United States Department of the Interior

FISH AND WILDLIFE SERVICE
Ecological Services
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Arlington, Texas 76006

In Reply Refer To:
02ETAR00-2014-F-0402

November 5, 2014

Memorandum

To: Chief, Wildlife and Sport Fish Restoration, Albuquerque, New Mexico (Attn: Susan MacMullin)

From: Field Supervisor

Subject: Biological Opinion for an IntraService Consultation on a Traditional Section 6 project, *Conservation Genetics of Wild and Propagated Sharpnose Shiner and Smalleye Shiner from the Upper Brazos River* and associated Recovery Permit

This memorandum responds to your request dated August 22, 2014, for formal consultation pursuant to the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.), on the proposed Federal funding of the traditional section 6 project, *Conservation Genetics of Wild and Propagated Sharpnose Shiner and Smalleye Shiner from the Upper Brazos River* to be conducted in Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, and Young Counties, Texas, and the associated section 10(a)(1)(A) research and recovery permit, and effects on the endangered sharpnose shiner (*Notropis oxyrhynchus* [SNS]) and smalleye shiner (*Notropis buccula* [SES]). Your request was received on August 22, 2014.

The following biological opinion is based on information provided by your office and the applicant (Dr. Gene Wilde and his associates of Texas Tech University) in their study proposal submitted for the permit application; data in the Arlington, Texas, Ecological Services Field Office (ARLES) files; and discussions with biologists knowledgeable about the species.

Consultation History

August 18, 2014 – ARLES received an e-mail from the office of Wildlife & Sport Fish Restoration (WSFR) which included a section 6 grant narrative entitled *Conservation Genetics of Wild and Propagated Sharpnose Shiner and Smalleye Shiner from the Upper Brazos River* and a

request for intraservice section 7 consultation.

August 20, 2014 – A phone conversation with Susan MacMullin of WSFR indicated that a request for formal consultation, an intraservice section 7 form, and a Biological Evaluation (BE) would be needed to initiate formal consultation.

August 22, 2014 – Received Memorandum from WSFR requesting formal consultation. The Traditional Section 6 Project Statement Form will serve as the BE, along with needed future correspondence between ARLES, Susan MacMullin, and Dr. Gene Wilde (Principal Investigator).

September 9, 2014 – Sent Memorandum to Susan MacMullin indicating that ARLES had accepted the request for formal consultation and that the due date for providing a final biological opinion would be January 4, 2015.

September 12, 2014 – Consensus between WSFR and ARLES dictated that the biological opinion would cover actions proposed under section 6 (Federal funding of the project) as well as section 10 (Recovery permit for the individuals conducting the project).

October 6, 2014 – ARLES requested clarification from WSFR as to whether or not the proposed actions affect critical habitat for the sharpnose shiner and smalleye shiner within the action area, and requested a determination of effect to interior least tern and whooping crane. WSFR responded indicating that the proposed actions "may affect, but are not likely to adversely affect" critical habitat for the sharpnose shiner and smalleye shiner. WSFR also offered the determination that the proposed actions "may affect, but are not likely to adversely affect" interior least terns or whooping cranes.

October 29, 2014 – Draft Biological Opinion sent to WSFR for review.

November 4, 2014 – Received comments on Draft Biological Opinion from WSFR

November 5, 2014 – Final Biological Opinion sent to WSFR

BIOLOGICAL OPINION

I. Description of Proposed Action

The proposed action is the funding of the traditional section 6 project, *Conservation Genetics of Wild and Propagated Sharpnose Shiner and Smalleye Shiner from the Upper Brazos River* located in Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, and Young Counties, Texas. The proposed action also includes the Federal permitting under section 10 of the Act for the individuals conducting the project. Research conducted under this grant will occur within the mainstem of the upper Brazos River, the Salt Fork and Double Mountain Fork of the Brazos River, and in laboratory settings from 2014 to 2016. Work began on this project in

May of 2014 before the species were federally-listed as endangered on August 4, 2014. Thus, no section 10 permit or formal consultation under section 7 had not been necessary prior. Within the continuing study, three major tasks will be conducted:

Task 1: Across a three-year period, up to 22,500 (7,500 per year of each species) SNS and SES will be captured, identified, and immediately released at sites within the Brazos River, the Salt Fork and Double Mountain Fork. Fish will be captured by seining and released at the site of capture at sample points spread across the species' range.

Task 2: Fin tissue samples will be collected from SNS and SES captured during Task 1 to assess a number of genetic characteristics including: genetic diversity, allelic frequencies, heterozygosity, genetic structure, effective population size, and presence of historical population bottlenecks. Fin tissue will be collected from 30 fish of each species, at each of 15 sites, totaling 450 of each species.

Task 3: One hundred SES and SNS (each) will be live-collected during Task 1 for brood stock. A survey of genetic variation in the progeny of captive spawned fish will be used to determine whether such propagation adversely affects genetic diversity and to inform selection of numbers of individuals needed for brood stock. Fish collected during this one-time effort will be used for the genetic survey intended to provide information necessary for the conservation of genetic diversity and effective population sizes of the SES and SNS and genetic analysis of offspring of fish spawned in captivity will hopefully provide information needed to further develop protocols for captive propagation.

This biological opinion also evaluates the effects of the research and recovery permit from the activities described in the 10(a)(1)(A) permit. The 10(a)(1)(A) permit activities and those described in the section 6 grant work plan focus on research/conservation actions to be taken; however, in implementing those actions (particularly those that involve capture and handling of individual animals), there may be injury or mortality to some individuals, the permanent removal of individuals from the wild and the disruption of normal behavior patterns which is why there is a level of take included in the permit and the incidental take statement in this BO. Take of individuals is estimated. This BO on the permit issuance provides section 7 coverage to the U.S. Fish and Wildlife Service (USFWS) for section 6 funding as well as the permit issuance.

II. Status of the Species/Critical Habitat

The current list of federally threatened, endangered, and proposed species that are known to occur, or have been documented in Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, and Young Counties is presented in Table 1. Proposed species are not afforded Federal protection under the Act; however, for the purposes of intra-Service consultations the potential impacts to listed, proposed, and candidate species are considered.

Table 1. Federally listed species known to occur in Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, and Young Counties, Texas.			
Common Name	**Scientific Name**	**Status**	**County**
interior least tern	*Sterna antillarum*	Endangered	Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, Young
sharpnose shiner	*Notropis oxyrhynchus*	Endangered	Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, Young
smalleye shiner	*Notropis buccula*	Endangered	Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, Young
whooping crane	*Grus americana*	Endangered	Baylor, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, Young
piping plover	*Charadrius melodus*	Threatened	Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, Young
red knot	*Calidris canutus rufa*	Proposed Threatened	Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, Young

No Effect and Concurrences

Piping plover

The threatened piping plover and proposed threatened red knot are known to occur in Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, and Young Counties during migration, but currently the USFWS recommends they be evaluated only for wind energy projects within these counties.

Interior least tern

The USFWS also recommends that the endangered interior least tern be evaluated only for wind energy projects within each of these counties except for Throckmorton where this species has

been recorded at Millers Creek Reservoir and has some potential to occur elsewhere along the Brazos River. However, no activities covered in this biological opinion would take place near Millers Creek Reservoir; the probability of encountering an interior least tern at other locations along the Brazos River is minimal, and impacts to interior least terns resulting from the proposed actions are highly unlikely. For these reasons, WSFR has determined that the proposed action is not likely to adversely affect interior least terns. ARLES concurs with this determination; and therefore, this species is not considered further in this biological opinion.

Whooping crane

Whooping cranes are transient, potentially occurring within the action area during their annual migration. The USFWS recommends that the whooping crane be evaluated only for wind energy projects within each of the counties within the action area except for Garza and Young Counties where it has documented to occur with more regularity. It is unlikely that whooping cranes would be utilizing the areas in which activities covered in this biological opinion would be performed. For these reasons, WSFR has determined that the proposed action is not likely to adversely affect whooping cranes. ARLES concurs with this determination; and therefore, this species is not considered further in this biological opinion.

Brazos Shiners Critical Habitat

Within the action area encompassing the entire range of the SNS and SES, 1002.62 river kilometers (km) (623 miles [mi]) of critical habitat has been designated for both species (79 FR 45242-45271). This includes the river, as well as upland areas extending beyond the bankfull river channel by 30 m (98 ft) on each side. These 1002.62 river km (623 mi) have been designated as critical habitat because they provide for the primary needs of SNS and SES populations including a minimum, unobstructed, wide, flat, flowing river segment to support development of their life history stages. The 30 m (98 ft) buffer on each side has also been designated to maintain proper runoff filtration to support adequate water quality. A complete description of the primary constituent elements of critical habitat for the SNS and SES can be found within the Federal Register Notice for its designation (79 FR 45242-45271).
Critical habitat was designated for each of these species on August 4, 2014 (79 FR 45242-45271), which includes approximately 1002.62 river km (623 mi) of the Upper Brazos River and the upland areas extending beyond the river channel by 30 meters (m) (98 feet [ft]) on each side. Preliminary recovery planning efforts are underway.

All fieldwork involving the SNS and SES would take place within critical habitat for both species. Addressing potential impacts to critical habitat, WSFR has indicated:

1. Any effect to a primary constituent element for either species would be unlikely.
2. The temporary effect of disturbance in the form of sediment increase in the water would subside quickly.
3. Walking on the substrate of the river would not significantly alter the river bottom.

For these reasons, WSFR has concluded that the effect to critical habitat from the proposed actions would be insignificant; and therefore, has determined that those proposed actions may affect, but are unlikely to adversely affect critical habitat for either the SNS or SES. Based upon the information supporting this determination, and our own information, we concur with this determination; and therefore, critical habitat is not considered further in this biological opinion.

Species Description and Life History

The two federally listed endangered species that do occur in the action area and that would be affected by the proposed action are the SES and SNS. This section provides a brief species description and life history of the SNS and SES. For more comprehensive information regarding background and ecology, refer to the USFWS's Species Status Assessment Report (USFWS 2014, entire) for these species.

SNS and SES are small minnows currently restricted entirely to the contiguous river segments of the upper Brazos River basin in north-central Texas, which represents a greater than 70 percent reduction in range for the SNS and a greater than 50 percent range reduction for the SES. The range of both species in the Brazos River drainage originally extended downstream of Possum Kingdom Reservoir nearly to the Gulf Coast. The SNS also once occurred in portions of the Colorado and Red River drainages in Texas. The two fishes have been of conservation concern since 1982 (47 FR 58454) and were made candidates for listing under the Act in 2002 (67 FR 40657). Both species were listed by the USFWS on August 4, 2014 (79 FR 45274-45286).

The portion of the upper Brazos River where the SNS and SES occur is upstream of Possum Kingdom Lake and includes portions of the Double Mountain Fork, Salt Fork, and Brazos River main stem. The river channel in this location is generally wide and shallow with sandy substrates, the preferred habitat for these species. During periods of summer drought the upper Brazos River has intermittent flow resulting in isolated pools as the river runs dry. Arid prairie streams such as the upper Brazos River are often dominated by small, physiologically tolerant fish species such as SNS and SES. However, when compared with the other most common fish species in the Upper Brazos, the SNS is the first species to succumb to elevated temperature and salinity while the SES is the second most likely species to succumb to these same stresses associated with low flow (Ostrand 2000, pp. 53-54).

SNS and SES are broadcast-spawners with external fertilization, meaning that eggs and sperm are released into the water column where fertilization subsequently occurs (Durham and Wilde 2009a, p. 21). Based on studies of similar species, cyprinid eggs spawned into the pelagic zone (open water not near the river bottom) typically become semi-buoyant within 10 to 30 minutes (Platania and Altenbach 1998, p. 565), allowing them to drift through the water column for one or two days prior to hatching (Platania and Altenbach 1998, p. 565; Moore 1944, p. 211). Pre-larval stages drift in the water column for an additional two to three days post-hatching before developing into a free-swimming juvenile stage (Moore 1944, pp. 211–212; Perkin and Gido 2011, p. 372). Once capable of horizontal swimming, SNS and SES are believed to move to the margins of the main channel, to eddies, and to water near tributary mouths where flow velocity is reduced and food sources are more abundant (USFWS 2014, p. 20). Spawning occurs

asynchronously from April through September during periods of no- and low-flow, and large, synchronized spawning events occur during high streamflow events (Durham 2007, p. 24; Durham and Wilde 2008a, entire; Durham and Wilde 2009a, p. 26). Research on the reproductive needs of broadcast-spawning minnow species suggests a minimum unimpounded stream length of 275 km (171 mi) for optimum reproductive success of both species (Perkin *et al.* 2010, p. 7; USFWS 2014, p. 22).

Individual Species Descriptions

1. Sharpnose shiner

The SNS is a small, slender minnow. Coloration is typically olive dorsally, silver-white ventrally, and silver laterally with a faint midlateral stripe most notable posteriorly (Thomas *et al.* 2007, p. 68). Adult SNS are approximately 3 to 5 centimeters (cm) (1.2 to 2.0 inches [in]) in standard length, have a strongly curved ventral contour, and an oblique mouth (Hubbs and Bonham 1951, pp. 94–95). The SNS was first collected from the Brazos River in 1938, but was not described until 1951 by Hubbs and Bonham, who speculated that its closest relative was *N. percobromus* (= *atherinoides*), which occurs in the Red River system to the north of the Brazos River drainage and in river systems to the east (Gilbert 1980a, p. 291). The maximum lifespan for this species is less than three years (Marks 1999, p. 69). The susceptibility of early life stages to predation and adverse environmental conditions results in the low observed survival of first year fish (Durham 2007, p. 89).

2. Smalleye shiner

The SES is a small, pallid minnow, measuring 3.5 to 4.4 cm (1.4 to 1.7 in; Cross 1953, pp. 252–254). Coloration is typically olive-green with scales outlined by dark pigment dorsally, white ventrally, and silver laterally with a midlateral stripe scattered anteriorly and concentrated posteriorly (Thomas *et al.* 2007, p. 61). The maximum life span of the SES is less than three years (Marks 1999, p. 69). As in the SNS, the susceptibility of early life stages to predation and adverse environmental conditions results in the low observed survival of first year fish (Durham 2007, p. 89).

Factors Contributing to Decline

Habitat loss due to the construction of dams and impoundments is the largest factor in both species' decline. The fragmentation of streams and rivers, particularly with the construction of reservoirs, throughout the Great Plains has likely acted to increase the frequency of reproductive failure among broadcast spawning species in these systems through restricting the upstream movement of adults to spawn, leaving drifting eggs without sufficient distance to develop and hatch before being transported into lentic habitats (Durham and Wilde 2008b, p. 278). Additional impoundments under consideration for construction within the species' current range continue to threaten their viability. Other sources of habitat loss include groundwater withdrawals, climate change and drought, invasive saltcedar, desalinization, water quality degradation, and instream gravel mining and dredging (USFWS 2014, p. 38-47). Because SNS

and SES are each restricted to single populations within the upper Brazos River, each species is less likely to withstand catastrophic events than they would be if they occurred in multiple resilient populations spread across a wider range.

Range-wide Survival and Recovery Needs

The best available science suggests the primary needs of SNS and SES populations include a minimum, unobstructed, wide, flat, flowing river segment length of greater than 275 km (171 mi) to support development of their early life history stages (Perkin *et al*. 2010, p. 7; USFWS 2014, p. 22). Although SNS and SES are capable of successfully producing offspring during periods of flow rapid enough to complete their life history stages, reproductive activity is increased during elevated streamflow events (such as pulse flows occurring during stormwater runoff), suggesting these elevated flows are likely important to the long term viability of these species.

Ideally, a necessary increase in available suitable habitat would be accomplished by providing additional unfragmented river length downstream of, and contiguous with, the occupied range of the upper Brazos River. The middle Brazos River is now fragmented by four large dams (two operated by the Brazos River Authority, and one each by the U.S. Army Corps of Engineers, and the City of Waco), three of which support large reservoirs. These structures are unlikely to be removed, eliminating the possibility of increasing the SNS and SES occupied range by permitting the downstream transport of early life history stages and the upstream migration of adults. Given the middle Brazos River does not appear restorable for the purpose of supporting SNS and SES connectivity with the upper Brazos River, reduced viability might be addressed through captive propagation and reintroduced populations.

SNS and particularly SES can be difficult to identify in the field and require expertise with cyprinid identification. Therefore, monitoring of SNS and SES should be conducted by experienced personnel. Within the occupied range of the species in the upper Brazos River basin there is little need for presence/absence surveys because these species are expected to occur when conditions are favorable (water present within their physiological tolerances). Outside of the known occupied range of the upper Brazos River basin (the Colorado River basin, the middle and lower Brazos River, and the Wichita River in the Red River basin) these species are thought to be extirpated. Additional surveys, particularly in the Colorado River basin for the SNS, would be beneficial to confirm the loss of these species in these areas. Yearly monitoring in the upper Brazos River basin would be beneficial in determining the effects of drought on the last remaining populations of these species. Texas Parks and Wildlife Department (TPWD) has several conservation activities underway for the species including temporarily holding a population at the Possum Kingdom hatchery and a 2012 reintroduction attempt of both the SNS and SES in the Lower Brazos (TPWD 2012 online).

III. Environmental Baseline

A. Description of the Action Area

The action area encompasses the entire range of the SNS and SES including the upper Brazos River, the Salt Fork, and Double Mountain Fork within Baylor, Fisher, Garza, Kent, Knox, Palo Pinto, Stonewall, Throckmorton, and Young Counties, Texas. This area, moving west to east, includes portions of the Southwestern Tablelands, Central Great Plains, and Cross Timbers ecoregions. Characteristics of each are described below.

1. Southwestern Tablelands – Characterized by red hued canyons, mesas, badlands, and dissected river breaks. Unlike most adjacent Great Plains ecoregions, little cropland occurs due to unfavorable conditions. Typically composed of sub-humid grassland and semiarid rangeland. Natural vegetation includes grama-buffalograss, mesquite-buffalograss, juniper-scrub oak-midgrass savanna on escarpment bluffs, and shinery. The area averages approximately 48 cm (19 in) of rainfall annually with an average minimum temperature in January of 28° F and an average maximum in July of 95° F (Griffith *et al.* 2004). The Southwestern Tablelands ecoregion spans counties within the action area including Garza, Kent, Stonewall, and portions of Baylor and Knox.

2. Central Great Plains – are slightly lower in elevation, receive more precipitation, and are more variable in landscape than the Southwestern Tablelands to the west. This area was once grassland, a mixed or transitional prairie from the tallgrass to the east to shortgrass farther west. Scattered low trees and shrubs occur in the south. Most of this ecoregion is now cropland. Soils are generally deep with shallow soils on ridges and breaks. The area averages approximately 56 cm (22 in) of rainfall annually with an average minimum temperature in January of 31° F and an average maximum in July of 96° F (Griffith *et al.* 2004). The Central Great Plains ecoregion spans counties within the action area including Fisher, Throckmorton, and portions of Baylor, Knox, and Young

3. Cross Timbers – is a transitional area between the once prairie, now winter wheat growing regions to the west, and the forested low mountains of eastern Oklahoma and Texas. This region stretches from southern Kansas into central Texas, and contains irregular plains with some low hills and tablelands. It is a mosaic of forest, woodland, savanna, and prairie. The transitional natural vegetation of little bluestem (*Schizachyrium scoparium*) grassland with scattered blackjack oak (*Quercus marilandica*) and post oak (*Quercus stallata*) trees is used mostly for rangeland and pastureland, with some areas of woody plant invasion and closed forest. The area averages approximately 76 cm (30 in) of rainfall annually with an average minimum temperature in January of 33° F and an average maximum in July of 96° F (Griffith *et al.* 2004). The Cross Timbers ecoregion spans counties within the action area including Palo Pinto and portions of Young.

B. Status of the Species within the Action Area

The status of the species in the action area is evaluated across their entire range for the purposes of this biological opinion (Figure 1). In addition, the action area also extends downstream of the current range into Palo Pinto County where potential SNS and SES habitat ends at the Possum Kingdom Reservoir. Access to the Brazos River and its tributaries by the project researchers is

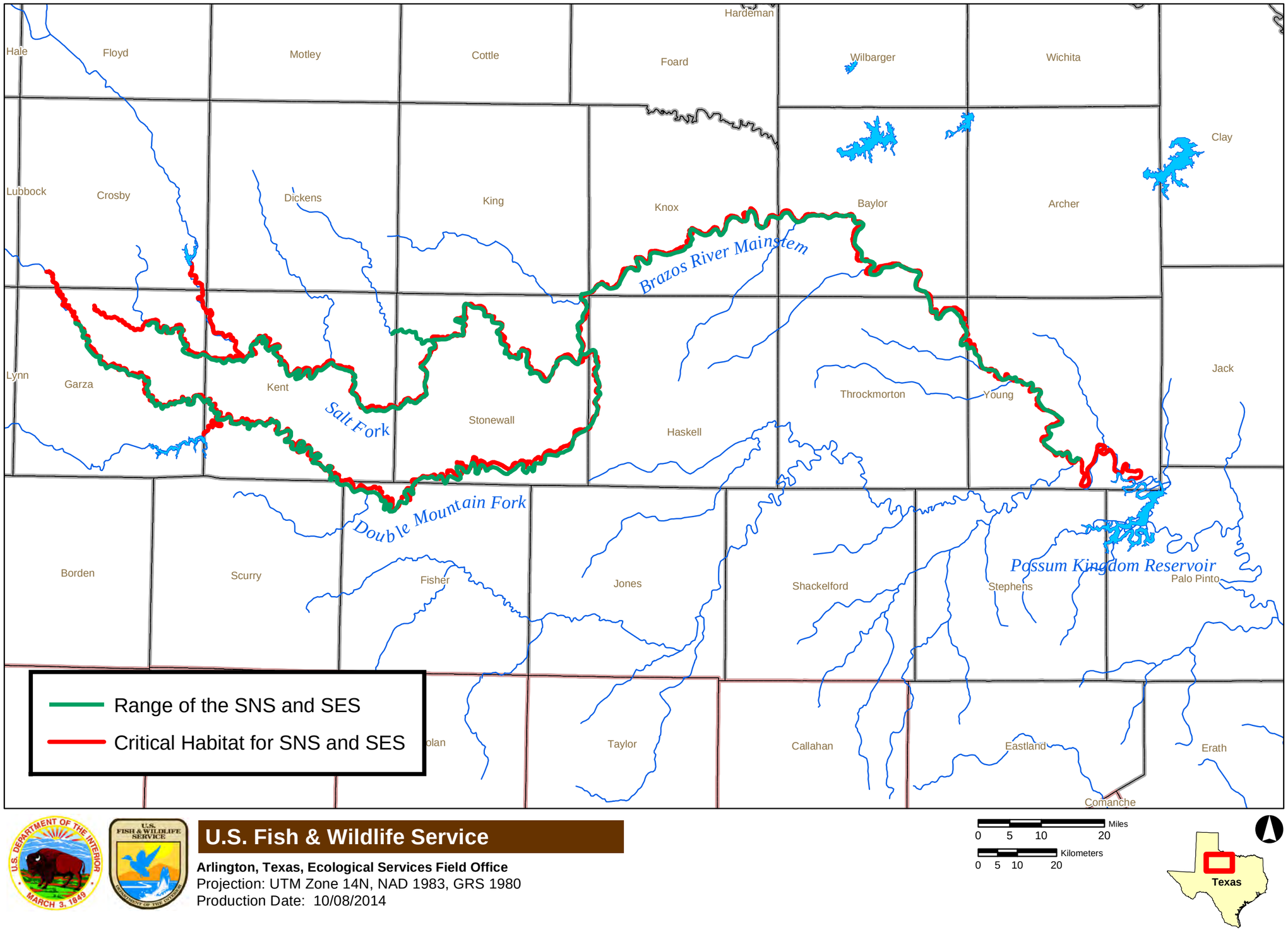

Figure 1: Sharpnose Shiner and Smalleye Shiner Range Map

generally limited to within walking distance of public access points at bridges and road crossings, and possibly other places where landowner permission might be obtained. Therefore, the action area for the proposed actions covered in this biological opinion encompasses the entire current range of the SNS and SES but is focused on these unspecified access points. Both species have limited viability and increased vulnerability to extinction largely because of their stringent life history requirements of long, wide, flowing rivers to complete their reproductive cycle. With a short life span allowing only one or two breeding seasons and the need for long, unobstructed flowing river reaches during the summer, both species are at a high risk of extirpation when rivers are fragmented by fish barriers and flows are reduced by multiple uses and drought-enhanced water shortages. These conditions have already resulted in substantial range reduction and isolated the one remaining population of both fish into the upper Brazos River basin. The extant population of each shiner species is located in a contiguous stretch of river long enough to support reproduction, is of adequate size, and is generally considered resilient to local or short-term environmental changes. However, with only one location, the species lack any redundancy and it is presumed these species lack the genetic and ecological representation to adapt to ongoing threats. Given the short lifespan and restricted range of these species, without human intervention, lack of adequate flows (due to drought and other stressors) persisting for two or more consecutive reproductive seasons may lead to species extinction. With high demand for water use and ongoing regional drought, the probability of this happening in the near term (approximately the next 10 years) is high, putting the species at a high risk of extinction. Over the longer term (the next 11 to 50 years) these conditions may deteriorate as human water use continues, including possible construction of new dams within the extant range, and enhanced chances of drought due to ongoing climate change. The condition of both species is at a low viability (low probability of persistence) and their viability is expected to decline into the future (USFWS 2014, Executive Summary). Conservation planning actions are underway involving USFWS, TPWD, and other entities.

IV. Effects of the Action

Under section 7(a)(2) "effects of the action" refers to the direct and indirect effects of an action on a species or critical habitat, together with the effects of other activities that are interrelated and interdependent with that action. The effects of the proposed action are added to the environmental baseline to determine the future baseline that serves as the basis for the determination in this biological opinion. The impacts discussed below are the USFWS's evaluation of the direct and indirect effects of the proposed action. Indirect effects are those caused by the proposed action that occur later in time, but are still reasonably certain to occur (50 CFR 402.02).

Factors to be Considered

The funding of the grant proposal by the Wildlife and Sport Fish Restoration Program will not directly affect the SNS and SES. However, effects from the interrelated actions of the research activities to be carried out with the proposed funding are likely to adversely affect the SNS and SES and would be covered under a section 10 research permit for the individuals involved. The

3-year research study will be conducted throughout the entire range of the SNS and SES across 2014-2016. SNS and SES will be captured through seining and subsequent release, and limited number of both species will also have fin tissue samples removed before release. These activities may subject SNS and SES to increased levels of stress, potential injury and/or mortality. A specific number of each species will also be collected from the wild from sampling sites across the species range and transported to a laboratory setting for reproductive and genetic studies.

Analyses for Effects of the Action

This effects analysis is based upon the effects of both the funding of the research and the issuance of the recovery permit that authorizes the incidental take. Therefore, the effects of these actions are considered together for the purpose of this analysis. The USFWS anticipates that direct and indirect adverse effects to the SNS and SES would result from the action as discussed below.

It is anticipated that up to 22,500 (7,500 per year, 3 years) SNS and 22,500 SES would be captured, identified, and immediately released. In 2014, 450 SNS and 450 SES would be sampled for fin tissue before release. In 2015, 100 SNS and 100 SES would be collected from sampling sites across the species' range and transported to Texas Tech University for reproductive and genetic studies.

Direct Effects

It is possible that SES and SNS may be injured during the seining and handling and during fin tissue sampling. Lead project personnel for this study indicate that they have worked extensively with these species in the past and have rarely observed any obvious signs of injury or distress in handled fish. Their 5 m (16.4 ft) seine haul protocol minimizes the time that the fish are in contact with the seine and, by limiting catch, reduces handling time. Additionally, 100 adult SNS and 100 adult SES will be permanently removed from the wild for genetic and propagation studies. The individual fish and their progeny will remain in the laboratory setting as specified under the 10a1A permit.

Indirect Effects

SNS and SES caught and released during seining activities, including those with fin tissue samples taken, may appear unharmed at the time of release. Collection of fin tissue is non-lethal to the species and is expected to occur without significant injury or harm to individuals. However, a small number may ultimately die or be permanently impaired due to undetected injury or as the result of stress. The project Principal Investigators estimate that no more than 2% of all SNS and SES seined would be impacted during the collection in a worst case scenario. This estimation is based upon extensive past experience seining both species utilizing the same seining protocols. Of the capture, fin clipping, and release of a maximum 22,500 SNS and 22,500 SES across the 3-year study, a maximum 2% rate of adverse impact in the form of mortality would result in the lethal take of no more than 150 individuals of each species within a

single year, totaling a maximum mortality of 450 individuals of each species across the 3 years of the project.

The section 6 grant and the section 10 permit are solely for the purpose of conservation of the species, the effects of which would be later in time. These would be indirect beneficial effects, and are discussed in the following section.

Beneficial Effects

Both components of the research study (genetic survey and captive propagation) could provide future contributions to the conservation of the SNS and SES. Only limited information is available on the genetic structure and variability of the SNS and SES (Gold *et al.* 1990 pp. 12-13). A recovery plan is not currently available for these species; however, in the future, hatchery propagation may be necessary to counter the effects of drought, climate change, and continued modification of the upper Brazos River (USFWS 2014, pp. 99-100). Recovery plans for endangered species may include a Genetics Management and Propagation Plan (e.g., Rio Grande silvery minnow (*Hybognathus amarus*) [USFWS 2009, entire]) to guide genetic and propagation goals. This study may provide data that can be used to directly inform development of a genetics management plan and provide an estimate of effective population size for both SNS and SES. Concerning captive propagation, basic genetic information with which to guide brood stock selection and spawning efforts is currently unavailable. Genetic analyses of offspring of fish spawned in captivity across multiple generations may provide information needed to further develop protocols for captive propagation.

V. Cumulative Effects

Cumulative effects include the effects of future State, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the Act.

Within the action area (encompassing the range of the SNS and SES) multiple river-crossings of unimproved roads are known to exist, typically consisting of culvert pipes and fill material placed within the river channel. These structures may impede river flow and act as partial fish barriers. Although numerous examples have been recorded through the use of aerial photography, more are likely to exist and new ones to be constructed in the future.

As water resources become scarcer, the capillary effects of increased groundwater pumping on private lands for agriculture and other needs reduces water levels and flow within the Brazos River. Surface water pumping for agriculture is also known to occur, reducing water level and flow. A lack of adequate flow can cause profound negative impacts to the reproduction and long-term viability of both species (USFWS 2014, p. 50). As water levels drop and flow decreases, salinity levels may rise potentially causing further stress to SNS and SES. Although

the extent of present impacts from groundwater and surface pumping are not known, they are reasonably certain to continue and likely increase in the future.

Gas and oil development activities are ongoing within the counties encompassing the action area. Associated land clearing for siting and road construction may negatively affect SNS and SES habitat through erosion and sedimentation. Also of concern is the use of water resources for gas and oil extraction as well as the potential for surface and groundwater contamination.

Texas may not have adequate water supplies to meet current or projected water demand in the upper Brazos River region and additional reservoir construction is likely. As a result, possible new impoundments included in the Texas State Water Plan's (TWDB 2012) proposed Post Reservoir in Garza County, the Double Mountain Fork Reservoir (East and West) in Stonewall County, and the South Bend Reservoir in Young County. Threats to the species and its habitat remain high; therefore any new structures further fragmenting stream habitats increases the likelihood of species extinction. Future major impoundments such as the Post Reservoir, Double Mountain Fork Reservoir, and South Bend Reservoir would require Federal permitting under section 404 of the Clean Water Act, which would necessitate separate consultation pursuant to section 7 of the Act. However, unauthorized smaller impoundments and other fish barriers are known to occur and may increase in the future to meet water needs.

VI. Conclusion

After reviewing the current status of the SNS and SES, the environmental baseline for the action area, the effects of the proposed section 6 research project and associated section 10 recovery permit, and the cumulative effects, it is the USFWS's biological opinion that the project, as proposed, is not likely to jeopardize the continued existence of the SNS and SES. The expected capture and release of up to 22,500 SNS and SES and the fin tissue sampling of 450 individuals of each species is expected to result in the maximum potential mortality of no more than 450 of each species spread across their entire range during the 3-year research study. Considering the stability of the populations of each species within the action area, the potential take of 450 SNS and SES across a 3-year period will not appreciably reduce the likelihood of both the survival and recovery of either species. Likewise, the permanent removal of 100 individuals of each species from sampling sites spread across the species' range for reproductive and genetic studies will not appreciably reduce the likelihood of both survival and recovery of the SNS and SES. Further, the potential future beneficial effects of this research may ultimately far offset any initial adverse impacts by guiding essential recovery efforts.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the USFWS to include significant habitat

modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the USFWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this incidental take statement.

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

Amount or Extent of Take Anticipated

Incidental take from seining and fin tissue sampling is anticipated. The majority of the individuals (22,050) will be temporarily captured and examined, returned to the water. Handling stress is not expected to result in any permanent harm to the majority of the individuals. Mortality rate is expected at no more than 2% of the maximum of 22,500 of each species captured and released. Over the 3-year duration of the project, the USFWS anticipates that up to 450 SNS and 450 SES may be killed as a result of seining and fin tissue sampling. The USFWS also anticipates 100 SNS and 100 SES would be taken as a result of capture and permanent removal of those individuals from the wild for genetic and propagation studies.

Effect of the Take

In the accompanying biological opinion, the USFWS determined that this level of anticipated take is not likely to result in jeopardy to either species.

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS

The USFWS believes the following reasonable and prudent measures and terms and conditions are necessary and appropriate to minimize impacts of incidental take of SNS and SES:

1. The conditions, including reporting, of Dr. Gene Wilde's recovery permit (TE-209033)

must be followed by research personnel and results reported to ARLES.

In order to be exempt from the prohibitions of section 9 of the Act, WSFR must comply with the following terms and conditions, which implement the reasonable and prudent measure, described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. Seine hauls for surveys will be short (5 m [16.4 ft]) and fish caught will be identified and released to reduce mortality.
2. Fish accidently killed may be collected for voucher specimens for deposition in an appropriate museum or university collection. These numbers should be reported to the USFWS.
3. The Arlington Field Office should be contacted immediately if the number of mortally injured SNS or SES exceeds 150 in a single year.
4. To limit handling stress of listed species, student assistants may only participate in sampling under the direct on-site supervision of the individuals named in the 10(a)1(A) permit.

The reasonable and prudent measures, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. WSFR must immediately provide an explanation of the causes of the taking and review the need for possible modification of the reasonable and prudent measures.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. This traditional section 6 grant and 10(a)1(A) permit address conservation needs identified within the USFWS's Species Status Assessment for the SNS and SES. No additional conservation recommendations are necessary.

Reinitiation Notice

This concludes formal consultation on the actions outlined in your request for IntraService consultation. As provided in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by

the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

If further assistance or information is required, please contact Mr. Sean Edwards, or Omar Bocanegra at (817) 277-1100.

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