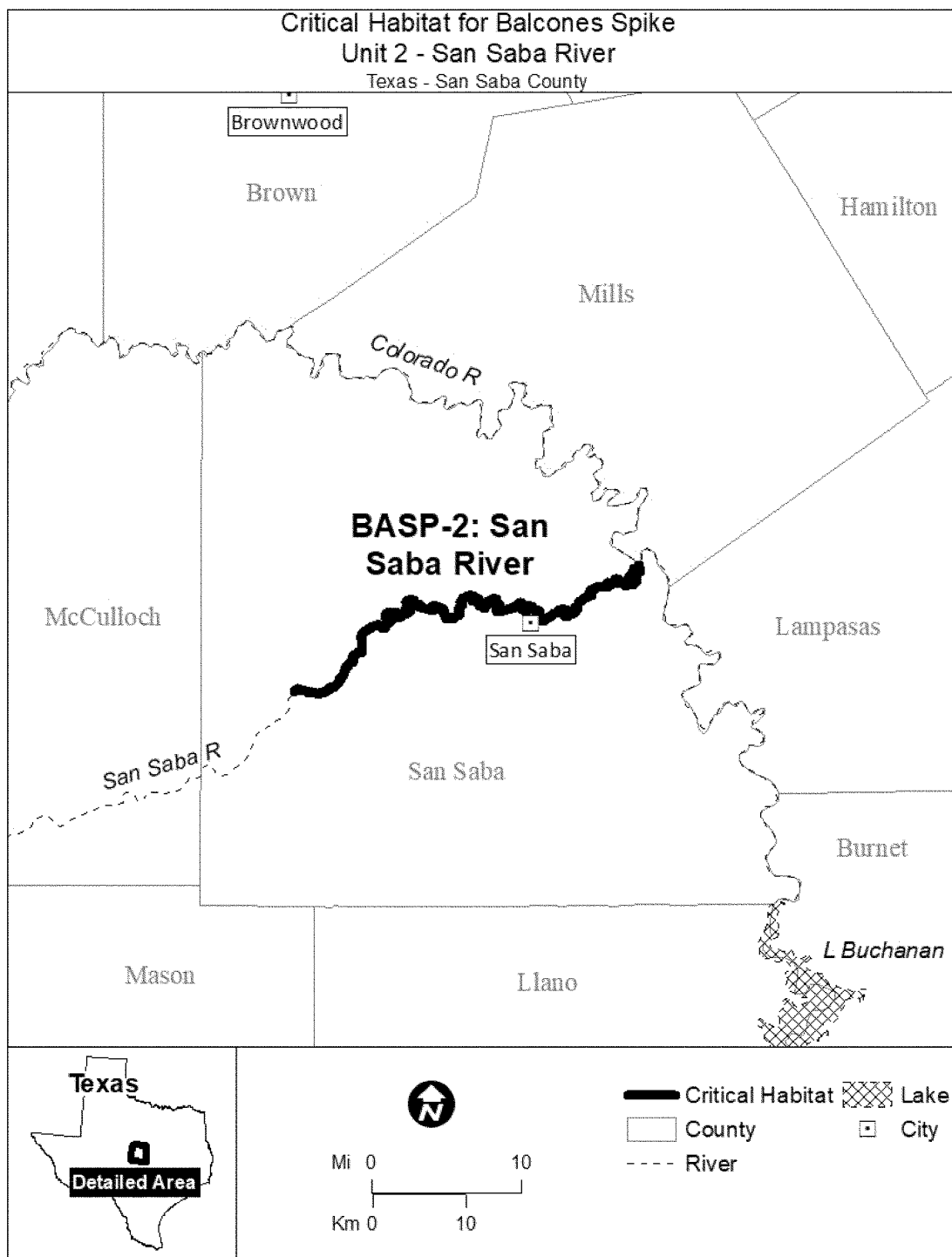
(6) Unit BASP-1 is excluded from the designation pursuant to section 4(b)(2) of the Act.

(7) Unit BASP-2: San Saba River; San Saba County, Texas.

(i) Unit BASP-2 consists of 49.1 river miles (mi) (79.0 kilometers (km)) in San Saba County, Texas. The riparian lands that border this subunit are in State/local government (1 percent) and private (99 percent) ownership.

(ii) Unit BASP-2 includes stream channel up to bankfull height.

(iii) Map of Unit BASP-2 follows: Figure 2 to Balcones Spike (*Fusconaia iheringi*) paragraph (7)(iii)



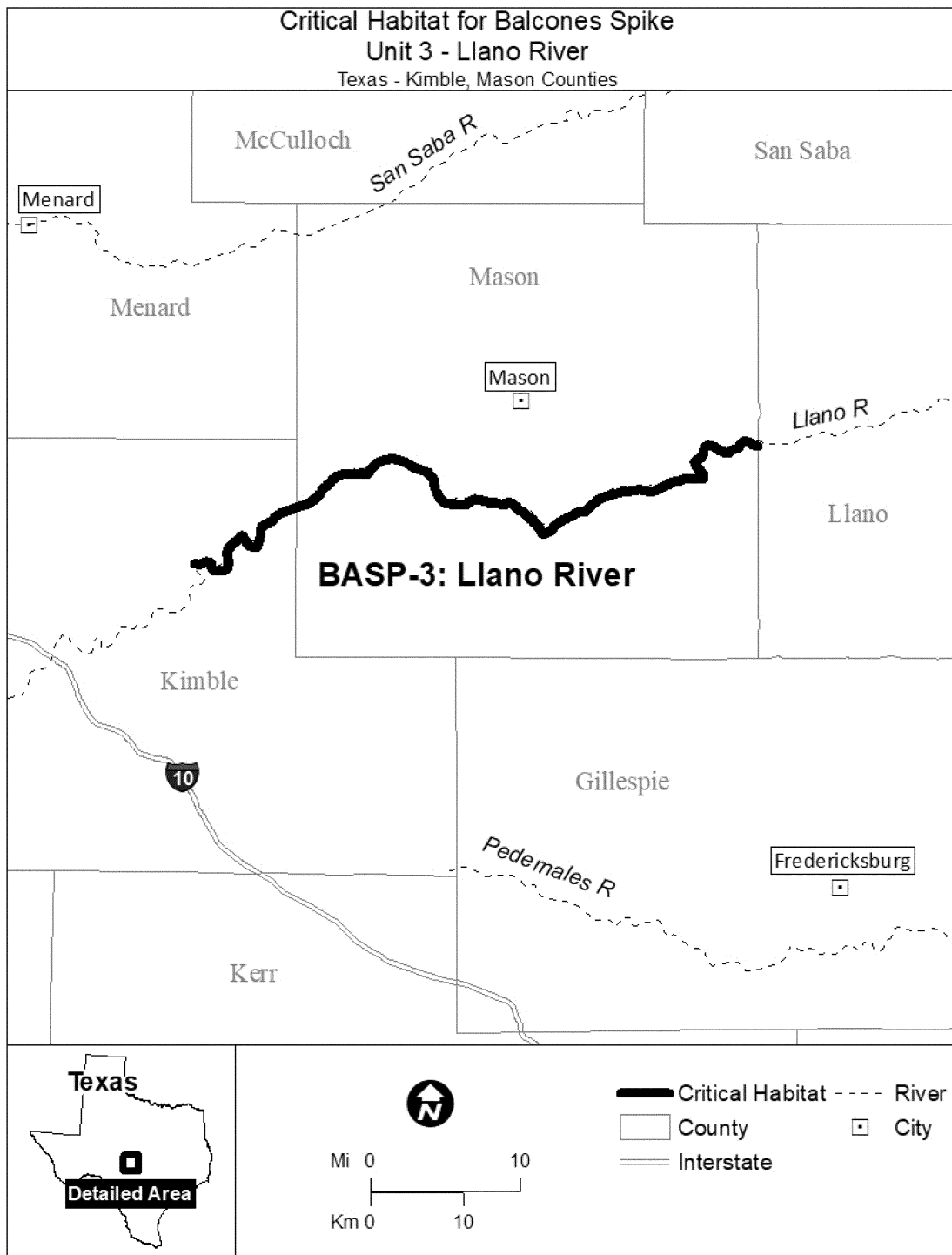
(8) Unit BASP-3: Llano River; Kimble and Mason Counties, Texas.

(i) Unit BASP-3 consists of 49 river mi (78.9 km) in Kimble and Mason Counties, Texas.

(ii) Unit BASP-3 includes stream channel up to bankfull height.

(iii) Map of Unit BASP-3 follows:

Figure 3 to Balcones Spike (*Fusconaia iheringi*) paragraph (8)(iii)



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**False Spike (*Fusconaia mitchelli*)**

(1) The critical habitat unit is depicted for DeWitt, Gonzales, and Victoria Counties, Texas, on the map in this entry.

(2) Within this area, the physical or biological features essential to the conservation of false spike consist of the following components within waters

and streambeds up to the ordinary high-water mark:

- (i) Flowing water at rates suitable to keep riffle habitats wetted and well-oxygenated and to prevent excess sedimentation but not so high as to dislodge individuals;
- (ii) Stable riffles and runs with cobble, gravel, and fine sediments;
- (iii) Blacktail shiner (*Cyprinella venusta*) and red shiner (*C. lutrensis*) present; and

(iv) Water quality parameters within the following ranges:

- (A) Dissolved oxygen greater than 2 milligrams per liter (mg/L);
- (B) Salinity less than 2 parts per thousand;
- (C) Total ammonia less than 0.77 mg/L total ammonia nitrogen;
- (D) Water temperature below 29 °C (84.2 °F); and
- (E) Low levels of contaminants.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, and other paved areas) and the land on which they are located existing within the legal boundaries on July 5, 2024.

(4) Data layers defining the map unit were created on a base of U.S. Geological Survey digital ortho-photo quarter-quadrangles, and the critical habitat unit was then mapped using Universal Transverse Mercator (UTM) Zone 14N coordinates. The map in this entry, as modified by any accompanying regulatory text, establishes the boundaries of the critical habitat designation. The coordinates or plot points or both on which the map is

based are available to the public at the Service's internet site at <https://www.fws.gov/office/austin-ecological-services>, at <https://www.regulations.gov> at Docket No. FWS-R2-ES-2019-0061, and at the field office responsible for this designation. You may obtain field office location information by contacting one of the Service regional offices, the addresses of which are listed at 50 CFR 2.2.

(5) Unit FASP-1: Guadalupe River; DeWitt, Gonzales, and Victoria Counties, Texas.

(i) Unit FASP-1 consists of two subunits:

(A) Subunit FASP-1a (San Marcos River) consists of 21.2 river miles (mi)

(34 kilometers (km)) of the in Gonzales County, Texas. The riparian lands that border this subunit are in State (8 percent) and private (92 percent) ownership.

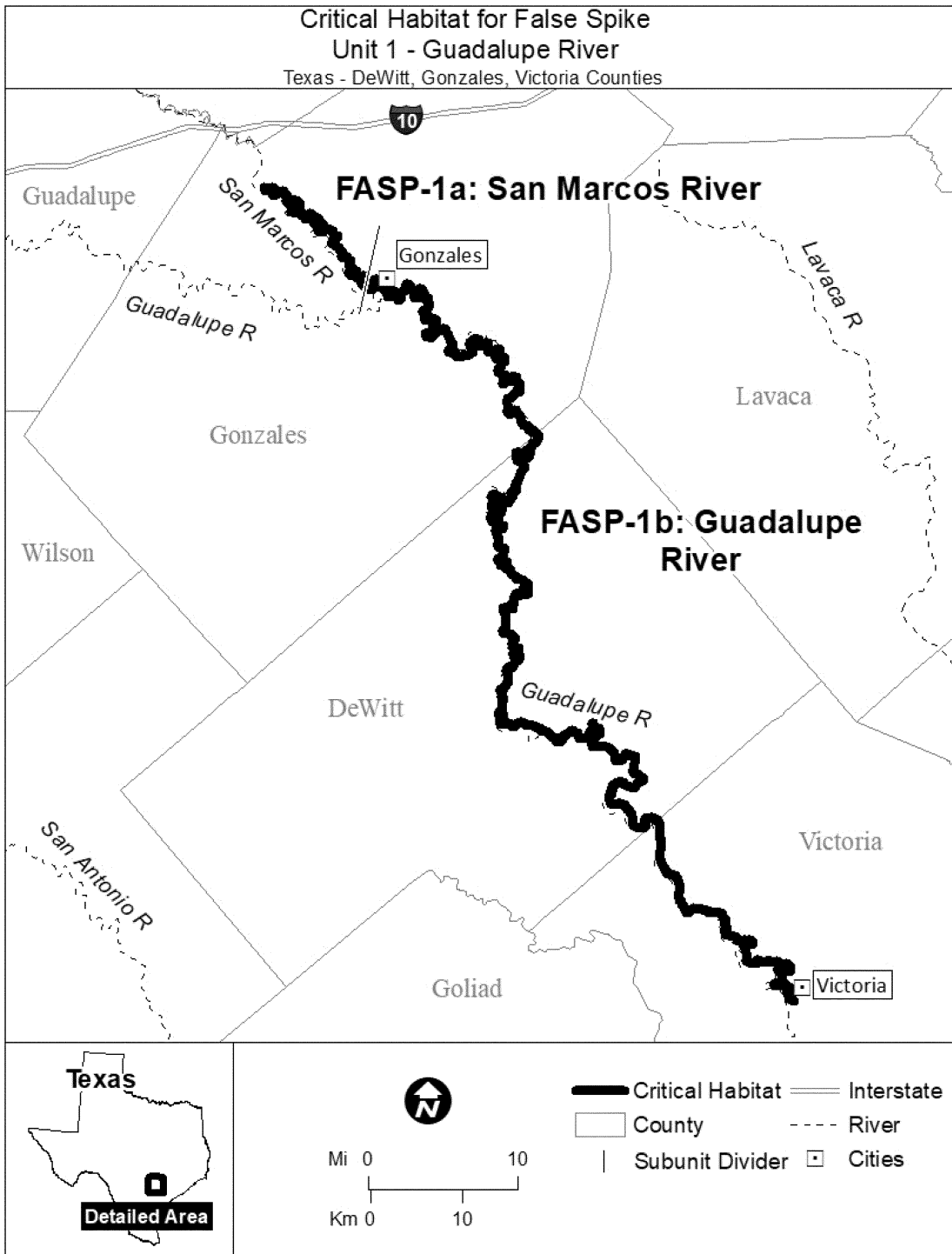
(B) Subunit FASP-1b (Guadalupe River) consists of 122.4 river mi (197 km) of the Guadalupe River in DeWitt, Gonzales, and Victoria Counties, Texas. The riparian lands that border this subunit are in State (2 percent) and private (98 percent) ownership.

(ii) Unit FASP-1 includes stream channel up to bankfull height.

(iii) Map of Unit FASP-1 follows:

Figure 1 to False Spike (*Fusconaia mitchelli*) paragraph (5)(iii)

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\* \* \* \* \*

**Martha Williams,**  
 Director, U.S. Fish and Wildlife Service.  
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