November 18, 2019

MEMORANDUM

To: Jennifer R. Baxter, Industrial Economics, Incorporated (IEc)

From: Adam Zerrenner, Austin Ecological Services Field Office /s/ Adam Zerrenner

Subject: Incremental Effects Memorandum for the Economic Analysis for the Proposed Rule to Designate Critical Habitat for *Donrichardsia macroneuron*

The purpose of this memorandum is to provide information to serve as a basis for conducting an economic analysis for the proposed designation of critical habitat for *Donrichardsia macroneuron*. Section 4(b)(2) of the Endangered Species Act (Act) requires the Secretary of Interior (Secretary), and therefore by delegation the U.S. Fish and Wildlife Service (Service), to consider the economic, national security, and other impacts of designating a particular area as critical habitat. The Secretary may exclude an area from critical habitat if the Secretary determines that the benefits of exclusion outweigh the benefits of including the area as critical habitat, unless the exclusion will result in the extinction of the species. In part to comply with section 4(b)(2) of the Act and consider the economic impacts of a proposed critical habitat designation, the Service prepares an economic analysis that describes and monetizes, where possible, the probable economic impacts of the proposed regulation. The data in the economic analysis may be used in the discretionary balancing evaluation under section 4(b)(2) of the Act to consider any particular area for exclusion from the final designation.

Determining the economic impacts of a critical habitat designation involves evaluating the "without critical habitat" baseline versus the "with critical habitat" scenario, to identify those effects expected to occur solely due to the designation of critical habitat and not from the protections that are in place due to the species being listed under the Act. Effects solely due to the critical habitat designation equal the difference, or increment, between these two scenarios, and include both (1) the effects of changes in the action to avoid destruction or adverse modification of critical habitat and (2) the costs of increased administrative efforts that result from the designation. These changes can be thought of as "changes in behavior" or the "incremental effect" that would most likely result from the designation if finalized. Specific measured differences between the baseline (without critical habitat) and the designated critical habitat (with critical habitat) may include, but are not limited to, the economic effects stemming from changes in land or resource use or extraction, changes in environmental quality, or time and effort expended on administrative and other activities by Federal landowners, Federal action

agencies, and in some instances, State and local governments or private third parties. These are the incremental effects that serve as the basis for the economic analysis.

There are a number of ways that designation of critical habitat could influence activities, but one of the important functions of this memorandum is to explain any differences between actions required to avoid jeopardy to the species versus actions that may be required to avoid destruction or adverse modification of critical habitat. The Service is analyzing whether destruction or adverse modification would occur based on whether the Federal agency's action is likely "to result in the destruction or adverse modification of habitat which is determined by the Secretary… to be critical.". To perform this analysis, the Service considers how the proposed action is likely to affect the function of the critical habitat unit in serving its intended conservation role relative to the entire designation. The information provided below is intended to identify the possible differences for this species under the two different section 7 standards (i.e., jeopardy to the species and adverse modification of critical habitat). Ultimately, however, a determination of whether an activity may result in the destruction or adverse modification of critical habitat is based on the effects of the action to the designated critical habitat in its entirety. The information provided below is intended to identify the possible differences for *Donrichardsia macroneuron* under the different section 7 standards for jeopardy to the species and destruction or adverse modification of critical habitat.

The Service recognizes that the "geographical area occupied by the species" at the time of listing as stated under section 3(5)(A)(i) of the Act as the geographical area which may generally be delineated around the 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). The species may or may not be present within all areas of the geographical area occupied by the species. Thus, the "geographical area occupied by the species" can, depending on the species at issue and the relevant data available, be defined on a relatively coarse scale.

Section 7 consultation is required whenever there is a discretionary Federal action that may affect listed species or designated critical habitat. Section 7(a)(3) also states that a Federal agency shall consult with the Secretary on any prospective agency action at the request of, and in cooperation with, the prospective permit or license applicant if the applicant has reason to believe that an endangered species or a threatened species may be present in the area affected by his project and that implementation of such action will likely affect such species. The initiation of section 7 consultation under the jeopardy standard takes place if the species may be present and the action is likely to affect the species.

Because of the relatively coarse scale of analysis allowed by the definition of "critical habitat," the species may or may not be present within all portions of the "geographical area occupied by the species" or may be present only periodically. Therefore, at the time of any consultation under section 7 of the Act, the species of interest may not be present within the action area for the purposes of the section 7 consultation, even if that action area is within the "geographical area occupied by the species." This possibility however, does not change the "geographical area occupied by the species" as stated under section 3(5)(A)(i) for the species. It must however, be reflected in our analysis of the economic impacts of a critical habitat designation. How we implement each critical habitat designation under section 7 is important because even when an area is determined to be within the general geographical area occupied by the species at the time of listing, the specific area where a consultation may occur is based on the presence of the species with the action area and the effects to that species. If a species is not present and the action is not likely to adversely affect the species within a particular area designated as critical habitat at the time of consultation, the economic effects of the consultation would likely be considered an incremental effect of the critical habitat because in almost all cases, the consultation would not have occurred absent the critical habitat designation[1]. These incremental economic effects would derive both from changes in management, such as costs resulting from restrictions on development and other activities due solely to critical habitat, and changes in the scope of administrative review, i.e., the added costs of considering effects to critical habitat during consultation. (Additional administrative costs would also occur in *occupied* areas due to the need to analyze destruction or adverse modification of critical habitat along with jeopardy to the species.) In this memorandum, when we describe occupancy for purposes of estimating the probable incremental impacts and therefore, potential economic costs of critical habitat designation, we are referring to the occupancy status within the action area of a particular Federal action at the time of a consultation under section 7 of the Act. In this context the "geographical area occupied by the species" under section 3(5)(A)(i) and the area where a species may be present or may be affected by a particular Federal action under a section 7 consultation may differ. The difference lies in the implementation of the critical habitat designation for purposes of the section 7 consultation, although within the geographical range occupied by the species under 3(5)(A)(i), the species may or may not be present at the time of consultation. The purpose of this memorandum is to describe how the Service will implement the critical habitat designation; however, it is only on a case by case basis that we are able to evaluate whether or not a Federal action may affect the listed species or its critical habitat while considering the species' presence within the action area.

I. BACKGROUND

[1] (If the area is not currently occupied and there is no critical habitat designated, it is unlikely that a Federal Agency would consult under section 7 in the first instance unless it is clear that activities in the unoccupied areas "may affect" nearby occupied areas.)

Description: *Donrichardsia macroneuron* is an aquatic moss in the family Brachytheciaceae that grows on submerged or partially submerged rocks. The deep, loosely interwoven mats are blue-green to blackish-brown where shaded and yellow-green where exposed to full sun. The curving, rigid stems reach 3 to 14 centimeters (cm) (1.2 to 5.5 inches (in)) in length, with irregular branches up to 10 millimeters (mm) (0.4 in) long. Leaves are loosely erect and spreading when moist, dark green to brownish, 0.4 to 0.8 mm (0.02 to 0.03 in) wide by 0.9 to 1.8 mm (0.04 to 0.07 in) long. The male reproductive structures (antheridia) are about 300 micrometers (µm) (0.01 in) long and are surrounded by threadlike filaments 7 to 8 cells long. The female reproductive structures (archegonia) and spore-bearing structures (sporophytes) have not been observed in *Donrichardsia macroneuron*, and it is possible that only male individuals remain and that sexual reproduction can no longer occur.

Distribution: *Donrichardsia macroneuron* has an extremely endemic range. It has only been documented from Seven Hundred Springs, on the South Llano River in Edwards County, Texas, and from one additional spring-fed site, reported by Redfearn in 1971, about 5 kilometers (km) (3.1 mi) downstream in Kimble County, Texas, both within the Edwards Plateau (Figure 4). Seven Hundred Springs is within the Bluff Creek 12−digit Hydrologic Unit Code (HUC−12) sub-watershed, and the Redfearn Site is within the Little Paint Creek and Paint Creek HUC−12 sub-watersheds (Figure 5). These sites are supported by spring flows and are both located within the Edwards-Trinity Aquifer and the South Llano River watershed; however, the groundwater basins that supply these springs have not been mapped. These springs have never ceased flowing in recorded history. Water from these springs emerges at a very consistent temperature and is rich in travertine minerals. *Donrichardsia macroneuron* was discovered at Seven Hundred Springs in 1932, and was most recently confirmed there in 1979 (Wyatt and Stoneburner 1980, entire). This is the best available data we have for this site; consequently, we consider the Seven Hundred Springs population to be extant. *Donrichardsia macroneuron* was last documented at the Redfearn site in 1971. Surveys were conducted in the general area of the Redfearn site in 2017 (the exact location of Redfearn's collections are unknown), but *Donrichardsia macroneuron* was not found. This is the best available data we have for this site; consequently, we consider the Redfearn population to be extirpated. However, few surveys for this species have been conducted. Consequently, it is possible that this species occurs elsewhere along Paint Creek or the South Llano River. It is also possible that the species does not occur anywhere else.

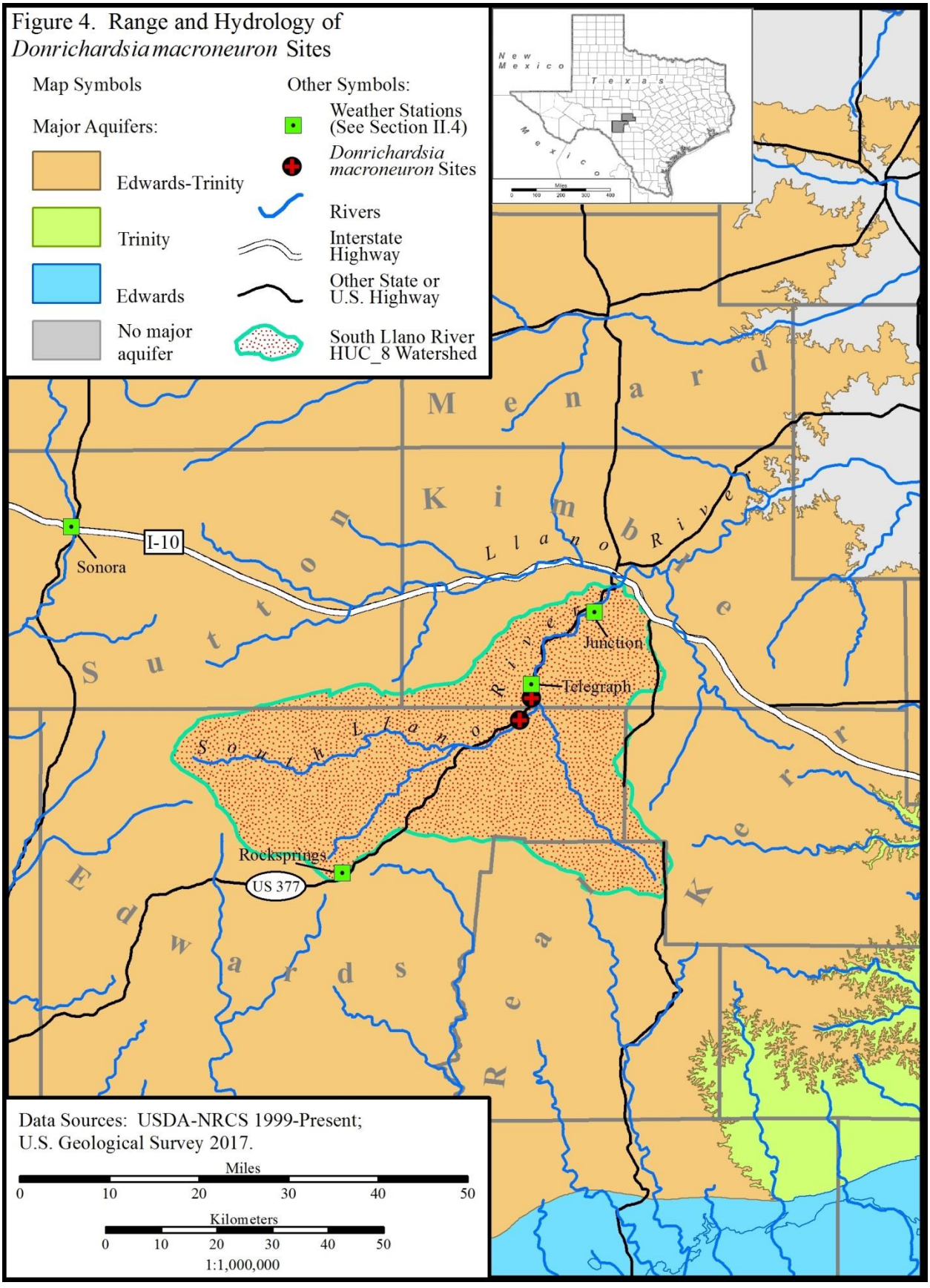
Figure 4. Range and Hydrology of
Donrichardsia macroneuron Sites
Map Symbols
Major Aquifers:
Edwards-Trinity
Trinity
Edwards
No major aquifer
Other Symbols:
Weather Stations (See Section II.4)
Donrichardsia macroneuron Sites
Rivers
Interstate Highway
Other State or U.S. Highway
South Llano River HUC_8 Watershed
New Mexico
Texas
Mexico
Menard
Kimble
Sutton
Edwards
Real
Kerr
Llano River
North Llano
South Llano
I-10
Sonora
Junction
Telegraph
Rocksprings
US 377
Data Sources: USDA-NRCS 1999-Present;
U.S. Geological Survey 2017.
Miles
0 10 20 30 40 50
Kilometers
0 10 20 30 40 50
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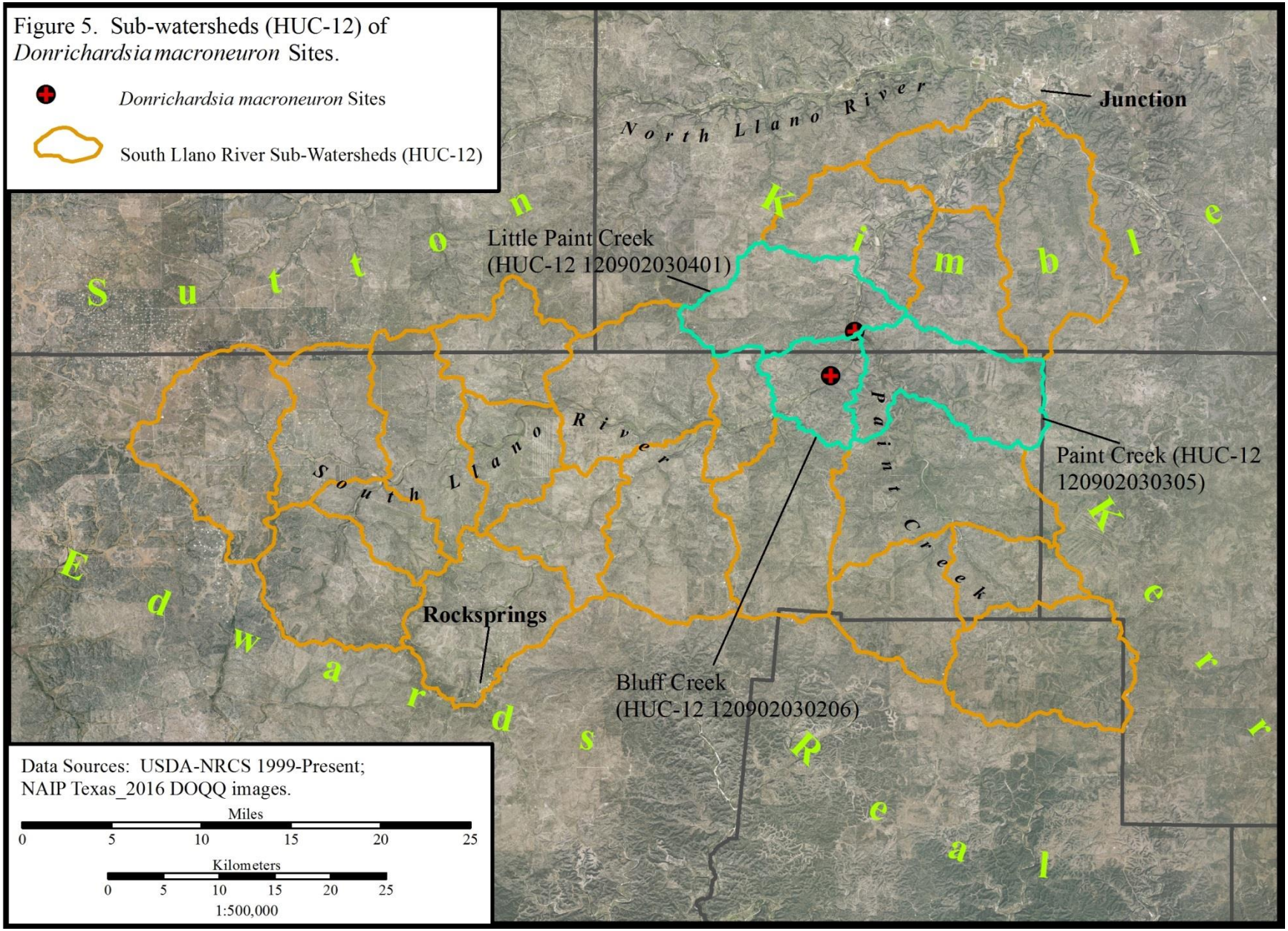
Figure 5. Sub-watersheds (HUC-12) of *Donrichardsia macroneuron* Sites.
Donrichardsia macroneuron Sites
South Llano River Sub-Watersheds (HUC-12)
North Llano River
Junction
Little Paint Creek (HUC-12 120902030401)
Paint Creek (HUC-12 120902030305)
South Llano River
Paint Creek
Rocksprings
Bluff Creek (HUC-12 120902030206)
Sutton
Kimble
Edwards
Real
Kerr
Data Sources: USDA-NRCS 1999-Present;
NAIP Texas_2016 DOQQ images.
Miles
0 5 10 15 20 25
Kilometers
0 5 10 15 20 25
1:500,000

Major threats: During the next 50 years, increased pumping may occur from the Edwards-Trinity Aquifer for transfer to other regions to supply increased municipal water demands. This increased pumping could reduce water storage in the Edwards-Trinity Aquifer and spring flows in the South Llano River. Interrupted spring flows would likely reduce or extirpate the only remaining population of *Donrichardsia macroneuron*. The potential effects of climate changes could include an increased duration and severity of droughts and an increased frequency and severity of heavy rainfall, thereby increasing the threats of interrupted spring flows and flash floods. Prolonged drought would increase the likelihood of interrupted spring flows. Since the populations are within or at the edge of streams, they are vulnerable to scouring and silt deposition during flash floods. The combined demographic and genetic consequences of small population sizes may reduce population recruitment, leading to even smaller populations and greater isolation, and further decreasing the viability of the species. These factors may already have contributed to the decline of *Donrichardsia macroneuron* to its current state of extreme endemism in the upper South Llano River.

Critical habitat: We have identified 1 unit of critical habitat along the upper South Llano River in northeastern Edwards County.

Physical or biological features: We derived the specific physical or biological features essential to the conservation of *Donrichardsia macroneuron* from studies of this species' habitat, ecology, and life history. We have determined that the following physical or biological features are essential to the conservation of *D. macroneuron* and may require special management considerations or protection:

- The uninterrupted flow of spring water supplied by the Edwards-Trinity aquifer.
- Relatively constant temperature due to the proximity to the point of spring outflow.
- A substrate of calcareous or travertine rock not more than 15 cm (12 in) below the surface of the water.

Unit Descriptions

Unit 1: Upper South Llano River.

The Upper South Llano River unit is located at Seven Hundred Springs, in northeastern Edwards County, covering 0.19 ha (0.48 ac). This unit is in the outflow area of Seven Hundred Springs, between the water's edge of the South Llano River and extending about 10 m (33 ft) upslope. The species was last documented at this site in 1979 and is presumed to persist there. This entire unit is on privately owned land. This unit contains at least one of the physical or biological features essential to the conservation of the species. The physical or biological features in this unit may require special management consideration due to groundwater pumping causing loss of base flow; flood-control projects; and development of areas adjacent to or within proposed critical habitat.

Table 1: Size and ownership of each unit.

Unit	Occupancy/Presence	Ownership	Area	Co-occurring Listed Species or Existing Critical Habitat for Listed Species?
1. Upper South Llano River	Occupied	Private	0.19 ha (0.48 ac)	None

We are not considering any portion of this unit for exemption under Section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) or exclusion Under section 4(b)(2) of the Act.

II. BASELINE ANALYSIS

A. Identify conservation plans and regulatory mechanisms that provide protection to the species and its habitat absent the critical habitat designation

1. Conservation Plans/Efforts.

The following are ongoing conservation efforts that provide some benefits to *Donrichardsia macroneuron* and are considered part of the baseline because these activities will occur with or without critical habitat designation.

Local stakeholders founded the South Llano Watershed Alliance in 2009 to preserve and enhance the South Llano River and its watershed by encouraging land and water stewardship through collaboration, education, and community participation. This alliance published the North and South Llano Watershed Conservation Plan in 2012 to serve as a guide for coordinated conservation and restoration though voluntary, non-regulatory measures. Numerous Partners for Fish and Wildlife projects have been funded and implemented within these watersheds that address recommendations of these two plans.

The Upper Llano River Watershed Protection Plan (Broad *et al.* 2016) recommends a wide range of voluntary, non-regulatory watershed protection measures to address threats and promote conservation of the North Llano and South Llano Rivers above their confluence in Junction. These measures include the repair of defective septic systems (p. 55), reduction of feral hog populations (pp. 56−58), exotic wildlife management (pp. 59−60), conservation planning with private landowners (pp. 61−63), brush control and prescribed fire (pp. 51, 64−66, 68−69, 86), and streambank restoration and invasive plant control (pp. 67−69).

2. Federal Regulations/Acts.

The following Federal laws and regulations provide some benefits to *Donrichardsia macroneuron* and are considered part of the baseline because these benefits will continue with or without critical habitat designation.

CLEAN WATER ACT. Congress passed the Federal Water Pollution Control Act Amendments of 1972 and the Clean Water Act (CWA) of 1977 to provide for the restoration and maintenance of the chemical, physical, and biological integrity of the nation's lakes, streams, and coastal waters. Primary authority for the implementation and enforcement of the CWA now rests with the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (COE). In addition to the measures authorized before 1972, the CWA implements a variety of programs, including: Federal effluent limitations and state water quality standards, permits for the discharge of pollutants and dredged and fill materials into navigable waters, and enforcement mechanisms.

Section 404 of the CWA is the principal Federal program that regulates activities affecting the integrity of waters. Section 404 prohibits the discharge of dredged or fill material in jurisdictional waters of the United States, unless permitted by COE under § 404(a) (individual permits), 404(e) (general permits), or unless the discharge is exempt from regulation as designated in § 404(f).

Section 402 of the CWA is the principal Federal program that regulates activities affecting water quality. One of the most significant features of the 1972 CWA is the creation of a National Pollutant Discharge Elimination System (NPDES). Except as otherwise provided in the CWA, industrial sources and publicly owned treatment works may not discharge pollutants into navigable waters without a permit. The EPA or state authorized programs may issue a permit for discharge upon condition that the discharge meets applicable requirements, which are outlined extensively in the CWA and which reflect, among other things, the need to meet Federal effluent limitations and state water quality standards.

Since *Donrichardsia macroneuron* occurs within or at the edge of a navigable water of the United States, provisions of the CWA could protect the species from adverse modifications to the South Llano River caused by pollutants, dredge, or fill material.

3. *Federal Land Management.*

No Federal agencies own or manage lands within any of the areas designated as critical habitat for *Donrichardsia macroneuron*.

4. *Tribal Regulations.*

There are no Tribal regulations that provide protections to *Donrichardsia macroneuron*.

5. *State Laws that may provide protections/conservation.*

The following Texas laws and regulations provide some benefits to *Donrichardsia macroneuron* and are considered part of the baseline because these benefits will continue with or without critical habitat designation.

The survival of *Donrichardsia macroneuron* depends on the continued flow of Seven Hundred Springs (and perhaps other springs), which in turn depend on the storage of water in the Edwards-Trinity aquifer and the amount of pumping from the aquifer. The Texas Water Development Board (TWDB) is the state agency responsible for conservation and responsible development of water resources. In 1997, TWDB designated 16 Water Planning Regions that adopt plans to meet projected needs for surface and groundwater over 50-year time frames. The Texas Legislature and Texas Commission on Environmental Quality (TCEQ) have also established 98 Groundwater Conservation Districts (GCDs) in Texas that regulate the spacing and production from water wells. Additionally, the Texas Legislature authorized TWDB to designate 16 Groundwater Management Areas (GMAs) to manage the state's aquifers. TWDB develops estimates of groundwater availability, called Modeled Available Groundwater (MAG), and must provide MAGs to the GCDs and water planning groups. GCDs consider MAGs in developing Desired Future Conditions (DFCs) that balance the highest practicable amount of groundwater production with the long-term conservation and protection of groundwater resources. The hydrologic basin that supplies the South Llano River springs lies within Regional Water Planning areas F (32 counties including Kimble) and Plateau (6 counties including Edwards). The HUC−12 watersheds (sub-watersheds) of the upper South Llano River occur in four GCDs: Real-Edwards Conservation and Reclamation District, Kimble County GCD, Sutton County Underground Water Conservation District, and Headwaters Underground Water Conservation District. These GCDs lie within Groundwater Management Area (GMA) 7, which has established a Desired Future Condition (DFC) limiting average drawdown of the Edwards-Trinity Aquifer to 2.1 m (7 ft). Collectively, these overlapping authorities are responsible for sustaining the water supply from the aquifers that supply the South Llano springs that *Donrichardsia macroneuron* depends on.

B. Federal agencies and other project proponents that are likely to consult with the Service under section 7 absent the critical habitat designation

In the baseline scenario, section 7 of the Act requires Federal agencies to consult with the Service to ensure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of *Donrichardsia macroneuron*. This is the baseline scenario (i.e. without critical habitat). For the purposes of consultation regarding the listing of the species we would recommend consultation on activities that would impact the South Llano River or Paint Creek within the HUC-12 watersheds of Paint Creek, Bluff Creek, and Little Paint Creek or upper South Llano River HUC-8 watershed depending on the activity and location.
Some of the Federal agencies and projects that would likely go through the section 7 consultation process whether or not critical habitat is designated include the following:

1. U.S. Environmental Protection Agency (EPA) administers the CWA overall. Section 7 consultation could be invoked for projects that discharge contaminants into the South Llano River and Paint Creek upstream from the known populations of *Donrichardsia macroneuron*.

2. U.S. Army Corps of Engineers (USACE) jointly administers Section 404 of the CWA with the EPA and enforces permit provisions. Section 7 consultation could be invoked for projects, such as oil and gas pipelines or highway construction that discharge dredge or fill material into the South Llano River and Paint Creek upstream from the known populations of *Donrichardsia macroneuron*.

1. U.S. Department of Transportation (DOT) and its subordinate agencies, such as the Federal Highway Administration and Federal Railroad Administration, administer federal transportation programs, policies, and development, and coordinate these activities with state and local governments. Section 7 consultation could be invoked for highway or railroad construction projects that propose to cross the South Llano River and Paint Creek upstream from known populations of *Donrichardsia macroneuron*.

2. U.S. Fish and Wildlife Service (USFWS) promotes and supports endangered species conservation and habitat management on privately-owned lands through its Partners for Fish and Wildlife (PFW) program. Projects that are proposed for PFW support invoke intra-service section 7 consultation.

Table 3: Conservation Plans or other Protections Afforded to *Donrichardsia macroneuron*.

Unit	Conservation Plan/Protection Measure	Area Covered by Plan/Measure	All or Some Activities Covered?	Recommend Changes after Critical Habitat Designated?	Major Changes?
1	North and South Llano Watershed Conservation Plan (2012)	North and South Llano Rivers above Junction.	All	None.	No.
1	The Upper Llano River Watershed Protection Plan (2016)	North and South Llano Rivers above Junction.	All	None.	No.
1	The Clean Water Act of 1972	Navigable waters of the U.S., including wetlands.	Discharge of pollutants, dredge, and fill material	None.	None.
1	Groundwater conservation regulated by	Region F and Plateau Water Planning	Spacing and production of wells and	None.	None.

	TWDB, GCDs, GMAs, and Water Planning Regions	Regions, 4 GCDs, and GMA 7.	amount of drawdown of the Edwards-Trinity aquifer.		

C. What Types Of Project Modifications Are Currently Recommended Or Will Likely Be Recommended By The Service To Avoid Jeopardy (i.e., The Continued Existence Of The Species)?

For the purposes of consultation regarding the listing of the species, we would recommend consultation on activities that impact the South Llano River or Paint Creek within the HUC-12 watersheds of Paint Creek, Bluff Creek, and Little Paint Creek, or within the HUC-8 watershed of the upper South Llano River, depending on the activity and location.

1. *Typical Recommendations To Avoid Jeopardy.*

- Conduct surveys along Paint Creek and the South Llano River within the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds where habitat conducive to the species survival is present.
- Avoid activity at Seven Hundred Springs between the river and upslope.
- Avoid disturbance directly above the Seven Hundred Springs site.
- Avoid disturbance to the rock substrate and aquatic vegetation at occupied sites and upstream of occupied sites.,
- Avoid contamination of Paint Creek and the South Llano River within the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds with substances that are toxic to aquatic mosses, or with nutrient levels that alter the aquatic plant community to the detriment of *Donrichardsia macroneuron*.
- Avoid contamination of the portion of the Edwards-Trinity aquifer that supplies springs along Paint Creek and the South Llano River with substances that are toxic to aquatic mosses, or with nutrient levels that alter the aquatic plant community to the detriment of *Donrichardsia macroneuron*.
- Avoid withdrawals (pumping) from the Edwards-Trinity aquifer of such volume, distribution, or frequency that the supply of water to the springs on the upper South Llano and Paint Creek could be interrupted or reduced.
- Avoid disturbance to the terrestrial soil and vegetation within the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds to an extent that would increase the incidence and severity of flash floods and soil erosion at occupied sites.
- Avoid the introduction or increase of introduced invasive plants and animals within the Bluff Creek, Paint Creek, and Little Paint Creek watersheds that harm *Donrichardsia macroneuron* through competition, parasitism, pathogenism, or herbivory.

2. *Project Modifications During A Section 7 Consultation To Avoid Jeopardy.*

- Re-align or relocate a project so that it cannot directly or indirectly affect the extant population of*Donrichardsia macroneuron.*
- Minimize any increased demands for water from the Edwards-Trinity aquifer.
- Clean and inspect boats and equipment that could transport introduced invasive plants and animals into the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds.
- Implement soil conservation measures during project implementation within the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds Restore native vegetation promptly, and practice effective soil conservation measures following disturbance to significant areas of soil and vegetation within the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds.
- Implement fail-safe measures to prevent contamination of the Bluff Creek, Paint Creek, and Little Paint Creek HUC-12 watersheds, as well as the Edwards-Trinity aquifer, with toxic chemicals or excessive nutrient levels.

III. ONCE CRITICAL HABITAT IS DESIGNATED, WILL THE OUTCOME OF SECTION 7 CONSULTATIONS IN OCCUPIED HABITAT BE DIFFERENT?

The area covered by the presumed extant Seven Hundred Springs population is very small (0.19 ha (0.48 ac)), because the occupied habitat is the outflow area of a single large spring. However, few surveys for this species have been conducted. Consequently, it is possible that this species occurs elsewhere along Paint Creek or the South Llano River. It is also possible that the species does not occur anywhere else. The Service will likely recommend surveys for *Donrichardsia macroneuron* in other areas of the South Llano River and Paint Creek that have suitable habitat for this species. Since *Donrichardsia macroneuron* is intimately tied to its habitat, any potential project modifications to avoid adverse modification of critical habitat are most likely also going to be required to avoid jeopardizing this species. Hence, there will be no difference between jeopardy and adverse modification in section 7 consultations.

IV. INCREMENTAL IMPACTS ANALYSIS

A. ADVERSE MODIFICATION ANALYSIS

Explain Additional Recommendations The Service Will Make When Considering Both Jeopardy And Adverse Modification.

1. *What Federal Agencies Or Project Proponents Are Likely To Consult With The Service Under Section 7 With Designation Of Critical Habitat? What Kinds Of Additional Activities Are Likely To Undergo Consultation With Critical Habitat?*

The same Federal agencies listed above under the baseline for listing analysis are expected to be the primary agencies that would consult with the Service under section 7 *Donrichardsia macroneuron* critical habitat: EPA, USACE, DOT, and USFWS (intra-service). We foresee no additional activities that will invoke section 7 consultation through this designation of critical

habitat that would not invoke section 7 consultation through the listing of the species. Proposed actions that would result in sufficient harm or harassment to constitute jeopardy to this species would also likely adversely modify physical and biological features in the occupied designated critical habitat.

2. *Provide Examples Representing Typical Recommendations to Avoid Adverse Modification of Critical Habitat Applicable Across A Broad Suite Of Projects. Where Significant Uncertainty Exists, Provide Ranges Of Potential Outcomes.*

To avoid adverse modification of critical habitat, we will make the same recommendations listed in above (section C.1) to avoid jeopardy.

3. *What Types Of Project Modifications Might The Service Make During A Section 7 Consultation To Avoid Destruction Or Adverse Modification Of Critical Habitat That Are Different Than Those For Avoiding Jeopardy?*

To avoid adverse modification of critical habitat, we will make the same project modifications listed in above (section C.2) to avoid jeopardy.

4. *If The Species is Only Seasonally Or Sporadically Present Would The Outcome Of The Consultation Be The Same If Present at Time of Section 7 Consultation?*

Not applicable; the listed species is an aquatic moss that is firmly attached to submerged rocks.

5. *What Project Proponents Are Likely To Pursue HCPs Under Section 10 After The Designation Of Critical Habitat?*

Since a) *Donrichardsia macroneuron* is a plant, b) the extant population occurs on private land, and c) the take of listed plants is not prohibited under the ESA, project proponents are unlikely to pursue an HCP for this species.

B. UNOCCUPIED AREAS OR AREAS WHERE THE SPECIES IS NOT PRESENT

Does the designation include unoccupied habitat that was not previously subject to the requirements of section 7?

1. *Identify Unoccupied Units Or Subunits.*

The designation does not include any areas of unoccupied critical habitat.

2. *Provide Information About The Likelihood That Project Proponents Would Have Known About The Potential Presence Of The Species Absent Critical Habitat.*

The designation does not include any areas of unoccupied critical habitat.

3. *Describe Typical Project Modifications the Service Will Recommend When Considering Adverse Modification.*

The designation does not include any areas of unoccupied critical habitat.

4. *Provide Examples Representing Typical Recommendations Applicable Across A Broad Suite Of Projects. Where Significant Uncertainty Exists, Provide Ranges Of Potential Outcomes.*

The designation does not include any areas of unoccupied critical habitat.

C. BEHAVIOR CHANGES

Will the designation provide new information to stakeholders resulting in different behavior?

1. *Describe Actions Taken By Stakeholders As A Result Of Critical Habitat.*

Because *Donrichardsia macroneuron* is so closely tied to its habitat and the physical and biological features, it is unlikely that the designation of critical habitat provides new information to stakeholders that would change their behavior. However, it is possible that private landowners will perceive this designation of critical habitat as an intrusion on their private property rights and will not allow any scientific researchers or employees of conservation agencies to access the area. It is also likely that private landowners will not engage in activities with federal agencies in order to avoid consultation with the Service. Conversely, some landowners and natural resource managers may be motivated to look for this species and promote its conservation.

2. *Describe How Local Agencies Might Change Project Requirements.*

Agencies such as Texas Parks and Wildlife Department may want to conduct surveys for the species' presence prior to conducting projects in designated critical habitat that could affect the species.

3. *How Many New Consultations May Result From The Critical Habitat Alone?*

Section 7 consultation related to critical habitat and adverse modification for occupied areas will likely be the same as the jeopardy analysis for occupied areas because the life history needs of *Donrichardsia macroneuron* are dependent on the same habitat factors that make up the physical

or biological features of proposed critical habitat. In other words, section 7 evaluations related to the plant itself for our jeopardy analysis will focus on the very same factors that would go into an adverse modification analysis for proposed critical habitat. This is because the physical or biological features that define critical habitat are also essential to the survival of *Donrichardsia macroneuron* itself.

4. *How Many New HCPs May Be Undertaken Or Reinitiated As A Result Of The Critical Habitat Designation Alone?*

We do not anticipate any new HCPs as a result of the critical habitat designation.

5. *Will There Be Changes In Permitting Processes By Other State Or Local Agencies Or Other Land Managers?*

We do not anticipate any changes in permitting processes by other state or local agencies or land managers.

D. ADMINISTRATIVE EFFORTS

How Much Additional Administrative Effort Will Be Spent To Address Adverse Modification In Section 7 Consultations With Critical Habitat? Estimate The Difference Compared To Baseline.

During the last 15 years, 13 Section 7 consultations (listed under Section E.1., below) have taken place within the HUC-12 watersheds of Paint Creek, Bluff Creek, and Little Paint Creek. This is about 0.87 consultations per year. All of these projects were habitat restoration projects that were funded by the USFWS Partners for Fish and Wildlife program, and were Informal consultations, Technical Assistance, or Species List requests. One project was a fish passage project and the other 12 projects involved upland habitat restoration, prescribed fire, and brush management in which both the species and critical habitat would have been evaluated during section 7 consultation. Based on the analysis above, we project 0.87 consultations per year within the HUC-12 watersheds of Paint Creek, Bluff Creek, and Little Paint Creek. Biologists from the PFW program and the Habitat Conservation Planning Branch estimated that the critical habitat designation would increase the work load by about 2 hours per intra-service consultation. Therefore, we project that the critical habitat designation would increase the administrative effort by 1.6 hours per year.

E. PROBABLE PROJECTS

Based on the consultation history within the Paint Creek, Bluff Creek, and Little Paint Creek HUC-12 watersheds, as well as the recommendations of the Upper Llano River Watershed

Protection Plan, we anticipate continued upland habitat restoration, prescribed burning, and brush management projects, as well as riparian restoration and enhancement of fish habitat.

A large number of oil and gas pipelines have been constructed in the last 8 years approximately 60 miles west and southwest of the proposed critical habitat unit for *Donrichardsia macroneuron*. These pipelines do not cross any part of the HUC-8 South Llano River watershed and do not affect the species or the proposed critical habitat. Pipeline projects are likely to impact the species and proposed critical habitat if the pipeline passes directly through or upstream from the unit, with the severity of effects inversely proportional to the distance. However, we are not aware of any pipeline projects that will be proposed in the future that would affect this critical habitat unit.

1. **Land Use Sectors Within The Critical Habitat Designation Area**

- What economic activities may be affected by the designation of critical habitat?

Conservation/restoration, fire management, forest management, grazing, and recreation occur within the proposed critical habitat unit, but would not be affected by it.

- Is there a Federal nexus for each of these economic activities?

Conservation/restoration, fire management, and forest management projects have been supported by, and likely will continue to be supported by, the USFWS Partners for Fish and Wildlife program.

- Are there energy supply, distribution, or use sectors that are reasonably likely to be affected by this critical habitat designation?

No.

- Consultation History Within The Critical Habitat Designation Area.

The following table lists all section 7 consultations that have taken place within the HUC-12 watersheds of Paint Creek, Bluff Creek, and Little Paint Creek.

Table 4: Known probable projects that may affect the critical habitat designation or require consultation under section 7 of the Act

Consultation Number	Title	Finalized	Lat	Lon	Type	Project Modifications
21450-2011-I-0261	Upper Llano National Fish Passage, FWS/TPWD	1-Aug-2011			I	None

Consultation Number	Title	Finalized	Lat	Lon	Type	Project Modifications
02ETAU00-2012-I-0159	Llano Springs Ranch Watershed Improvement; TPWD LIP	23-May-2012			I	None
02ETAU00-2013-I-0200	PFW Upland Enhancement	10-Jun-2013	30.2828	-99.9037	I	None
02ETAU00-2014-I-0174	PFW Upland Enhancement	3-Jun-2014	30.2678	-99.9192	I	None
02ETAU00-2015-I-0245	PFW/TPWD Brush Management	18-May-2015	30.2626	-99.8302	I	None
02ETAU00-2016-I-0409	PFW Updland Enhancement	7-Jun-2016	30.2412	-99.8497	I	None
02ETAU00-2018-TA-0556	Rx Fire Kimbe/Edwards County	5-Mar-2018	30.2804	-99.9044	TA	None
02ETAU00-2018-SLI-0557	Rx Fire Private Lands	3-May-2018	30.23503	-99.8953	SLI	None
02ETAU00-2018-SLI-0962	Habitat Management P Ranch	4-Jun-2018			SLI	None
02ETAU00-2018-SLI-0963	Habitat Management R Ranch	4-Jun-2018			SLI	None
02ETAU00-2018-I-1019	Habitat Management P Ranch	6-Jun-2018	30.2544	-99.8458	I	None
02ETAU00-2018-I-1020	Habitat Management R Ranch	6-Jun-2018	30.2617	-99.9133	I	None
02ETAU00-2019-SLI-1222	Brush Management T Ranch	6-Jun-2019	30.25684	-99.916	SLI	None

V. CONCLUSION

The recommendations and project modifications to avoid jeopardy and to avoid adverse modification of critical habitat for *Donrichardsia macroneuron* are the same. We do not anticipate that project applicants will pursue a Habitat Conservation Plan for this species. The designation of critical habitat for *Donrichardsia macroneuron* would increase administrative efforts for intra-service section 7 consultation by about 1.6 hours per year.

VI. Literature Cited.

Broad, T., E. Seldomridge, T. Arsuffi, and K. Wagner. 2016. Upper Llano River Watershed Protection Plan. Prepared for Upper Llano River Watershed Coordination Committee. 111 pp. + 10 Appendices.

South Llano Watershed Alliance. 2012. North and South Llano River Watershed Conservation Plan. 58 pp.