AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

FEDERAL REGISTER

Vol. 77 Tuesday,
No. 176 September 11, 2012

Part III

Department of the Interior

Fish and Wildlife Service

50 CFR Part 17

Endangered and Threatened Wildlife and Plants; Determination of Status for Texas Golden Gladecress and Neches River Rose-mallow and Designation of Critical Habitat; Proposed Rule

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

[Docket No. FWS–R2–ES–2012–0064; 4500030113]

RIN 1018–AX74

Endangered and Threatened Wildlife and Plants; Determination of Status for Texas Golden Gladecress and Neches River Rose-mallow and Designation of Critical Habitat

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Proposed rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, propose to list two Texas plants, *Leavenworthia texana* (Texas golden gladecress) as an endangered species and *Hibiscus dasycalyx* (Neches River rose-mallow) as a threatened species under the Endangered Species Act of 1973, as amended (Act) and propose to designate critical habitat for both species. These are proposed regulations, and if finalized the effect of these regulations will be to conserve the species and protect their habitat under the Endangered Species Act.

DATES: We will accept comments received or postmarked on or before November 13, 2012. We must receive requests for public hearings, in writing, at the address shown in the **ADDRESSES** section by October 26, 2012.

ADDRESSES: You may submit comments by one of the following methods:

(1) *Electronically:* Go to the Federal eRulemaking Portal: *http://www.regulations.gov.* In the Keyword box, enter Docket No. FWS–R2–ES–2012–0064, which is the docket number for this rulemaking. Then, in the Search panel on the left side of the screen, under the Document Type heading, click on the Proposed Rules link to locate this document. You may submit a comment by clicking on ''Send a Comment or Submission.''

(2) *By hard copy:* Submit by U.S. mail or hand-delivery to: Public Comments Processing, Attn: FWS–R2–ES–2012–0064; Division of Policy and Directives Management; U.S. Fish and Wildlife Service; 4401 N. Fairfax Drive, MS 2042–PDM; Arlington, VA 22203.

We request that you send comments only by the methods described above. We will post all comments on *http://www.regulations.gov.* This generally means that we will post any personal information you provide us (see the Public Comments section below for more information).

The coordinates or plot points or both from which the critical habitat maps are generated are included in the administrative record for this rulemaking and are available at *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm, http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0064, and at the Corpus Christi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Any additional tools or supporting information that we may develop for this rulemaking will also be available at the Fish and Wildlife Service Web site and Field Office set out above, and may also be included in the preamble and/or at *www.regulations.gov.*

FOR FURTHER INFORMATION CONTACT: Allan Strand, Field Supervisor, U.S. Fish and Wildlife Service, Corpus Christi Ecological Services Field Office, 6300 Ocean Drive, Unit 5837, Corpus Christi, Texas, 78412–5837, by telephone 361–994–9005 or by facsimile 361–994–8262. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Information Relay Service (FIRS) at 800–877–8339.

SUPPLEMENTARY INFORMATION:

Executive Summary

Why we need to publish a rule. Under the Endangered Species Act (Act), a species may warrant protection through listing if it is determined to be an endangered or threatened species throughout all or a significant portion of its range. *Leavenworthia texana* (Texas golden gladecress) and *Hibiscus dasycalyx* (Neches River rose-mallow) have been candidates for listing since 1997, but action has been precluded by higher priority listings. As part of a court-approved settlement, we agreed to reevaluate the status of both species and after conducting a thorough review of the current status and level of threats to both species and their habitats between fall 2011 and winter 2012, we concluded that listing, and designation of critical habitat, for both species is warranted.

This rule proposes to add both species to the Federal Lists of Threatened and Endangered Animals and Plants and proposes to designate critical habitat for both species.

- We propose to list the Texas golden gladecress and the Neches River rose-mallow as an endangered and threatened species, respectively, under the Act.

We propose to designate approximately 1,353 acres (ac) (539 hectares (ha)) of critical habitat for the gladecress in Sabine and San Augustine Counties, and approximately 187.8 ac (76.0 ha) of critical habitat for the rose-mallow in Cherokee, Houston, Trinity, Harrison, and Nacogdoches Counties, Texas.

The basis for our action. Under the Act, we can determine that a species is an endangered or threatened species based on 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 have determined that both species are negatively affected by the following:

- Habitat loss and degradation of herbaceous glade plant communities supporting the gladecress, and of open habitats on hydric alluvial soils along sloughs, oxbows, terraces, and wetlands of the Neches River or Mud and Tantabogue Creeks that support the rose-mallow. Activities or factors negatively impacting the habitat of the gladecress include: Glauconite quarrying; natural gas and oil exploration and production; invasion of open glades by nonnative and native shrubs, trees, and vines, and other weedy species; pine tree plantings in close proximity to occupied glades; and herbicide applications that have potential to kill emerging seedlings. The rose-mallow's habitat is being lost and degraded by encroachment of nonnative and native plant species, particularly trees, herbicide use, livestock trampling, and alteration of natural hydrology of seasonal flooding to conditions where habitat has been drained or has become permanently flooded. Prolonged or frequent droughts can exacerbate habitat degradation for both species.
- Lack of existing regulatory mechanisms to protect either species or their habitats.
- Other natural or manmade factors, including low numbers of individual plants and few remaining populations. The species' natural variability that is associated with climatic conditions can be negatively affected by the effects of drought.

Also under the Act, upon making a determination that a species warrants listing as an endangered or threatened species, we are required to designate critical habitat to the maximum extent prudent and determinable. We are required to base the designation on the best available scientific data after taking into consideration economic and other impacts. We can exclude an area from critical habitat if the benefits of

exclusion outweigh the benefits of designation, unless the exclusion will result in the extinction of the species.

This rule proposes to designate critical habitat for each species.

We are proposing to designate critical habitat for both species in East Texas as follows:

- Approximately 1,353 acres (ac) (539 hectares (ha)) are designated as critical habitat for Texas golden gladecress.
- Approximately 178 ac (76 ha) are designated as critical habitat for Neches River rose-mallow.

We are planning to prepare an economic analysis. To ensure that we consider the economic impacts, we will prepare an economic analysis of the proposed critical habitat designations. We will use the data from the economic analysis to inform the final rule.

We will seek peer review. We are seeking comments from independent specialists to ensure that our assessment of threats and their impacts on these species, as well as our critical habitat designations, are based on the best available scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment on our proposed listing of the gladecress and the rose-mallow and our critical habitat designations. Because we will consider all comments and information received during the comment period, our final determinations may differ from this proposal.

This document consists of: (1) One proposed rule to list the *Leavenworthia texana* as an endangered species; (2) one proposed rule to list the *Hibiscus dasycalyx* as a threatened species; and (3) proposed critical habitat designations for each species. For the purposes of this document, we will refer to *Leavenworthia texana* as Texas golden gladecress or gladecress and *Hibiscus dasycalyx* as Neches River rose-mallow or rose-mallow.

Information Requested

We intend that any final action resulting from this proposed rule will be based on the best scientific and commercial data available and be as accurate and as effective as possible. Therefore, we request comments or information from the public, other concerned governmental agencies, Native American tribes, the scientific community, industry, or any other interested parties concerning this proposed rule. We particularly seek comments concerning:

(1) These species' biology, range, and population trends, including:

(a) Habitat requirements for pollination, reproduction, and dispersal;

(b) Genetics and taxonomy;

(c) Historical and current range including distribution patterns;

(d) Historical and current population levels, and current and projected trends; and

(e) Past and ongoing conservation measures for these species, their habitat or both.

(2) The factors that are the basis for making a listing determination for a species under section 4(a) of the Act (16 U.S.C. 1531 *et seq.*), which are:

(a) The present or threatened destruction, modification, or curtailment of their 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 their continued existence.

(3) Biological, commercial trade, or other relevant data concerning any threats (or lack thereof) to these species and existing regulations that may be addressing those threats;

(4) Additional information concerning the historical and current status, range, distribution, and population size of these species, including the locations of any additional populations of these species;

(5) Any information on the biological or ecological requirements of the species, and ongoing conservation measures for the species and their habitat;

(6) The reasons why we should or should not designate habitat as ''critical habitat'' under section 4 of the Act (16 U.S.C. 1531 *et seq.*), including whether there are threats to these species from human activity, the degree of which can be expected to increase due to the designation, and whether that increase in threats outweighs the benefit of designation such that the designation of critical habitat is not prudent.

(7) Specific information on:

(a) The amount and distribution of the Texas golden gladecress and Neches River rose-mallow and their habitat;

(b) What may constitute ''physical or biological features essential to the conservation of these species,'' within the geographical range currently occupied by these species;

(c) Where these features are currently found;

(d) Whether any of these features may require special management considerations or protection;

(e) What areas, that were occupied at the time of listing (or are currently occupied) and that contain features essential to the conservation of these species, should be included in the designation and why;

(f) What areas not occupied at the time of listing are essential for the conservation of these species and why;

(8) Land use designations and current or planned activities in the areas occupied by these species or proposed to be designated as critical habitat, and possible impacts of these activities on these species and proposed critical habitat;

(9) Information on the projected and reasonably likely impacts of climate change on these species and proposed critical habitat;

(10) Any foreseeable economic, national security, or other relevant impacts that may result from designating any area that may be included in the final designation. We are particularly interested in any impacts on small entities, and the benefits of including or excluding areas from the proposed designation that are subject to these impacts;

(11) Whether our approach to designating critical habitat could be improved or modified in any way to provide for greater public participation and understanding, or to assist us in accommodating public concerns and comments;

(12) The likelihood of adverse social reactions to the designation of critical habitat and how the consequences of such reactions, if likely to occur, would relate to the conservation and regulatory benefits of the proposed critical habitat designations.

Please include sufficient information with your submission (such as scientific journal articles or other publications) to allow us to verify any scientific or commercial information you include.

Please note that submissions merely stating support for or opposition to the action under consideration without providing supporting information, although noted, will not be considered in making a determination, as section 4(b)(1)(A) of the Act directs that determinations as to whether any species is a threatened or endangered species must be made ''solely on the basis of the best scientific and commercial data available.''

You may submit your comments and materials concerning this proposed rule by one of the methods listed in the **ADDRESSES** section. We request that you send comments only by the methods described in the **ADDRESSES** section.

If you submit information via *http://www.regulations.gov,* your entire submission—including any personal identifying information—will be posted on the Web site. If your submission is made via a hardcopy that includes personal identifying information, you may request at the top of your document

that we withhold this information from public review. However, we cannot guarantee that we will be able to do so. We will post all hardcopy submissions on *http://www.regulations.gov.* Please include sufficient information with your comments to allow us to verify any scientific or commercial information you include.

Comments and materials we receive, as well as supporting documentation we used in preparing this proposed rule, will be available for public inspection on *http://www.regulations.gov,* or by appointment, during normal business hours, at the U.S. Fish and Wildlife Service, Corpus Christi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**, above).

Previous Federal Actions

We first identified the Texas golden gladecress and Neches River rose-mallow as candidates for listing in the September 19, 1997, Notice of Review of Plant and Animal Taxa that are Candidates or Proposed for Listing as Endangered or Threatened Species (62 FR 49397). Candidates are those fish, wildlife, and plants for which we have on file sufficient information on biological vulnerability and threats to support preparation of a listing proposal, but for which development of a listing regulation is precluded by other higher priority listing activities. The Texas golden gladecress and the Neches River rose-mallow were included in subsequent annual Candidate Notices of Reviews through 2004 (64 FR 57533, October 25, 1999; 66 FR 54808, October 30, 2001; 67 FR 40657, June 13, 2002; and 69 FR 24876, May 4, 2004). A petition to list Texas golden gladecress and the Neches River rose-mallow was received on May 11, 2004, but contained no new information, and we continued to include both species in all annual Candidate Notices of Review between 2005 and 2011 (70 FR 24870, May 11, 2005; 71 FR 53756, September 12, 2006; 72 FR 69034, December 6, 2007; 73 FR 75176, December 10, 2008; 74 FR 57804, November 9, 2009; 75 FR 69222, November 10, 2010; and 76 FR 66370, October 26, 2011). In 2000, Texas golden gladecress' listing priority number was increased from 5 to 2 in accordance with our priority guidance published on September 21, 1983 (48 FR 43098). A listing priority of 2 reflects a species with threats that are both imminent and high in magnitude. In 2010, Neches River rose-mallow's listing priority number was also increased from 5 to 2. It is our intent to discuss below only those topics directly relevant to the proposed listing of the Texas golden gladecress as an endangered species and Neches River rose-mallow as a threatened species in this section of the proposed rule.

Background

This document contains proposed rules to list Texas golden gladecress as an endangered species and Neches River rose-mallow as a threatened species and to propose critical habitat for each species. The document is structured to address the taxa separately under each of the sectional headings that follow.

Species Information

Texas Golden Gladecress

Taxonomy and Description

Texas golden gladecress is a small, annual, herbaceous plant belonging to the mustard family (Brassicaceae). Dr. M.C. Leavenworth, an Army physician, first collected the taxon in Choctaw County, Oklahoma, in 1835, and the specimens were later described as a new species, *Leavenworthia aurea,* by Torrey (Mahler 1981, pp. 76–77). From 1836 to 1837, Leavenworth collected similar specimens near the present-day town of San Augustine, San Augustine County, Texas, and these were also identified as *L. aurea.* Later collections of the plant in the San Augustine area were made by E.J. Palmer (1915 and 1918), D.S. and H.B. Correll (1961 to 1962) as cited by Mahler (1981, pp. 83), and populations in this area were studied and mapped by George and Nixon (1990, pp. 117–127) between 1979 to 1980. W.H. Mahler studied the collected specimens and their habitat, and described the Texas plants as a new species, *Leavenworthia texana* (Mahler 1987, pp. 239–242), based on differences in morphological characteristics of flowers and leaves, and in chromosome number, between the Oklahoma and Texas plants (Mahler 1987, pp. 239–242).

According to Mahler (1987, p. 240), Texas golden gladecress flower petals were a brighter, deeper yellow than those of *L. aurea;* and the petals were egg-shaped and flat instead of being broad and notched. The *L. texana* had wider-than-long terminal leaf segments that were usually distinctly lobed while *L. aurea's* terminal leaves were essentially unlobed, flat, and more circular. Texas plants had a chromosome number of 2n = 22 (E.S. Nixon, pers. comm. in Mahler 1987, pp. 239, 241) while the Oklahoma *L. aurea* had 2n = 48 (Rollins 1963, pp. 9–11; Beck *et al.* 2006, p. 156). We are aware that a recently completed monograph of the genus may have taxonomic implications for the Texas and Oklahoma *Leavenworthia* species in the future, but several questions, including the differences in chromosome number, remain unresolved and no supporting information that would change the current status of Texas golden gladecress has been published to date (Poole 2011a, pers. comm.).

Texas golden gladecress is a weakly rooted, glabrous (smooth, glossy), winter annual (completes its life cycle in 1 year). Texas golden gladecress is small in stature, less than 3.9 inches (in) (10 centimeters (cm)) in height, making it difficult to find except during flowering or when it bears fruit. The leaves are 0.8–3.1 in (2–8 cm) long and 0.4–0.6 in (1–1.5 millimeters (mm)) wide, forming rosettes at the base of the plant. Terminal leaf segments are wider-than-long, and usually distinctly lobed, with angular teeth. Flowers are bright yellow and borne on scapes (leafless flowering stems or stalks arising from the ground) that are 1.2–3.5 in (3–9 cm) long early in the flowering season. Later in the season, the flowers occur on unbranched flower clusters that come off a single central stem from which the individual flowers grow on small stalks, at intervals. The four petals are bright golden-yellow with a slightly darker base, narrowly obovate (tongue-shaped), 0.3–0.4 in (7–10 mm) long and 0.1–0.2 (3.5–5 mm) wide. The fruit is a slender seed capsule, known as a silique, with a length (0.6–1.2 in (15–30 mm)) that is more than twice its width (0.08–0.22 in (2–5.5 mm)) and that contains 5–11 flattened, circular or spherically shaped seeds. The description above was drawn from Poole *et al.* (2007, p. 286), who adapted it from others.

Habitat

Texas golden gladecress occurs within the Pineywoods natural region of easternmost Texas, within the Gulf Coastal Plain Physiographic Region. The region is defined by pine-dominated forests or woodlands interspersed with bottomland, mesic slope and bald cypress-tupelo swamp forests. Many of the rare plants of the Pineywoods region, including the gladecress and the federally endangered *Physaria pallida* (white bladderpod) are found in small-scale plant communities tied to ''geologic and hydrologic conditions that are themselves rather rare on the landscape'' (Poole *et al.* 2007, p. 6).

The Texas golden gladecress is endemic to glade habitats in northern San Augustine and northwest Sabine Counties, Texas, and is a habitat specialist, occurring only on outcrops of the Weches Geologic Formation (Mahler 1987, p. 240; George and Nixon 1990, p. 120; Poole *et al.* 2007, pp. 286–287). The gladecress grows only in glades on shallow, calcium-rich soils that are wet

in winter and spring. These occur on ironstone (glauconite or green-stone) outcrops (Poole *et al.* 2007, p. 286).

All species within the small genus *Leavenworthia* share an adaptation to glade habitats that have unique physical characteristics, the most important being a combination of shallow soil depth and high calcium content (dolomitic limestone or otherwise calcareous soils) where the soil layers have been deposited in such a manner that they maintain temporary high-moisture content at or very near the surface (Rollins 1963, pp. 4–6). Typically, only a few inches of soil overlie the bedrock, or, in spots, the soil may be almost lacking and the surface barren. The glade habitats that support all *Leavenworthia* species are extremely wet during the late winter and early spring and then dry to the point of being parched in summer (Rollins 1963, p. 5). These glades can vary in size from as small as a few meters to larger than 0.37 miles^2 (mi^2) (1 kilometer^2 (km^2)) and are characterized as having an open, sunny aspect (lacking canopy) (Quarterman 1950, p. 1; Rollins 1963, p. 5). The landscape position of the glades may also play a role in assuring the cyclic moisture regime required by glade vegetation communities.

The Weches Geologic Formation consists of bands of ancient marine sediments deposited in a line roughly parallel to the Gulf of Mexico, running from Sabine to Frio Counties, Texas. A layer of glauconite clay is either exposed at the surface or covered by a thin layer of calcareous (calcium-containing) sediment measuring as deep as 20 in (50 cm) (George and Nixon 1990, pp. 117–118). Glauconite is a characteristic mineral of marine depositional environments, presenting a greenish color when initially exposed to the atmosphere, and later turning red (Davis 1966, pp. 17–18; Nemec 1996, p. 7). The area of the Weches outcrops in San Augustine County is referred to as the ''redlands'' (Ritter 2011b, pers. comm.). The glauconite is very friable (crumbly) and has low resistance to weathering (Geocaching.com 2010, p. 5). The soils overlying the clay layer are typically rocky and shallow (George 1987, p. 3) and at all Texas golden gladecress sites are classified within the Nacogdoches, Trawick, or Bub soils series (USDA 2009, entire).

Weches outcrops occur in a band averaging 5 miles (mi) (8 kilometers (km)) in width that parallels Texas State Highway (SH) 21 through northern San Augustine and northwestern Sabine Counties (Sellards *et al.* 1932 in Diggs *et al.* 2006, p. 56). It has been deeply dissected by erosion that created islands of thin, loamy, alkaline soils (pH 7–8), within the normally deep, sandy, acidic soils (pH 4–5) of the Pineywoods region. The glauconite layer of the Weches Formation is fairly impermeable to water, producing saturated, thin upper soils in late fall through spring, that dry out and harden during summer months (George 1987, pp. 2–4; Bezanson 2000 in Diggs *et al.* 2006, p. 56). Down-slope seepage across the Weches terraces may also be important to maintain the hydrology required by the gladecress (Singhurst 2003, pers. comm.). The cyclic moisture regime and the alkalinity of the soils produce conditions unique to the Weches outcrops. Certain plants, such as the Texas golden gladecress, have evolved to live within these specialized geologic formations (Mahler 1987, p. 240; George and Nixon 1990, pp. 120–122).

Biology

The Texas golden gladecress occurs in open, sunny, herbaceous-dominated plant communities in Weches glades, in some areas that also support the white bladderpod (Bridges 1988, p. II–7, II–35, and II–35 supplement). Unlike the white bladderpod, which can grow throughout the glade, the gladecress is restricted to the outcrop rock faces within the glades where it occurs (Nemec 1996, p. 8).

As is true of other *Leavenworthia* species (Rollins 1963, p. 6), Texas golden gladecress seeds germinate during fall rains and the plants overwinter as small, tap-rooted rosettes. Flowering begins in February and continues into March, and sometimes as late as April, depending on annual weather conditions. Rollins (1963, p. 6) noted that the blooming period of *Leavenworthia* varied according to the temperature, moisture, and severity of winter freezes. Fruit production is generally seen from March into April. The plants respond to drying of the soil by dropping seed and withering away, usually in April and May (Singhurst 2011b, pers. comm.). By summer months, gladecress plants are dead, replaced by other low-growing species such as *Sedum pulchellum* (stonecrop), *Portulaca oleracea* (common purslane), *Phemeranthus parviflorus* (sunbright), and *Elocharis occulata* (limestone spikerush) (Singhurst 2012e, pers. comm.). Although seed dispersal has not been studied in Texas golden gladecress, observations indicate that seeds fall within 6–8 in (15–20 cm) of the parent plant (Singhurst 2011c, pers. comm.).

Little is known about the gladecress' seed bank as this aspect of life history has not been researched. The species did reappear at two sites where it was believed lost due to habitat degradation. A population location, the Geneva Site in Sabine County (see Table 1), was bulldozed in late March 1999, one week after flowering plants were counted—the site was subsequently described by the surveyor as ''lost or destroyed'' (Turner 1999, pers. comm.). However, plants were found again at this site in 2003 and continued to emerge in succeeding years. At a second site in San Augustine County (Chapel Hill Site, see Table 1), a thick growth of the invasive, nonnative shrub, *Rosa bracteata* (Macartney rose) was removed in 1995. Post-brush removal, the gladecress reappeared after not having been seen for the previous 10 years (Nemec 1996, p. 1). The species' reappearance after these habitat alterations suggests a persistent seed bank, although there have been no formal studies to verify this hypothesis.

Rare plants often have adaptations such as early blooming, extended flowering, or mixed-mating systems that allow them to persist in small populations (Brigham 2003, p. 61). The Texas golden gladecress is believed to be self-compatible and able to self-fertilize (Rollins 1963, p. 19; Beck *et al.* 2006, p. 153). The species may have evolved for self-fertilization when conditions are not favorable for insect-vectored pollination, lessening the species' dependence on pollinators for cross-pollination and survival and potentially making the species more resilient under conditions of small, geographically separated populations. Rollins (1963, pp. 41–47) speculated that species in the genus *Leavenworthia* evolved from a self-incompatible original ancestor to self-compatibility in some species to persist with a diminishing overlap in seasonality of adequate moisture in glade habitats versus availability of insect pollinators (e.g., as the southeastern part of the U.S. warmed, the required moisture levels for germination and flowering became more restricted to winter months when insect availability was lower). This could help to enhance the species' persistence, at least in the short term, in a fragmented landscape where habitat patches may be so distant from one another as to preclude pollinators' movements between them. The presence of other flowering plants at gladecress sites could help to attract and maintain a reservoir of pollinators, thereby increasing the chances for the gladecress to be cross-pollinated. This would benefit the species by potentially providing a higher level of genetic diversity.

Distribution and Status

Texas golden gladecress is known from eight locations, including one introduced population, all within a narrow zone that parallels SH 21 in San Augustine, Sabine, and Nacogdoches Counties (Texas Natural Diversity Database (TXNDD) 2012b). Table 1 (below) summarizes the location information for Texas golden gladecress populations (taken from the TXNDD 2012b). Based on known population locations, taken from the TXNDD element occurrence records from 1974–1988, the Weches Glades of San Augustine County appear to be the center of the species' distribution; to date all but one of the naturally occurring populations were found in this area, with the other naturally occurring population in Sabine County. One population was successfully introduced into Nacogdoches County. All locations (historic and extant) occur primarily on privately owned land, although the plants do extend onto the Texas Department of Transportation (TxDOT) right-of-way (ROW) at two sites: Geneva Site and Caney Creek Glades Site 1 (CCG 1).

TABLE 1—LOCATION AND STATUS OF TEXAS GOLDEN GLADECRESS POPULATIONS

County	Population designation	Status	Historic site description	Land owner
San Augustine	Caney Creek Glade Site 1.	Extant	Described by The Nature Conservancy as approx. 1 ac (0.4 ha) site; by 2001 was less than 100 ft^2 (9 m^2).	Private & State ROW.
San Augustine	Chapel Hill (aka Tiger Creek).	Extant	Tract on which gladecress was found was less than 0.25 ac (0.1 ha).	Private.
Sabine	Geneva	Extant	Size of site was approx. 100 ft^2 (9 m^2).	Private & State ROW.
Nacogdoches	Simpson Farms (Introduced Population).	Extant through 2009. Site was eradicated by pipeline in 2011.	Population approx. 200 ft^2 (18 m^2) in size.	Private.
San Augustine	Caney Creek Glade Site 7.	Status unknown. Possibly extant—not accessible in last 24 years.	Small population; locally abundant in very small area.	Private.
San Augustine	Caney Creek Glade Site 2.	Site is now excavated pits	Site was approx. 3 ac (1.21ha)	Private.
San Augustine	Caney Creek Glade Site 6.	Site is now excavated pits. Possibility that some habitat and plants remain on adjacent, unquarried land.	Multiple tracts totaling ~ 10 ac. Sites 6, 7 and 8 in different areas on these tracts. Site 6 was the largest known population—thousands of plants.	Private.
San Augustine	Caney Creek Glade Site 8.	Site lost to excavated pits	Very small population on a degraded outcrop.	Private.

Four Texas golden gladecress populations (CCG 1, Chapel Hill, Geneva, and Simpson Farms) were present through 2009—the last year that the plants were surveyed (Singhurst 2011a, pers. comm.). In October 2011, Service and TPWD biologists visited all four known locations and found that the plants and habitat at the introduced site in Nacogdoches County (Simpson Farms) had been removed by a recent pipeline installation. The habitat was still intact at the other three locations (Cobb 2011, pers. comm.), and we assume that plants still occupy these sites.

Three San Augustine County occurrences (CCG Sites 2, 6, and 8) were believed extirpated, at least in large part, by construction of glauconite mines (open pits) beginning in the late 1990's. These occurrences may have been part of a much larger glade complex, referred to as the Caney Creek Glade Complex, that included the Caney Creek Glade Sites 1, 2, 6, 7, and 8. These five occurrences were located within an area extending out to 1.5 mi (2.41 km) to the east of the town of San Augustine (TXNDD 2012b, unpaginated). In 1987, the CCG Site 6 was described as having Texas golden gladecress plants ''in the thousands'' (TXNDD 2012b, unpaginated). Access to these three privately owned sites is prohibited; therefore, we cannot ascertain whether any plants or their habitat are still present on the peripheries of the mined areas.

The CCG Site 7 was last visited in 1988 (TXNDD 2012b, unpaginated). There were no further site visits due to lack of access to the privately owned land. Satellite images taken as recently as 2008 show this population site has not been altered by construction or quarrying (mining), but the open glade appearance at this site has changed to one of dense growth of woody vegetation, so it is unknown whether the plants still occur at the site.

Table 2 presents estimates for extant Texas golden gladecress populations between 1999 and 2009 (USFWS 2012, p. 4). The total number of plants seen in 2009 was 1,108. The largest population, consisting of 721 plants, was at the introduced site in Nacogdoches County, a site that was lost in 2011 when a pipeline route was constructed directly through it. This represents a loss of 65 percent of the known plants. After 2009, approximately 400 plants in 3 populations were all that remained of this species. The number of gladecress plants fluctuated widely from year to year, likely due to differences in precipitation levels between years. The gladecress is dependent on fall and winter rain to saturate the sediment and produce the seeps and pooling it requires, and drought conditions were noted to have a significant negative effect on reproduction, (Turner 2000, p. 1) as seen in the drought years of 1999–2000 (Texas Water Resources Institute 2011, unpaginated) when the Chapel Hill site decreased from 91 to 67 plants and the CCG Site 1 decreased from 490 to 96 plants (USFWS 2010, p. 5).

TABLE 2—POPULATION ESTIMATES FOR TEXAS GOLDEN GLADECRESS AT MONITORED SITES

Year	Chapel Hill	CCG #1	Geneva	Simpson Farms
1999	91	490	319	*NS
2000	67	96	NS	NS

TABLE 2—POPULATION ESTIMATES FOR TEXAS GOLDEN GLADECRESS AT MONITORED SITES—Continued

Year	Chapel Hill	CCG #1	Geneva	Simpson Farms
2001	96	520	NS	270
2002	NS	NS	NS	NS
2003	42	NS	57	57
2004	NS	NS	NS	NS
2005	40–50	0	54	2,873
2006	NS	NS	200	NS
2007	200	NS	1,000	1,000
2008	9	NS	49	NS
2009	98	29	260	721

* NS—Not surveyed.

Singhurst (2011a, pers. comm.) referred to the difficulty of trying to determine population trends for the Texas golden gladecress due to the lack of comprehensive numbers for the species. He attributed this data gap to variation in surveyors and their techniques, the inability to see gladecress plants under invasive brush, lack of access to multiple sites, and the fluctuation in plant numbers associated with moisture conditions. Nevertheless, despite these limitations, it is evident that there are few remaining populations and that the overall numbers of existing plants are fluctuating. For example, a decrease in plant numbers in 2009 was likely due to drought; however, following significant rains in late fall 2011 and early winter 2012, Singhurst (2012f, pers. comm.) noted higher numbers of plants than the 2009 counts at Geneva, Chapel Hill, and CCG Site 1.

Most of the known populations, historic and extant, were and are restricted to small areas (see Table 1). For example, in San Augustine County, the Chapel Hill site is less than 0.2 acres (ac) (0.1 hectare (ha)) in size and lies between a pasture fence and gravel road southwest of SH 21. The area of the plants at the CCG Site 1 is less than 100 ft^2 (9 m^2) in size, on the side of Sunrise Road south of SH 21. In Sabine County, the plants at the Geneva site occupy approximately 100 ft^2 (9 m^2) adjacent to, and west of, SH 21, south of Geneva. The total area occupied by the plants at the remaining three sites covers less than 1.2 ac (0.5 ha). Area sizes for gladecress occurrences were taken from the TXNDD element of occurrence records.

Although no new populations of Texas golden gladecress have been found since the late 1980s, there is potential for more gladecress to exist across the Weches Glades Region. Known populations all occur close to roads suggesting that most searches for the species were nearby to public road access. All known occurrences are on private property, as is all remaining habitat; therefore, surveys cannot be conducted without landowner permission. Effective identification of suitable habitat is needed to survey for new populations. Even in areas of potential Weches Glades, as identified using Geographic Systems Information (GIS) data, including aerial, geologic, and hydrologic data sources, the habitat may not contain Texas golden gladecress populations. Between 1999 and 2003, The Nature Conservancy (TNC) used these tools to identify 44 potential sites of gladecress and white bladderpod occurrence in the San Augustine Glades. The TNC was granted access to 14 of the 44 sites, but found little Weches habitat, and no new gladecress or bladderpod sites (Turner 2003 in USFWS 2010b, p. 3).

Neches River rose-mallow

Taxonomy and Description

Hibiscus dasycalyx (the rose-mallow) (Blake) is a nonwoody perennial (plant that grows year after year) in the Malvaceae (mallow) family that grows 1.9–7.5 feet (ft) (0.6–2.3 meters (m)) tall (Correll and Johnston 1979, p. 1030). Leaves are alternate and simple, generally t-shaped and deeply three-lobed with petioles (leaf stalks) 1.1–1.9 in (3–5 cm) long (Correll and Johnston 1979, p. 1030). This rose-mallow generally produces six or seven creamy white flowers (rarely pink) singularly on branches flowering between June and August (Poole *et al.* 2007, p. 265), sometimes into late October depending on water availability during springtime inundations (Warnock 1995, p. 20; Center for Plant Conservation 2011, *http://www.centerforplant conservation.org/*). Large and numerous stamens are monodelphous, forming a tube that is united with the base of the petals (Klips 1999, p. 270).

The rose-mallow was first collected by Ivan Shiller on June 23, 1955, at the type locality at Hwy 204 (also referred to as Apple Springs), Trinity County, Texas, and was later identified as a distinct species (Correll and Johnston 1979, pp. 1030–1031). Blake (1958, p. 277) determined that the rose-mallow was different from the closely related *Hibiscus laevis* (halberdleaf rose-mallow) by examining specimens from the type locality. Gould (1975), Nixon (1985), Hatch *et al.* (1990), Johnston (1990), and Fryxell (Warnock 1995, pp. 1–2; Poole 2002, pers. comm.) all recognized the rose-mallow as a distinct species.

Two similar-looking *Hibiscus* species, *H. laevis* and *H. moscheutos* (crimsoneyed rose-mallow) are aquatic species documented in areas where the rose-mallow occurs. A morphological distinction between these *Hibiscus* species of East Texas and the rose-mallow is the species' notably hairy calyx (Warnock 1995, p. 5). All three of these species have a similar general appearance, but can be separated based on a comparison of external characteristics including leaf structure, and degree of pubescence (fine hairs) on the calyx, leaves, capsule (dry fruit), or seeds (Correll and Correll 1975, p. 1118; Blanchard 1976, p. 5; Warnock 1995, p. 4). Geographically, these three species can be found within similar habitats, but the halberdleaf and the crimsoneyed rose-mallows prefer deeper water and are found along edges of major rivers and streams (Blanchard 1976, pp. 10–14; Poole 2011b, pers. comm.), compared with the rose-mallow, which is found in side channels and floodplains of major river drainages. Based on the available information on the species morphology, biology, and habitat-specific needs, we conclude that the rose-mallow is a valid taxon.

Habitat

The rose-mallow is endemic to relatively open habitat (Kennedy and Poole 1990, p. 11) of the Pineywoods (or Timber belt) of East Texas (Gould 1975, p. 1; Correll and Johnston 1979, p. 1030), within Cherokee, Houston, and Trinity Counties and has been introduced into Nacogdoches and Harrison Counties. Shortleaf/loblolly pine-hardwood forests dominate the habitat with portions of suitable habitat extending into longleaf pine (*Pinus palustrus*) and loblolly pine forest (*Pinus taeda*) (Telfair 1983, p. 28; Diggs *et al.* 2006, p. 95). The common native woody and herbaceous plant associates are listed in Table 3 (Warnock 1995, pp. 14–15; Poole *et. al* 2007, pp. 264–265).

TABLE 3—NATIVE PLANT ASSOCIATES OF NECHES RIVER ROSE-MALLOW

Scientific name	Common name
Native Woody Plant Associates	
Carya aquatic	water hickory.
Cephalanthus occidentalis	common buttonbush.
Celtis laevigata var. *laevigata*	sugar berry.
Fraxinus sp.	ash.
Quercus lyrata	overcup oak.
Q. nigra	waterоak.
Liquidambar styraciflua	sweetgum.
Salix nigra	black willow.
Native Herbaceous Plant Associates	
Boehmeria cylindrica	smallspike false nettle.
Brunnichia ovate	buckwheat vine.
Carex lupulina	common hop sedge.
Chasmanthium sessilifolium	longleaf woodoats.
Diodia virginiana	Virginia buttonweed.
Eichhornia crassipes	water hyacinth.
Heliotropium indicum	Indian heliotrope.
H. moscheutos	crimsoneyed rose-mallow.
H. laevis	halberdleaf rose-mallow.
Hydrolea ovate	ovate false fiddleleaf.
Hydrocotyle ranunculoides	floating pennywort.
Juncus effuses	common rush.
Ludwigia leptocarpa	anglestem primrose-willow.
Nuphar lutea	yellow pond-lily.
Phanopyrum gymnocarpon	Savannah-panicgrass.
Panicum ridgulum	redtop panicgrass.
Pluchea foetida	stinking camphorweed.
Polygonum hydropiperoides	swamp smartweed.
Pontederia cordata	pickerelweed.
Rhynchospora corniculata	shortbristle horned beaksedge.
Scirpus cyperinus	woolgrass.
Thalia dealbata	powdery alligator-flag.
Trachelospermum difforme	climbing dogbane.

Sites where the rose mallow have been found have been described as sloughs, oxbows, terraces, and sand bars. Sites include low areas (Warnock 1995, p. 13) within the Neches River basin and Mud and Tantabogue Creek basins, with soils that are classified generically as hydric alluvials, or water-saturated soils, of the Inceptisol or Entisol orders (Diggs *et al.* 2006, pp. 46, 79) that remain flooded or frequently flood. The U.S. Department of Agriculture's (USDA) Natural Resource Conservation Service (NRCS) completed soils surveys for all counties with known occurrences of the rose-mallow, and the associated soils are frequently flooded clay loams. Sites are both perennial and intermittent wetlands with water levels between sites varying due to their proximity to water, amount of rainfall, and floodwaters. Intermittent wetlands are inundated during the winter months but become dry during the summer months (Warnock 1995, p. 11). Flowing water is required for seed dispersal downstream (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3). Rivers of East Texas tend to overflow onto banks and floodplains (Diggs *et al.* 2006, p. 78), especially during the rainy season, thereby dispersing seed. Research has not been done to identify methods of seed dispersal upstream; however, avian species may facilitate this process.

Biology

The rose-mallow is a perennial that dies back to the ground every year and resprouts from the base; however, still maintaining aboveground stems. Longevity of the species is unknown but it may be long-lived. Cross-pollination occurs (Blanchard 1976, p. 38) within the rose-mallow populations and the species has high reproductive potential (fecundity). The number of flowers and fruits per plant were documented during the TPWD's annual monitoring of the rose-mallow along State Highway (SH) ROWs. The species produced an average of 50 fruits per plant, but seed viability and survivorship are not known (Poole 2012a, pers. comm.). An open canopy (Warnock 1995, pp. 11, 13) and sunlight are needed for flowers to bloom, and the blooming period may only last 1 day (Snow and Spira 1993, p. 160).

Potential pollinators of the rose-mallow may include but are not limited to, the common bumblebee (*Bombus pensylvanicus*), Hibiscus bee (*Ptilothrix bombiformis*), moths, and the scentless plant bug *Niesthrea louisianica* (Klips 1995, p. 1471; Warnock 1995, p. 20; Warriner 2011, pers. comm.). Both *H. laevis* and *H. moscheutos* are pollinated by common bumblebees and the Hibiscus bee (Snow and Spira 1993, p. 160; Klips 1999, p. 270). The solitary Hibiscus bee prefers gently sloping or flat areas with sandy or sandy-loam soils for nesting areas (Vaughan *et al.* 2007, pp. 25–26; Black *et al.* 2009, p. 12), and female bees will excavate nest cavities in elevated, hard packed, dirt roadways or levees near stands of *Hibiscus* (in this case *H. palustris*) and standing water (Rust 1980, p. 427). Members of the genus *Bombus* (family Apidae) are social bees, predominantly found in temperate zones, nesting underground (Evans *et al.,* 2008, p. 6) in sandy soils (Cane 1991, p. 407). Bumblebees nest in small cavities, often underground in abandoned rodent nests, grass (Black *et al.* 2009, p. 12), or in open, grassy habitat (Warriner 2012a,

pers. comm.). Other aboveground-nesting bees that may potentially pollinate the rose-mallow may include carpenter, mason, and leaf cutter bees that nest in dead snags or twigs or standing dead wood (Warriner 2012a, pers. comm.). Maximum foraging distances of solitary and social bee species are 492 to 1,968 ft (150 to 600 m) (Gathrmann and Tscharntke 2002, p. 762) and 263 to 5,413 ft (80 to 1,650 m) (Walther-Hellwig and Frankl 2000, p. 244), respectively. The scentless plant bug is a member of the *Rhopalidae* family found specifically in association with various members of the Malvaceae family. This species is known to deposit eggs on both the vegetative and reproductive parts of mallow plants (Spencer 1988, p. 421). Holes have been eaten in floral parts of rose-mallow plants suggesting that the scentless plant bug may be a pollinator as well as a consumer of the rose-mallow.

Natural fires occur every 1 to 3 years in East Texas (Landers *et al.* 1990, p. 136; Landers 1991, p. 73) and control the overgrowth of longleaf and loblolly pine, as well as nonnative species; humans later used fire to suppress overgrowth. Fire suppression allows for sweetgum (*Liquidambar styraciflua*), oaks (*Quercus* sp.), hickories (*Carya* sp.), common persimmon (*Diospyros virginiana*), and southern magnolia (*Magnolia grandiflora*) to invade the natural pine forests (Daubenmire 1990, p. 341; Gilliam and Platt 1999, p. 22), and reduce the open canopy needed by the rose-mallow. Lack of fire increases the opportunity for nonnative species, such as chinese tallow (*Triadica sebifera*), to invade these sites.

Distribution and Status

The natural geographic range of the rose-mallow is within Trinity, Houston, Harrison, and Cherokee Counties, Texas, on State highway (SH) ROWs and on private and Federal lands. However, the species has been introduced outside of the known geographic range in Nacogdoches County on private land (Mill Creek). In addition, populations of rose-mallow have been introduced within their natural geographic range on Federal lands. In total, there are 12 occurrences of rose-mallow (see Table 4). Eleven of these are within the known geographic range, and, as of October 2011, are occupied by the rose-mallow. The rose-mallow plants within the SH 230 ROW have not been seen since 2002, and the site is considered extirpated.

TABLE 4—POPULATION ESTIMATES FOR KNOWN ROSE-MALLOW OCCURRENCES

Site	County	First and last observation	Plant estimates
1. Compartment 55, Davy Crockett National Forest (NF).	Houston	2000; 2011	1000 in 2000, 750 in 2002, 750 in 2010, 400–500 in Oct. 2011.
2. Compartment 16, Davy Crockett NF (introduced).	Houston	2000; 2011	450 in 2000, 115 in 2002, 78 in 2003, 50 in 2006, 90 in 2010, 43 in 2011.
3. Compartment 11, Davy Crockett NF (introduced).	Houston	2004; 2011	200 in 2004, 10 in 2006, 7 in 2010, 10 in 2011.
4. Compartment 20, Davy Crockett NF (introduced).	Houston	2000; 2011	200–250 in 2000, 70 in 2002, 182 in 2002, 350 in 2006, 120 in 2010, 101 in 2011.
5. SH 94 ROW/Boggy Slough	Trinity	1955; 2011	100+ in 1968, 50 in 1986, 50 in 1987, 13 in 1988, 7–9 in 1991, 2 in 1992, 27 in 1993, 38 in 1994, 41 in 1995, 16 in 1996, 15 and 20 on private land in 1997, 13 in 1998, 49 in 1999, 17 in 2000, 15 and 300+ on private land in 2001, 20 in 2002, 20 and 0 on private land in 2005, 35 along powerline in 2007, 128 along ROW in 2011.
6. SH 204 ROW/Mud Creek	Cherokee	1992; 2011	1 in 1992, 1 in 1993–1996, 75 in 1997, 1 in 1998, 2 in 1999, 1 in 2000, 5 in 2001, 1 in 2002, 7, 6, 3, and 30 respectively at four new subpopulations in 2010, 20 in 2011.
7. SH 230 ROW	Houston	1978; 2002	50 in 1991, 58 in 1993, 38 in 1994, 1 in 1995, 2 in 1996, 6 in 1997, 8–13 in 1998, 14 in 1999, 8 in 2000, 4 in 2001, 12 in Sept. 2002, none in Oct. 2002, none in 2003, 2004, 2005, and 2011.
8. Lovelady	Houston	2011	50–70 in 1991, 7 in 1992, 58 in 1993, several hundred in 2001, 400 in 2002, 539 in 2011.
9. Mill Creek Gardens (introduced)	Nacogdoches	1995; 2011	96 in 1995, hundreds in Oct. 2011.
10. Harrison site	Harrison	Not observed after 1980.	Herbarium specimen was recently confirmed as *H. dasycalyx,* but site has not been observed since 1980.
11. Champion site	Trinity	1996; 2001	Hundreds in 1997, 300–400 in 2001.
12. Camp Olympia	Trinity	1977; 1992	No estimates.

Populations along SH ROWs include Hwy 94 in Trinity County, collected in 1955 (Blake 1958, p. 277); Hwy 204 in Cherokee County, first observed in 1992; and Hwy 230 in Houston County, first observed in 1978. The TPWD performed annual SH ROW monitoring along Hwy 94 from 1993 thru 2001 (Poole, 2001, p. 1); along Hwy 204 from 1993 thru 2003 (Poole 2001, p. 1; TXNDD 2012a, pp. 20–28); and along Hwy 230 from 1993 thru 2001 (Poole 2001, p. 1). These three ROW populations are separated from one another and are considered distinct. However, the Boggy Slough site consists of several scattered rose-mallow subpopulations that are located in close proximity to one another. Boggy Slough subpopulations and the SH 94 ROW population are separated by no more than a distance of 1.0 km (3, 280 ft), and these two sites likely constitute a single, larger population, sharing pollinators, and exchanging genetic material (NatureServe 2004, p. 6; Poole 2011c, p. 2). Therefore, in Table 4, they are combined and represented as a single location.

Adjacent lands to the SH 230 ROW were purchased by the Texas Land Conservancy (TLC) in 2004 (TLC 2011, *http://www.texaslandconservancy.org).* The rose-mallow plants in this site, referred to as Lovelady, are part of a population that included the rose-mallow plants in the SH 230 ROW. The rose-mallow plants within the SH 230 ROW have not been observed since 2002, and the site is considered

extirpated (TXNDD 2012a, pp. 61–67). The Lovelady site was recently surveyed in 2011, and although 539 plants were found, most were in notably poor condition, being much shorter in stature because of the drought and herbivory (Poole 2012b, pers. comm.; TXNDD 2012a, pp. 14–19). The estimates of rose-mallow displayed in Table 4 show wide variations in plant numbers. Some of this variation is due to incomplete counts at the sites, in other words, only a portion of the population was counted. Meaningful trends cannot be derived from these population estimates.

Although annual monitoring of the ROW sites was discontinued in the early 2000s, TPWD visited all of the ROW sites in October 2011. In the past, along SH 204, several subpopulations existed along multiple portions of the ROW; however, several of these subpopulations were gone in 2011. The recent drought conditions have allowed surveyors to count rose-mallow plants in parts of sites that were not accessible in the past because the sites were too wet. The increase in numbers of plants at some of the ROW sites may be partially attributed to this.

The Davy Crockett National Forest (NF), Houston County, Texas, contains four extant sites of the rose-mallow, three introduced and one natural. The one natural population is found in compartment 55 located west of the Neches River. This site is considered the most robust of all known extant populations (Poole 2011c, p. 3) and is almost entirely unaltered from its originally observed state as a seasonally wet flatwood pond, with vegetation being distinctly zoned (TXNDD 2012a, p. 29). The three introduced populations are located in compartment 16, which started with 450 plants (Davis 2000, pers. comm.; McCormick 2002, p. 1; USFWS 2000, p. 3), compartment 20 with 200–250 plants (Davis 2000, pers. comm.; McCormick 2002, p. 2; USFWS 2000, p. 3), and compartment 11 with about 200 plants (Nemec 2005, pers. comm.). The populations in compartments 16 and 20 were introduced in 2000, while the population in compartment 11 was introduced in 2004 (USFWS 2007, p. 6). All four of the Davy Crockett NF sites were censused in October 2011 by the Service and TPWD, and all of the introduced sites on the Davy Crockett National Forest have declined dramatically.

The four remaining rose-mallow sites have had sporadic monitoring or have not been visited in recent years. In 1995, Stephen F. Austin State University (SFASU) Mast Arboretum planted 96 rose-mallow plants into a site at Mill Creek Gardens, Nacogdoches County (Scott 1997, pp. 6–7). A conservation easement was placed on this land, and now the site is managed by the Arboretum. Rose-mallow plants at this site were observed in 1997, 1998, 2001, 2009, and in 2011 (Creech 2011a, pers. comm.). The introduced plants appear to be doing well; however, nonnatives and native species are becoming more prevalent, and may compete with the rose-mallow (Creech 2011c, pers. comm.). A rose-mallow specimen collected on private lands in 1980 from Harrison County, Texas, was presumed to be a halberdleaf rose-mallow specimen; however, it has been recently confirmed (2011) to be the rose-mallow (Birnbaum 2011, pers. comm.; TXNDD 2012a, pp. 12–13). The Harrison County site has not been visited since 1980, but we presume that rose-mallow is extant at this site since we have no evidence that the species is extirpated. Two additional populations occur on private lands in Trinity County; the Camp Olympia and Champion sites, discovered in 1977 and 1996, respectively. The current status of rose-mallow on the Camp Olympia site is unknown since access has been denied. We consider this site to be extant because we have no evidence that it has been extirpated. The population on the Champion site was observed in 2011; plants were seen, but no plants counts were done.

Summary of Factors Affecting the Species

Section 4 of the Act (16 U.S.C. 1533), and its implementing regulations at 50 CFR part 424, set forth the procedures for adding species to the Federal Lists of Endangered and Threatened Wildlife and Plants. Under section 4(a)(1) of the Act, we may list a species based on any of the following 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; and (E) other natural or manmade factors affecting its continued existence. Listing actions may be warranted based on any of the above threat factors, singly or in combination. Each of these factors is discussed below.

Texas Golden Gladecress

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Habitat loss and degradation have been the primary cause of decline in Texas golden gladecress during the last two decades. Permanent removal or destruction of habitat by quarrying and pipeline installation projects has eradicated several populations. Other habitat alterations that are occurring across the species' range, with potential to destroy or negatively alter gladecress' habitat, include construction of well pads, buildings, roads, and poultry production facilities. A historic and ongoing major threat to Texas golden gladecress' habitat is the invasion by nonnative and native shrubs and trees into the formerly open-sun, herbaceous, glade vegetation communities. Grazing has been implicated as a habitat threat because it is often associated with the encroachment of undesirable vegetation into the outcrop habitat, and may lead to trampling of plants. Agricultural herbicide use has some potential to damage emerging gladecress seedlings. Severe and extended periods of drought, anticipated to increase with projected changes in the climate, may negatively affect a given year's reproductive effort by Texas golden gladecress. These factors will be discussed in more detail below.

Glauconite Quarrying (Mining)

Glauconite, often called ''blue rock'' or ''green rock'' is used in San Augustine and Sabine Counties for road construction and maintenance by county road departments, the USDA Forest Service, and Louisiana Parishes (McGee 2011, pers. comm.). Glauconite has also been used by the oil and natural gas industry for roads and well pads, and demand by the oil and gas industry is high (McGee 2011, pers. comm.). Glauconite is also used as a component of fertilizer. A number of commercial glauconite quarries or mines were in production by 1997, and subsequent interest in its use grew because traditional pavement base materials historically used in this region (iron ore and limestone) were becoming harder to obtain and more expensive (Button and Little 1997, p. 14). A representative of one mining company with four quarries in the San Augustine and Sabine County area expressed an opinion that their mines were sustainable for 15 to 20 years at the current level of demand (McGee 2011, pers. comm.). We do not have a more quantified prediction regarding demand and existing supply; therefore, we

cannot accurately predict future quarry development. Selection of locations for glauconite quarries may target areas ''where the glauconite can be seen on the surface'' (outcrops), although quarries have also been dug on sites where the glauconite was not visible at the surface (McGee 2011, pers. comm.).

The Nature Conservancy (TNC) (2003, p. 9) noted that glauconite quarrying (mining) in glades destroys habitat and is a significant threat to the Texas golden gladecress. The majority of known habitat was excavated at three of the eight historical populations (CCG Sites 2, 6, and 8) between 1996 and 2011, resulting in open pits at the former habitat sites. The excavations removed all surface features required by the gladecress, as well as killing individual plants. Access to the Service has been denied at these sites, and we cannot determine if any habitat or plants remain on the periphery of the excavated quarries. The last recorded survey of plants at CCG Site 2 was on March 18, 1988, when the gladecress plants were described as growing on the sloping Weches outcrop that was brush-hogged and burned in 1988. Using available high-altitude photography taken between 1995 and 2009, supplemented with aerial photography from August 2010, it appears that the glade was still intact as of 1995–1996, but that a much larger area than the original population site was excavated by 2005. As of 2010, the entire population site and surrounding area looks to be two large, side-by-side pits or ponds. We assume that the populations are extirpated at this location.

The last information on plant numbers and conditions at the CCG Sites 6 and 8 was collected on March 19 and April 24, 1987. At that time, CCG Site 6 was recognized as the largest known viable population of Texas golden gladecress. At this site, the gladecress grew in a former pasture with thousands of fruiting plants in association with other native glade plants in shallow bedrock pockets. The CCG Site 8 consisted of a very small population on a degraded Weches outcrop, with scattered plants in fruit. Both elements of occurrence appeared to be eliminated by a large, open-pit quarry in which digging started after 1996, with the entire area being one large pit by 2009.

The outcrops may actually attract glauconite quarrying interests since the presence of an outcrop indicates that glauconite is close to the surface. Glauconite mining can occur throughout the range of Texas golden gladecress and has the potential to eradicate populations at sites where quarries are dug. There is no requirement for permits, no review of projects, and locations of future quarries are unknown. Based on our review of the scientific information, we conclude that excavation of pits for removal of glauconite, and associated glauconite quarrying activities, pose a threat to the gladecress across the species' range.

Natural Gas and Oil Exploration and Production

A principal threat to the habitat of Texas golden gladecress is the removal or destruction of habitat (outcrops and immediate surrounding land) by pipeline construction or from construction of buildings, well pads, or roads to access drilling sites directly over habitat. Natural gas pipeline installation requires trenching and clearing that can destroy all gladecress habitat and plants within the pipeline ROW. In addition to the destruction of habitat, excavation could conceivably alter the hydrology of gladecress sites if the lowered elevation of the excavation, or conversely, the increased ground elevation of a well pad or other structure, diminishes the amount of water that can move downslope over ground or through seeps. Adversely affecting the amount and timing of water delivery could render outcrop ledges uninhabitable for the species by interfering with the seeping or pooling action of water on which the species depends.

The loss of habitat and plants in the footprint of well pads and roads built for natural gas or oil exploration and production is a continuing threat because there is high potential to affect remaining glade habitat throughout the species' range. Numerous wells can be seen from SH 21 between the cities of Nacogdoches and San Augustine, with at least 30 wells visible along a 20-mile stretch of this road (Loos 2011, pers. comm.; Rodewald 2011, pers. comm.). The materials brought in to construct well pads and roads can directly cover habitat and plants, causing partial or total loss of populations. Excavations, as well as construction activities, that occur upslope of gladecress populations may act to impede movement of water downslope, thereby interfering with seeping and pooling of water needed by Texas golden gladecress. Concern about the extent of this threat is elevated due to our lack of information about potential gladecress populations across the Weches Glades where surveys for the species have not been undertaken, but where natural gas exploration and production is rapidly proceeding.

The entire known distribution of Texas golden gladecress is underlain by the Haynesville Shale formation (also known as the Haynesville/Bossier), recently recognized as a major natural gas source for the United States. The Haynesville Shale, located at a depth exceeding 11,000 ft (3,353 m), straddles the Texas-Louisiana border and almost 70 percent of its production is from wells located in Texas (Brathwaite 2009, p. 16). The Haynesville shale covers an area of approximately 9,000 square miles (23,310 square km). A June 2010 map shows the Haynesville Shale underlying the northwestern quarter of Sabine County, the entire northern half of San Augustine County, and the southeastern third of Nacogdoches County (Haynesville Shale Map 2010). Estimates of the natural gas contained in this formation's reserves indicate that it could sustain anticipated energy needs for well beyond the next several decades (*http://www.haynesvilleshalelandowners.org;* Brathwaite 2009, p. 16). Technological improvements in exploration (3-dimensional seismic surveys), drilling (horizontal wells), and well completion and stimulation (hydrologic fracturing) have enhanced the productive capability of natural gas shales throughout the United States, including the Haynesville Shale.

Natural gas exploration and production has been rapidly expanding within the Haynesville Shale, from the first significant production in 2005 to major development of the formation in 2009 (Brathwaite 2009, p. 16). Drilling activity over the entire Haynesville Shale peaked around 2009 or 2010 when approximately 200 drilling rigs were active. As of September 18, 2011, approximately 130 rigs were actively drilling; the slowdown being attributed to depressed natural gas prices (Murphy 2011a, p. 3). Even with natural gas prices down, most companies continue to drill one well per gas unit on the Haynesville Shale in order to maintain their leases (Murphy 2011a, p. 3). By September 2011, as many as 1,500 wells had been drilled with many more anticipated, along with perhaps another 10 years of active drilling on this formation (Murphyb 2011, pp. 2–3).

The Texas Railroad Commission's (RRCs) online maps (available at (*http://gis2.rrc.state.tx.us/public/startit.htm*) indicate that natural gas (and some crude oil) gathering and transmission pipelines are found throughout Nacogdoches County. In San Augustine County, the majority of existing pipelines are located in the area north of SH 21 and west of the town of San Augustine, an area of high glade

occurrence. To the east of San Augustine, there are fewer pipelines, but, of those that are located in this area, several are large gas transmission lines. One of these big transmission lines lies directly adjacent to the historic CCG Site 7. Sabine County has several major interstate pipelines, but fewer gathering and other transmission lines than the other two counties, and no pipelines near the Sabine County gladecress site (Texas Railroad Commission 2011).

The RRC regulates the oil and natural gas industry in the state of Texas. The RRC has detailed information on all existing pipelines, but the agency has no way to predict future routes for new pipelines or wells; they are limited to location data found within permit applications (Nunley 2011, pers. comm.). New pipelines, as well as ones for which routes are being determined, do not display on the RRC Web site, so although we are aware of the impact that pipeline excavations can have on Texas golden gladecress, we cannot tell where future pipelines may affect existing populations or suitable habitat.

Loss of gladecress habitat and plants is inevitable if pipelines are routed directly through population sites. Pipeline installation requires clearing of a path for the pipeline, cutting a trench in which to lay the pipe, recovering of the trench, and restoring the ground's surface. Clearing pipeline pathways eliminates obstacles to construction (NaturalGas.Org., p. 2), which may include the rocky outcrops supporting the Texas golden gladecress. Bulldozing the pipeline path likely permanently removes these rocky ledges and other features, along with the gladecress plants and seedbed. After the pipe is put into the ground and the trench covered with soil, elevations are restored and the surface is revegetated, generally using *Cynodon dactylon* (coastal bermudagrass) in this region (Rodewald 2011, pers. comm.). The Simpson Farms population, located 6 mi (9.7 km) east of the city of Nacogdoches, was eliminated by a natural gas pipeline that was installed sometime between August 2010 and October 2011 (date of installation determined from comparison of successive years of aerial photography). At this site, the pipeline ROW was approximately 75 ft (23 m) wide and the entire area formerly occupied by the gladecress was covered with deposited sediment or piles of cleared brush (Cobb 2011, pers. comm.). Given the degree of clearing of the ROW and the adjacent dirt work, the known extent of habitat is now gone and the entire population has likely been extirpated (Cobb 2011, pers. comm.). The Chapel Hill population may also be affected by future pipeline construction; the route for a future pipeline was being surveyed in October 2011 (Cobb 2011, pers. comm.). Although this pipeline does not directly cross the very small population site between the pasture fence and the road, it does lie parallel to, and just inside of, the fence line in a pasture where gladecress habitat does exist (Singhurst 2012c, pers. comm., Singhurst 2012f, pers. comm.).

The current trend over most natural gas shale formations is to drill multiple wells, when possible, and well pad sizes can vary accordingly. Well pad sizes in the San Augustine County area range from several acres to as large as 14 ac (5.67 ha), depending on the number of wells (Loos 2011, pers. comm.; Allen 2011b, pers. comm.). Although most oil and gas companies use existing roads, occasionally the companies need to build new roads, and in these cases the new routes may go through outcrop areas. The fill for pads and roads could cover portions of, or potentially entire, glade sites since some of the glades are so small. Placement of pads or roads upslope of gladecress sites may have the potential to affect downslope movement of water to outcrop sites (Ritter 2011b, pers. comm.).

In summary, the remaining populations of Texas golden gladecress and suitable habitat are within areas that are actively being drilled for natural gas. Plants and habitat have been destroyed by the construction of pipelines. The three remaining populations as well as suitable habitat are at risk of being destroyed by construction of natural gas and oil infrastructure (pipelines, well pads, metering stations, and roads) that continue to be constructed throughout the species' range. Exploration and production of natural gas and oil is anticipated to continue in this area for at least the next decade. Texas golden gladecress and its habitat may be directly impacted by the construction of pipelines and other infrastructure, and indirectly by altering the hydrology near occupied sites and suitable habitat. Based on our review of the scientific information, we conclude that natural gas and oil development is a threat to Texas golden gladecress.

Residential and Commercial Construction

Although residential and commercial construction was listed in the species' candidate assessments as a potential threat, there is no evidence that this type of disturbance has affected Texas golden gladecress populations. Historically, site selection for building homes and businesses in the town of San Augustine may have taken advantage of the open aspect of the glades—Leavenworth described the area in which he originally collected the species (vicinity of the town of San Augustine) as ''prairies'' (Bridges 1988, p. II–5). However, information about former glades in the area is lacking, as is documentation that the gladecress was present where buildings are currently located. Neither San Augustine nor Sabine Counties are experiencing rapid human population growth—San Augustine County saw a 0.9 percent decline in population from 8,946 to 8,865 between 2000 and 2010 while Sabine County had a modest increase of 3.5 percent (10,469 to 10,834) (U.S. Census Bureau 2010a,b), suggesting that residential and associated commercial development does not constitute a high level of threat to habitat throughout the species' range.

Proliferation of poultry farms was also listed as a potential threat to Texas golden gladecress habitat. Building poultry production houses and associated facilities would cover gladecress habitat in the same manner as would residential or other types of commercial construction. Aerial photography from November 2011 (Google Earth, November 17, 2011) shows 21 poultry farms within the gladecress' range (the approximate zone of the Weches Formation) in Sabine and San Augustine Counties. Of the 21 total, 18 are located on the San Augustine County Weches Formation. None of the existing farms is adjacent to any of the known population locations, and we are unable to determine if any gladecress habitat or plants were lost when these production facilities were built. Among the characteristics in East Texas that make a site desirable for poultry production are long, flat stretches of ground with a good, solid hardpan as opposed to rocky outcrops on slopes, the tops of ridges, or in low-lying areas (Ritter 2012, pers. comm.), such as those occupied by the gladecress. This site-selection preference means that poultry producers would most likely avoid gladecress habitat. In the last 2 years, most of the poultry farm construction has taken place in counties north of San Augustine and Sabine, and the only activity in the Weches Formation zone has been renovations to existing farms (Ritter 2012, pers. comm.). The construction of poultry farms is not considered a threat to Texas golden gladecress because poultry farm site selection does not appear to have significant overlap with gladecress habitat.

Roads

The portion of the CCG Site 1 population that occurred in the SH ROW was impacted when Sunrise Road was widened and straightened in the 1990's (Singhurst 2012g, pers. comm.); however, not all plants were destroyed. A 2011 list of TxDOT planned projects does not show any future road improvements or expansions near known gladecress population sites. Based on the best available information, we conclude that new road construction or improvements to the existing roads does not pose a threat to the gladecress at the three extant sites.

Invasive Species

A major stressor to the habitat of Texas golden gladecress is the ongoing invasion of nonnative and native shrubs and trees into the formerly open-sun, herbaceous, glade vegetation communities. This woody, weedy plant invasion is occurring on at least a portion of all three remaining population sites. Additionally, the historic CCG Site 7 appears, from 2010 aerial photography, to be almost 100 percent overgrown with woody vegetation.

Glades in most parts of the United States are declining due to grazing, fire suppression, and the subsequent invasion by woody vegetation. In presettlement times, glades were maintained by periodic fires and browsing of woody vegetation by white-tailed deer (*Odocoileus virginianus*) and elk (*Cervus canadensis*). This natural disturbance regime changed over the last century due to active fire suppression and diminished numbers of browsers reduced by hunting pressure (Rossiter 1995, p. 2). Although the harsh environment of glades helps to preclude tree establishment, without disturbance such as fire, woody plants will invade (Hartman 2005, p. 4). The exclusion of fire has allowed encroachment of trees, shrubs, vines, and other woody plants into glade communities (Borland 2008, p. 3).

As woody plants mature, they produce canopies that reduce the amount of sunlight reaching the ground. Sun-loving plants like Texas golden gladecress that are adapted to hot, dry sites do not tolerate shade well. Research conducted in Missouri's cedar glades showed that herbaceous plant production rapidly declined when red cedar cover exceeded more than one third of a glade's area (Rossiter 1995, p. 3). A combination of reduced sunlight (shading) and increased leaf litter can act to suppress herbaceous species (Hartman 2005, p. 2). These types of changes in glades that were historically hot and dry can contribute to cooling of the ground and enhancing of moisture content. Wetter, cooler conditions during traditionally hot, dry summer months may be counter-productive for sun-loving glade species by encouraging invasion by cool season vegetation and exotic species. Buildup of a deeper organic layer can also facilitate the establishment of woody plants that results in further shading of the ground (Hartman 2005, p. 2).

Invading species can also compete directly with Texas golden gladecress for water and nutrients. Interspecific competition has been noted as potentially causing reduction in the extent of the root system in several small outcrop plant species, thereby reducing their nutrient uptake (Baskin and Baskin 1988, p. 836). Shading further stresses the herbaceous layer, including the gladecress. In Missouri, stressed glade communities were more prone to invasion from invasive species like *Schedonorus phoenix* (tall fescue), *Sericea lespedeza* (Chinese bushclover), and *Rosa multiflora* (multiflora rose) (Hartman 2005, p. 4). On Texas' Weches Glades, Carr (2005) reported tall fescue at the Chapel Hill site, and Macartney rose was listed as a major invading species in pastures throughout the range of Texas golden gladecress. The Weches outcrops that parallel SH 21 appear to support the heaviest Macartney rose infestation in San Augustine County (Ritter 2011a, pers. comm.). A 1995 report by the Service's Clear Lake Ecological Services' Field Office described known white bladderpod sites, including several with gladecress, all of which needed active management to preclude invasion by woody shrubs (Nemec 1996, p. 1).

Texas golden gladecress habitat has been documented since the 1980's to be affected by an accelerated succession from open herbaceous Weches outcrops to dense shrub thickets and closed canopy woodlands (USFWS 1992, p. 7; Carr 2005, p. 2; Nemec 1996, p. 4). The most serious invaders are included in Table 5. Encroachment of these species is thought to suppress the less competitive components of the community like Texas golden gladecress and white bladderpod (TNC 2003, p. 4). Some of these invasive species can grow on the shallow outcrop soils, while others can invade open space around the edges of the outcrop ledges (USFWS 1992, p. 7). Some of the native invading species are likely controlled by occasional wildfire under natural conditions. More serious are the introduced invaders, including the small hop clover that can cover Weches outcrops and eliminate other vegetation. The introduced shrubs, including Macartney rose and Japanese honeysuckle, will invade open space, including gladecress habitat (USFWS 1992, p. 7).

TABLE 5—PRIMARY INVASIVE SPECIES FOUND IN TEXAS GOLDEN GLADECRESS HABITAT

Scientific name	Common name
Nonnative Species	
Rosa bracteata	Macartney rose
Lonicera japonica	Japanese honeysuckle
Stellaria media	chick-weed
Bromus japonicus	Japanese brome
Kummerowia striata	Japanese bush-clover
Ligustrum japonicum	Japanese privet
Meliotus indicus	sour clover
Cynodon dactylon	coastal bermudagrass
Trifolium dubium	small hop clover
Native Species	
Andropogon virginicus	broomsedge
Plantago virginica	pale-seeded plantain
Euphorbia sp.	spurge
Frangula caroliniana	Carolina buckthorn
Rhamnus lanceolata	lanceleaf buckthorn
Crataegus monogyna	hawthorn
Prunus mexicana	Mexican plum

TABLE 5—PRIMARY INVASIVE SPECIES FOUND IN TEXAS GOLDEN GLADECRESS HABITAT—Continued

Scientific name	Common name
Viburnum prunifolium	blackhaw viburnum
Rhus glabra	smooth sumac
Ulmus alata	winged elm
Berchemia scandens	Alabama supplejack
Cissus incisa	ivy treebine

The three extant Texas golden gladecress sites have shrubs and trees encroaching into formerly open glade habitat. At the Chapel Hill site, Carr (2005, p. 2) noted that 13 scattered pines within a 6,000-square-foot (557-square-meter) area produced a total canopy coverage of less than 10 percent of site, but indicated that future shading effects when the pine trees reach maturity, might prove detrimental. At this same site, other woody plants were controlled, but not eliminated, by regular shredding (Carr 2005, p. 2).

Texas golden gladecress does show some ability to persist at sites that have been overrun by woody vegetation. At the Geneva site, the area with the gladecress was bulldozed, and although the site was reported as destroyed, the species reappeared within several years. At the Chapel Hill site, brush removal actions to benefit white bladderpod also resulted in the reappearance of the gladecress after its apparent absence for 10 years. This suggests that the gladecress' seed bank may be able to remain viable over extended time periods even though the habitat is overgrown by woody species.

Nonnative and native woody species, including woody shrubs, vines, and trees, continue to degrade Texas golden gladecress' habitat across the species' entire range. This threat is significant for the species because it is ubiquitous and has led to declines, or disappearance as in the Chapel Hill site, in the gladecress populations, along with altering its habitat. Based on our review of the scientific information, we conclude that invasion of woody and weedy nonnative and native plants into gladecress habitat is a threat across its range.

Habitat Damage Associated With Grazing

Grazing has been implicated as a habitat threat because it can facilitate the encroachment of undesirable vegetation into the outcrop habitat, and because it may lead to trampling of plants and soil compaction. Historically, the introduction of grazing livestock into East Texas, coupled with heavy grazing pressure, adversely impacted glade sites by facilitating the spread of invasive woody plants, and potentially trampling native plants. Acting in concert with fire suppression, heavy grazing pressure may have accelerated conversion of the grassy prairies and herbaceous glades to the dense, thorny masses of vegetation seen at many sites today (Nemec 1996, p. 4; USFWS 1992, p. 7). Overgrazing of Texas golden gladecress' habitat can promote invasion by woody species and enhance competition on the glade from herbaceous weeds like pale-seeded plantain, Japanese brome, and spurge (USFWS 1992, p. 7). Grazing livestock serve as a source of introduced species' seeds as well as supplying nutrients for competitive native weedy species. Grazing animals can also encourage unpalatable invasive species like Macartney rose to move into areas where more preferred natives have been grazed out (Bridges 1988, p. II–35). The negative impacts to gladecress habitat from woody plant invasion are detailed in the ''Invasive Species'' section.

There is no documentation of gladecress plants being lost due to trampling. Potential does exist for this to happen, for example, at the Geneva Site, where gladecress plants have been observed growing directly adjacent to and inside the fence where a cow trail is evident. Loss of plants in this small area has not been confirmed and the larger part of this population grows in the SH 21 ROW where no grazing takes place, so it is unlikely that trampling at this site truly constitutes a threat. Grazing also occurs within the fenced private portions of the other two remaining gladecress population sites (CCG Site 1 and Chapel Hill), where individual plants may be subject to trampling if they are growing directly in cattle trails.

Grazing does occur on portions of the three extant population sites, but we do not have information to show that grazing has destroyed Texas golden gladecress habitat or plants. Based on our review of the scientific information, we conclude that the direct effects of grazing are not a threat to Texas golden gladecress.

Land Conversion for Agriculture and Silviculture

Another potential habitat threat is conversion of Weches Glade outcrops to nonnative grass pastures or conversion of existing pasture lands that may contain viable outcrops to pine tree plantations. Over the last 200 years, most of the native vegetation communities of East Texas were dramatically altered by human activities as the region was logged and extensively cultivated (Diggs *et al.* 2006, p. 76). Due to widespread land use changes throughout the entire range of the gladecress, and the fact that the glade areas were always somewhat small and surrounded by forest, there is a high likelihood that some glades were negatively affected by past agricultural and silvicultural land cover conversions (USFWS 1992, p. 7). At least one gladecress population was described as being lost to this type of land use change during the 1980's (Turner unpubl. data in TNC 2003, p. 2).

Conversion of native vegetation communities to pasture or row crop in the region is much less common now. The Weches outcrops are not considered desirable substrate for planting to pasture as landowners are not interested in deep plowing, breaking up, or dragging out rocks (Ritter 2011a, pers. comm.). The ''Redland'' soils that are exposed in the Weches outcrops are thin and rocky. The Natural Resource Conservation Service (NRCS) recommends avoiding these soils because there are not practical conservation practices for these types of sites (Ritter 2011a, pers. comm.). The more prevalent land use change now is from pasture to tree plantation (Ritter 2011a, pers. comm.). Within the last few years, many Sabine and San Augustine County landowners have shifted from grazing to timber planting (Ritter 2011a, pers. comm.). Most timber planting consists of *Pinus taeda* (loblolly pine) and *Pinus palustris* (longleaf pine); planted on 8–10 ft (2.4–3 m) centers. Although landowners will likely avoid planting directly onto Weches outcrops because these rocky soils will not support trees, it is conceivable that the spacing between plantings would allow

trees to be planted near the edges of outcrops (Ritter 2011a, pers. comm., Ritter 2012, pers. comm.). As these trees mature, their canopies may potentially cause shading problems on glade areas (see Invasive Species Section for explanation of negative effects of shading). For example, it appears that former habitat adjacent to the Chapel Hill site may be planted, in part, to rows of trees.

In addition to shading, pine tree plantings may also result in production of large amounts of pine needle litter that could accumulate in small glade openings near the trees. Where a mid-story of trees develops, light may be blocked from reaching the ground level by upper-canopy and mid-story shading; with a subsequent build-up of leaf litter, the herbaceous species can be suppressed. In the face of fire suppression, Missouri glades became choked with litter that kept the ground more moist and cool, leading to replacement of the sun-loving natives by invading cool-season vegetation and exotic species (Hartman (2005, pp. 2–4).

Based on our review of the scientific information, we conclude that planting of pine tree plantations, if in close proximity to occupied glade openings, can constitute a threat to Texas golden gladecress.

Herbicide Use

The candidate assessments for Texas golden gladecress list herbicide use in highway ROWs and for agricultural purposes as a potential threat to the species because of the plant's occurrence within highway ROW's and in pastures. Herbicide use to maintain highway and county road ROW's has the potential to destroy the small subpopulations that exist in the TxDOT ROW's at the Geneva and CCG 1 sites. If timing of the herbicide application coincides with the growing and reproductive period of the year for the gladecress, all individuals that are growing in the ROW might potentially be extirpated if the herbicide contacts all gladecress individuals in these small sites. Herbicide exposure from highway and county road maintenance would affect only a small portion of two extant sites, and recent information suggests that use of herbicides for state and county roads in this area is not a widespread practice (Adams 2011b, pers. comm.; Hunter 2011, pers. comm.). We do not have documentation of negative impacts to the species from herbicide applications for road maintenance. The TxDOT uses herbicides only on an ''as needed'' basis to eliminate encroaching woody plants or along the edges of the road pavement (Adams 2011b, pers. comm.). San Augustine County does not use herbicides for county roadside maintenance due to costs (Hunter 2011, pers. comm.).

With regard to agricultural herbicide use in San Augustine and Sabine Counties, the NRCS has a program to assist landowners with Macartney rose control using Grazon® P+D herbicide. This program involves a 3-year approach—broadcast spraying from a tractor during the first 2 years, followed by individual plant treatments in the third year. Grazon® P+D has active ingredients of picloram and 2,4–D (dichlor) and can persist in some soils for months and act as a preemergent, killing germinating seedlings. In an appendix to TNC's Conservation Area Plan for the San Augustine Glades (TNC 2003, pp. 30–31), it is one of several herbicides identified as potentially harmful to the gladecress and white bladderpod if used near their habitats. Management recommendations included avoiding use of this herbicide within 200 yards (yd) (183 m) of areas described as habitat within the region, along with limiting timing of use to spot treatments only July 1–August 30. Because Macartney rose is infesting the region of the Weches outcrops, and since this exotic invader is capable of establishing itself in Weches Glades and has been noted as occurring at gladecress population sites, it is reasonable to assume that some areas of glade habitat are included in these treatment programs. So although control of Macartney rose would likely benefit the gladecress in the long term, application of a preemergent herbicide has the potential to eliminate the gladecress altogether if it stays in the soil long enough to kill emerging seedlings. We have no evidence that this type of application has affected Texas golden gladecress populations to date.

Based on our review of the scientific information, we conclude that using preemergent herbicides such as Grazon P+D that persist in the soil for brush control could constitute a threat to Texas golden gladecress emerging seedlings.

Climate Change

Our analyses under the Endangered Species Act include consideration of ongoing and projected changes in climate. The terms ''climate'' and ''climate change'' are defined by the Intergovernmental Panel on Climate Change (IPCC). The term ''climate'' refers to the mean and variability of different types of weather conditions over time, with 30 years being a typical period for such measurements, although shorter or longer periods also may be used (IPCC 2007a, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (e.g., temperature or precipitation) that persists for an extended period, typically decades or longer, whether the change is due to natural variability, human activity, or both (IPCC 2007a, p. 78).

Scientific measurements spanning several decades demonstrate that changes in climate are occurring, and that the rate of change has been faster since the 1950s. Examples include warming of the global climate system, and substantial increases in precipitation in some regions of the world and decreases in other regions. For these and other examples, see IPCC 2007a, p. 30 and Solomon *et al.* 2007, pp. 35–54, 82–85. Results of scientific analyses presented by the IPCC show that most of the observed increase in global average temperature since the mid-20th century cannot be explained by natural variability in climate, and is ''very likely'' (defined by the IPCC as 90 percent or higher probability) due to the observed increase in greenhouse gas (GHG) concentrations in the atmosphere as a result of human activities, particularly carbon dioxide emissions from use of fossil fuels (IPCC 2007a, pp. 5–6 and figures SPM.3 and SPM.4; Solomon *et al.* 2007, pp. 21–35). Further confirmation of the role of GHGs comes from analyses by Huber and Knutti (2011, p. 4), who concluded it is extremely likely that approximately 75 percent of global warming since 1950 has been caused by human activities.

Scientists use a variety of climate models, which include consideration of natural processes and variability, as well as various scenarios of potential levels and timing of GHG emissions, to evaluate the causes of changes already observed and to project future changes in temperature and other climate conditions (e.g., Meehl *et al.* 2007, entire; Ganguly *et al.* 2009, pp. 11555, 15558; Prinn *et al.* 2011, pp. 527, 529). All combinations of models and emissions scenarios yield very similar projections of increases in the most common measure of climate change, average global surface temperature (commonly known as global warming), until about 2030. Although projections of the magnitude and rate of warming differ after about 2030, the overall trajectory of all the projections is one of increased global warming through the end of this century, even for the projections based on scenarios that assume that GHG emissions will stabilize or decline. Thus, there is strong scientific support for projections that

warming will continue through the 21st century, and that the magnitude and rate of change will be influenced substantially by the extent of GHG emissions (IPCC 2007a, pp. 44–45; Meehl *et al.* 2007, pp. 760–764 and 797–811; Ganguly *et al.* 2009, pp. 15555–15558; Prinn *et al.* 2011, pp. 527, 529). (See IPCC 2007b, p. 8, for a summary of other global projections of climate-related changes, such as frequency of heat waves and changes in precipitation. Also see IPCC 2011 (entire) for a summary of observations and projections of extreme climate events.)

Various changes in climate may have direct or indirect effects on species. These effects may be positive, neutral, or negative, and they may change over time, depending on the species and other relevant considerations, such as interactions of climate with other variables (e.g., habitat fragmentation) (IPCC 2007a, pp. 8–14, 18–19). Identifying likely effects often involves aspects of climate change vulnerability analysis. Vulnerability refers to the degree to which a species (or system) is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the type, magnitude, and rate of climate change and variation to which a species is exposed, its sensitivity, and its adaptive capacity (IPCC 2007a, p. 89; see also Glick *et al.* 2011, pp. 19–22). There is no single method for conducting such analyses that applies to all situations (Glick *et al.* 2011, p. 3). We use our expert judgment and appropriate analytical approaches to weigh relevant information, including uncertainty, in our consideration of various aspects of climate change.

As is the case with all stressors that we assess, even if we conclude that a species is currently affected or is likely to be affected in a negative way by one or more climate-related impacts, it does not necessarily follow that the species meets the definition of an ''endangered species'' or a ''threatened species'' under the Act. If a species is listed as endangered or threatened, knowledge regarding the vulnerability of the species to, and known or anticipated impacts from, climate-associated changes in environmental conditions can be used to help devise appropriate strategies for its recovery.

The climate in Texas has shown a long-term gradual warming trend—pollen, plant macrofossils (fossils large enough to be seen without a microscope), packrat middens (ancient ''garbage piles'' left by rodents in the genus *Neotoma*), and other evidence show substantial climate changes in Texas over the past 15,000 years (end of the last glacial period) when the mean annual air temperature was 9 °Farenheit (F) (5 °Centigrade (°C)) cooler than present (Diggs *et al.* 2006, p. 73). The Texas climate is considered highly variable with seasonal precipitation patterns that dramatically increase from west to east, and temperatures that increase from north to south (Nielsen-Gammon 2008, p.1). Climate models predict increased temperatures, and concurrent increased evapotranspiration, and decreased regular precipitation and soil moisture in Texas (Diggs *et al.* 2006, p. 73.), all of which would have negative implications for Texas golden gladecress. Based on a climate model developed by the United Kingdom Hadley Center (HadCM2), temperatures in Texas could increase by 3 °F (1.7 °C) in spring (range of 1–6 °F (0.6–3.3 °C)) and about 4 °F (2.2 °C) in other seasons (with range of 1–9 °F (0.6–5 °C)).

Droughts are not uncommon in Texas (Texas Water Resources Institute 2011, pp. 1–13). The most severe drought recorded in Texas occurred in the 1950's, and in the last 15 years there have been widespread droughts: In 1996, 1999–2000, 2005–2006, 2007, 2010–2011 (Texas Water Resources Institute 2011, pp. 10–12). Projections are for winter precipitation to decrease by 5–30 percent although it may increase by 10 percent in other seasons (Environmental Protection Agency 1997, p. 2).

East Texas is subtropical with a wide range of extremes in weather (Diggs *et al* 2006, p. 65). Mean annual temperatures range from 70 °F (21 °C) in the south to approximately 64 °F (18 °C) in the north, although extremes like 0 °F (−18 °C) and 110 °F (43 °C) are observed occasionally. The highest reported eastern Texas temperature was 118 °F (48 °C) in Collin County in 1936 (Bomar 1995 in Diggs *et al.* 2006, p. 65). Average rainfall ranges from 60 in (152 cm) at the State's southeastern border to 40 in (98 c) at the western edge. These rainfall differences are related to proximity to the warm, moist air supplied by the Gulf of Mexico. The native vegetation of this region evolved with, and is adapted to, recurrent extremes (Diggs *et al.* 2006, p. 67). That said, the Pineywoods region is vulnerable to even small climatic shifts because it is ''balanced'' on the eastern edge of a dramatic precipitation gradient. Temperature increases that are projected in climate change scenarios will likely be associated with increases in transpiration and more frequent summer droughts. Decreased rainfall may result in an eastward shift in the forest boundary and replacement of the Pineywoods forest with scrubland (Diggs *et al.* 2006, p. 80). There is potential for loss of species that are limited to mesic conditions of deep East Texas, such as the hardwood forests surrounding the Weches Glades. There may also be a northerly shift of southerly species based on climate models that predict increasing temperatures and, therefore, increasing evapotranspiration and decreasing regional precipitation and soil moisture (Diggs *et al.* 2006, p. 73).

Although East Texas has typically received a greater amount of precipitation during December through March than other regions (Neilsen-Gammon, p. 24), future precipitation trends indicate a decrease in precipitation toward the middle of the 21st century (Nielsen-Gammon, p. 28). The timing of this precipitation is crucial for the Texas golden gladecress, which is dependent on late-fall-through-spring moisture to generate the seeps and pooling that it requires for germination, growth, and reproduction. Reproduction is known to be negatively impacted by drought as evidenced by declines of 91 to 67 plants at the Chapel Hill site and 490 to 96 plants at the CCG Site 1 during the 1999–2000 droughts (USFWS 2010b, p. 5; Singhurst 2011a, pers. comm.). It is unknown how the gladecress will respond to continued years of drought, especially when combined with other threats.

A warmer climate with more frequent droughts, but also extreme precipitation events, may adversely affect Texas golden gladecress by altering the glade habitat the species is known to occupy. It may also improve habitat conditions for invasive plant species and other plants (USFWS 2010b, p. 5). Climate extremes, especially drought and low temperatures, probably play a bigger role in excluding nonadapted species than average conditions will (Diggs *et al.* 2006, p. 80). Because the gladecress is a habitat specialist, being closely tied to the geology and soils on the Weches outcrops, it seems unlikely that this species will be flexible in terms of shifting to new habitats if the glades become unsuitable due to lack of winter-spring moisture. Also, if conditions shift in favor of nonnatives, the gladecress will likely be negatively affected. Although the gladecress has survived cycles of drought in the past, as well as some years with extraordinary temperature shifts, it may have done so in a landscape where it was more abundant and with populations distributed in closer proximity to one another. Based on our review, the best

scientific and commercial information did not provide us with information regarding the species' seedbank so we do not know how many consecutive years of poor conditions (in terms of low rainfall and high temperatures) the species can survive.

We lack firm predictions for future patterns of precipitation and temperature that are specific to East Texas. While it appears reasonable to assume that climate change will occur within the range of Texas golden gladecress, at this time we do not have information to indicate specifically how climate change may affect the species or its habitat. However, we do know from recent records that frequent and sustained droughts have resulted in declines, at least in the short term, in the remaining populations.

Other Conservation Efforts

Texas golden gladecress has benefitted to a limited degree from its co-occurrence at some sites with the federally listed white bladderpod. Management activities (brush clearing) carried out in 1995 at the Chapel Hill site for the white bladderpod resulted in a return of the gladecress after a 10-year absence (Nemec 1996, p. 5). However, nonnative shrubs quickly reinvaded the site, and repeated maintenance was needed. The landowner at this site has continued to mow at least once per year, keeping the habitat relatively open (Singhurst 2012f, pers. comm.), and the gladecress and bladderpod continue to occupy this site. A Partners for Fish and Wildlife Program project involving restoration of habitat (brush clearing) and planting of white bladderpod was planned to benefit both species although the gladecress has not been detected at the site to date.

The Service funded several projects with TNC, including one that provided for 3 years of status surveys for gladecress and bladderpod. These were completed in 2006 and were the sole source of population numbers for these species for several years. The TNC also identified a total of 44 potential sites for both plant species using GIS data (aerial, geology, and hydrology sources) and obtained permission to visit 14 of them, but found little Weches habitat and no new gladecress populations (Turner 2003, p. 4).

In the early 2000's, the Service collaborated with Mercer Arboretum and other partners, including TNC and the Pineywoods Native Plant Center at Stephen F. Austin State University in Nacogdoches, Texas, to collect gladecress seeds for cultivation, research, and long-term storage, and as seed sources for reintroduction work. Seeds were kept by Mercer Arboretum for long-term storage as well as germination and cultivation work. Nothing has been done recently with gladecress research or reintroduction efforts. The species was successfully introduced into apparently appropriate habitat in Nacogdoches County at a site located approximately 30 mi (48 km) west of its historic range in the late 1980's, where it grew and reproduced through 2011 when it was eradicated by construction of a pipeline. The success of this reintroduction project may bode well for future efforts to increase the numbers of populations by reintroductions or introductions to new sites.

Summary of Factor A

The highest levels of threat to Texas golden gladecress are the loss and degradation of habitat. Specifically, surface quarrying of glauconite and the exploration and development of oil and natural gas wells and associated roads and pipelines have destroyed 50 percent of the known populations between the mid 1990's and 2011. These threats are likely to continue since glauconite is currently in demand for road bed, well pad construction, and for fertilizer, and development of the natural gas-bearing Haynesville Shale, which underlies the entire range of Texas golden gladecress, has been very rapid during the last several years. Portions of two extant populations extend into SH ROW's where TxDOT has the ability to provide some protections. Nevertheless, much of the species' potential habitat throughout the range occurs on private lands that, due to lack of access, have not been surveyed; therefore, the current level of threats across these lands cannot be assessed. Surface quarrying of glauconite and oil and gas development pose significant threats to the known extant populations and associated habitats of the gladecress.

Texas golden gladecress also faces threats throughout its range from competition for light and nutrients from both native and nonnative invasive woody plants, including the nonnative Macartney rose. We have determined that the extant populations will decline or become extirpated unless they are periodically maintained to remove invading trees and shrubs. Additionally, herbicides used to control Macartney rose may be a threat to the gladecress if applied or persisting in the soil during the species' period of growth, from fall through early summer.

A recent, ongoing trend in local land use is the conversion of open pasture to pine plantations. We found no evidence that grazing and trampling by livestock may be a threat to the species, and we believe that pastures provide suitable habitat for the sun-loving gladecress. However, densely planted pine trees may degrade the species' habitat due to competition for light and nutrients, and by contributing masses of leaf litter onto formerly sparsely vegetated glades.

Finally, the information regarding climate change is not yet specific enough for us to determine the potential long-term effects to the gladecress habitat. However, long-term drought has negatively affected and will likely continue to negatively affect the reproduction and germination of gladecress seeds. Therefore, we conclude that Texas golden gladecress faces significant threats from habitat loss, destruction, modification, or curtailment of the species' habitat or range.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Limited collection of gladecress has occurred for scientific purposes; only voucher specimens and several seed collection events are documented. Dr. Elray Nixon collected seed in 1987 and successfully created a new population when he introduced the seed onto an outcrop in Nacogdoches County. The Mercer Arboretum, a participating institution in the Center for Plant Conservation, collected seed in 2001—maintaining some in long-term storage and planting some in germination trials. There are no records of any collections of seeds or other plant materials in the last few years. Because these collections were limited, we do not believe that this activity constituted a threat to the species. There is no information to suggest that Texas golden gladecress is collected for commercial, recreational, or educational purposes, and we have no reason to believe that this factor will become a threat to the species in the future. Therefore, based on our review of the best available scientific and commercial information, we conclude that collection or overutilization of Texas golden gladecress is not a threat to the species.

C. Disease or Predation

There is no available information regarding disease in Texas golden gladecress. There is no information regarding predation by wildlife on the species. Grazing is ongoing across the range of the gladecress and occurs on portions of all extant population sites; however, there is no information to document that cattle eat gladecress. No studies have been conducted to investigate the effect of grazing or

herbivory specifically on Texas golden gladecress. George (1987, p. 17) studied the herbaceous flora of three Weches outcrops in San Augustine County and saw little grazing within his study plots although cattle were present at all three sites. Therefore, based on our review of the best available scientific and commercial information, we conclude that disease and predation on Texas golden gladecress, including predation associated with grazing, are not threats to the species.

D. The Inadequacy of Existing Regulatory Mechanisms

Under this factor, we examine whether existing regulatory mechanisms are inadequate to address the threats to the species discussed under the other factors. Section 4(b)(1)(A) of the Act requires the Service to take into account ''those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species * * *.'' In relation to Factor D under the Act, we interpret this language to require the Service to consider relevant Federal, State, and tribal laws, regulations, and other such mechanisms that may minimize any of the threats we describe in threat analyses under the other four factors, or otherwise enhance conservation of the species. We give strongest weight to statutes and their implementing regulations and to management direction that stems from those laws and regulations. An example would be State governmental actions enforced under a State statute or constitution, or Federal action under statute.

Having evaluated the significance of the threat as mitigated by any such conservation efforts, we analyze under Factor D the extent to which existing regulatory mechanisms are inadequate to address the specific threats to the species. Regulatory mechanisms, if they exist, may reduce or eliminate the impacts from one or more identified threats. In this section, we review existing State and Federal regulatory mechanisms to determine whether they effectively reduce or remove threats to the Texas golden gladecress.

The greatest threats to the gladecress include loss of habitat and the plants themselves due to actions that remove the substrate under the populations or that cover them up. These types of actions have been associated with quarrying of glauconite; construction related to natural gas and oil exploration and production; conversion of native glades or pastures with glades and outcrops to other land uses, most recently planting to pine plantations; and potentially herbicide applications for purposes of controlling the invasive Macartney rose. State and Federal regulations that might help conserve rare species on State highway ROWs, including avoidance or minimization of habitat destruction, as well as regulations that would protect plants from herbicide applications, are requirements only for already listed species; therefore, these regulations do not apply to gladecress. Likewise, no existing regulations protect the species on privately owned land, where most of the remnant gladecress is found.

Currently, Texas golden gladecress is not protected by State or Federal laws. All of the populations occur on private property, and portions of those populations extend onto SH ROWs. As such, there are no regulatory mechanisms in place to address the threats to the species.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Small Population Size

The Texas golden gladecress remains in only three small populations. Small populations can be prone to extirpation, especially if a series of drought years greatly reduces seed production and depletes the soil seed bank. The Service (1992, p. 8) noted that for a species like the white bladderpod, with only small populations and wide natural annual fluctuations in plant numbers, as well as fragmented habitat across its range, recolonization after a population loss would require long-distance seed dispersal. Although we have no information regarding the gladecress' seed dispersal patterns or distances, we do know that the gladecress' habitat is exceedingly fragmented, with fewer and smaller known populations than the bladderpod, and further distances between populations. This makes the prospects for recolonization after a potential loss of a gladecress population very remote.

Small populations can also be prone to extirpation from a single adverse natural or manmade event. The population at the Chapel Hill site is a good example of this vulnerability. Carr (2005, p. 2) reported that Texas golden gladecress habitat was extremely limited at Chapel Hill and that the numbers of gladecress plants would also always be restricted by the small size of the available habitat. He concluded that the population was so small that a single adverse event could extirpate the species from this location. The small population size and the small number of extant populations of gladecress increases each population's vulnerability to the significant threats listed in Factor A. Low numbers of plants, confined to very small areas, can be totally eradicated by actions such as installation of pipelines, excavation of mines, or construction of well pads, roads, or other types of construction. The remaining gladecress occurrences are so small that they can fall completely within the footprint of one well pad, or even within the width of a pipeline excavation. Small population size also increases the risk of total loss of populations due to contact with herbicides or shading and leaf litter accumulation from pine tree plantings because these threats are likely to affect the entirety of any given occurrence. Sustained drought may reduce the reproductive effort of a population, and this can lead to an overall decrease in fitness for the remaining populations. Reduced reproductive effort affects the seed bank, which represents the reproductive capacity of each gladecress population. The combined effects of drought, impacts from oil and gas development, herbicide treatment, shading, and competition place the remaining three populations at a high extinction risk, exacerbated by their small population size and narrow distribution.

In addition to increasing vulnerability to direct threats such as pipeline construction, small population size can result in a decrease in genetic diversity due to genetic drift (the random change in genetic variation in each generation) and inbreeding (mating of related individuals) (Antonovics 1976, p. 238; Ellstram and Elam 1993, pp. 218–219). Genetic drift can decrease genetic variation within a population by favoring certain characteristics and, thereby, increasing differences between populations (Ellstram and Elam 1993, pp. 218–219). This increased difference between populations can diminish a species' ability to adapt to the selective pressures of a changing environment (Newman and Pilson 1997, p. 360; Ellstrand 1992, p. 77). Self-fertilization and low dispersal rates can cause low genetic diversity due to inbreeding (Antonovics 1976, p. 238; Barrett and Kohn 1991, p. 21).

Although we do know that Texas golden gladecress exists in small populations in a fragmented landscape, no information is available regarding the genetic diversity exhibited by the species.

Summary of Factor E

Texas golden gladecress is a historically rare species with some adaptations, such as a mixed mating system, that help to alleviate part of the

inherent risks of small population size. The continued existence of Texas golden gladecress is negatively impacted by natural factors including being limited to only a few remaining populations that contain very small numbers of individual plants with a distribution restricted to extremely small areas of outcrop. The species' current, reduced occurrences across a range that has been highly fragmented by past and ongoing human activities increases its vulnerability. With only three remaining populations, loss of an entire population could be catastrophic for this species' long-term viability. Therefore, based on our review of the best available scientific and commercial information, we conclude that the small number of remaining populations, all of which are small in size, in conjunction with the threats described in Factor A, constitutes a threat to the species.

Proposed Determination

We have carefully assessed the best scientific and commercial available information regarding the past, present, and future threats to Texas golden gladecress and have determined that the species warrants listing as an endangered species throughout its range. Significant factors that support this determination include the following: (1) Loss of five of eight known populations and their associated habitat (Factor A); (2) the ongoing threat of loss or severe degradation of habitat on portions of the three remaining population sites from glauconite quarrying activities, oil and gas development, pipelines, wells, and brush encroachment (Factor A); (3) the threat of loss of emerging seedlings from herbicides used to control brush across the entire range of the species (Factor A); and (4) the impact of extreme or successive years of drought (Factor A). These factors place this species at high risk of extinction. Limited distribution and small population size of these remnant populations (Factor E) significantly heightens the danger of extinction due to threats from Factor A. The threats are ongoing and occur throughout the range of the species. Therefore, we find that a proposed determination as an endangered species, rather than a threatened species, is appropriate.

The Act defines an endangered species as ''any species which is in danger of extinction throughout all or a significant portion of its range.'' A major part of the analysis of ''significant portion of the range'' requires considering whether the threats to the species are geographically concentrated in any way. If the threats are essentially uniform throughout the species' range, then no portion is likely to warrant further consideration. Based on the threats to Texas golden gladecress throughout its entire known range (northern San Augustine County, into the northwest quarter of Sabine County, in a roughly 3-mi (5-km) wide band paralleling SH 21), we find that the species is currently in danger of extinction throughout all of its range, based on the severity and scope of the threats described above. The species is proposed as an endangered species, rather than a threatened species, because the threats are occurring now or will in the near term, and their potential impacts to the species would be severe given the limited known distribution of the species, the small population sizes at all three sites, and the tiny area occupied by these small populations, putting this species at risk of extinction at the present time. Since these threats extend throughout its entire range, it is unnecessary to determine if it is in danger of extinction throughout a significant portion of its range. Therefore, on the basis of the best available scientific and commercial information, we propose listing the Texas golden gladecress as an endangered species throughout its range in accordance with sections 3(6) and 4(a)(1) of the Act.

Neches River Rose-mallow

A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

The principal threats affecting the habitat of the rose-mallow include habitat loss and modification through the encroachment of nonnative and native plant species, hydrological changes, and construction and development projects. These threats may be intensified by the restriction of the species' known range to the Neches River basin and the Mud and Tantabogue Creeks of five counties within East Texas. Other stressors, including silviculture, herbicide use, trampling, natural gas activities, and climate change effects were reviewed for their impacts to the rose-mallow.

Nonnative Plants

Nonnative plant species are a constant threat to native flora throughout the Gulf coast prairies of Texas and Louisiana (McCormick 2005, p. 23). We consider the potential threat from two nonnative species, chinese tallow and coastal bermudagrass, that occur in rose-mallow habitat (Miller 2011, pers. comm.). Chinese tallow was introduced to the United States in the 1700's from China (McCormick 2005, pp. 7, 8). This species reproduces quickly, reaches reproductive maturity in as little as 3 years, and can remain reproductive for at least 60 years (United States Geological Survey (USGS), 2000, p. 2), producing an abundance of seed annually (Potts 1946, p. 375; Conway *et al.* 2000, pp. 268–269). Chinese tallow tolerates a range of habitat conditions including full sunlight and shade, flooding, and drought (USGS 2000, p. 1). The rose-mallow occurs in perennially and intermittently wet habitats. Butterfield *et al.* (2004, p. 338) found that chinese tallow grew faster than native species, such as loblolly pine, water tupelo (*Nyssa aquatic*), blackgum (*N. sylvatica*), and sweetgum in both perennially and intermittently wet habitats. Chinese tallow occurs at all rose-mallow sites (Miller 2011, pers. comm.) at varying densities, limiting the growth and reproduction of the rose-mallow through competition for light, space, and nutrients.

Burning, mechanical, and chemical (herbicide) means can be used to control chinese tallow. However, prescribed fire has produced complex and highly variable results in chinese tallow and may not be an effective management tool (Grace 1998, entire; Grace 2011, pers. comm.). The Davy Crockett NF is establishing a regular burn cycle of 3–4 years for all compartments containing the rose-mallow to control chinese tallow and to mimic the historical fire regimes of the Coastal Plain (Landers *et al.* 1990, p. 136). The Davy Crockett NF Resource and Land Management Plan (specific to the streamside Management Area 4) allows for mechanical means and prescribed fire to maintain the native plant community but prohibits the use of chemical agents (herbicides) unless applied by hand or through nonaqueous form within 100 ft (30.5 m) of the rose-mallow (USDA 1996, p. 154). Current mowing activities along ROWs may abate some growth of chinese tallow, but management actions on these sites should also be evaluated. Chemical methods are not being used to control chinese tallow.

Coastal bermudagrass is an introduced bermudagrass cultivar that has been widely planted in the southern United States for livestock forage. It is adapted to a wide range of soil types and climates and tolerates both drought and periodic inundation (Burton and Hanna 1985, p. 247). In dry climates, this cultivar will thrive along irrigation ditches and streambeds, agricultural fields, and roadside areas (Burton and Hanna 1985, p. 247). Due to its hybrid origin, coastal bermudagrass produces very few viable seeds and is established

by planting sprigs (rhizomes and stolons) (Stichler and Bade 2012, p. 1). Once established, coastal bermudagrass tends to produce dense monocultures where native species cannot persist. However, coastal bermudagrass has only been seen on one extant site of the rose-mallow. This is a secluded portion of the privately owned land of Boggy Slough, where coastal bermudagrass appeared to be planted (Allen 2011a, pers. comm.) and had not spread to any other sites on the property or the adjacent SH 94 ROW population. Since coastal bermudagrass is not present at most rose-mallow populations, and has a low rate of spread, we believe it is not a significant threat. However, coastal bermudagrass could become a threat if introduced into rose-mallow habitats.

In summary, all populations of the rose-mallow are negatively affected by chinese tallow, a nonnative tree species that competes with the rose-mallow for available soil nutrients, space, and light. Coastal bermudagrass is not a current threat to the rose-mallow.

Native Species

Sweetgum and green ash (*Fraxinus pennsylvanica*) are native, deciduous trees of East Texas found at all rose-mallow sites (Miller 2011, pers. comm.). Sweetgum is found on a variety of soils but grows best on moist, alluvial clay and sandy loams of river bottoms (Kormanik 2004, p. 790, in Burns and Honkala 1990). Green ash also tolerates a range of soils and in Texas is abundant in clay or silty loams of floodplains (Johnson 1980, in Gucker 2005, p. 15). Both species also grow in full sun to partially shaded habitats. Therefore, both the sweetgum and green ash are well adapted to the hydric alluvial soils and open canopies that the rose-mallow needs. In the absence of other competing species, sweetgum and green ash can attain large sizes (50–100 ft (15–30 m)) (Dickerson 2002, p. 1) and can reduce the open canopy needed by the rose-mallow (Kirkman 1995, pp. 12, 15). Although naturally occurring wildfires or prescribed fire limit the abundance of these tree species, prescribed fire is not a widely accepted method of ROW maintenance. Four rose-mallow populations that were monitored in 2011 were overgrown with sweetgum and green ash (Miller 2011, pers. comm.; TXNDD 2012a, pp. 1–11, 20–28). Two of these sites were on ROWs, and prescribed burning had not been used at the other two sites. Consequently, about 27 percent of the rose-mallow's populations are impacted by competition and shading from native sweetgum and green ash trees. Therefore, native species that compete with rose-mallow for light and nutrients are a moderate threat to the species, and may become a significant threat if maintenance is not continued at occupied sites.

Hydrological Changes

The rose-mallow can be found in both intermittent and perennial wetlands along oxbows, sloughs, terraces, ponds, and other low-lying areas in habitats with minimal standing water. Wetlands are ecological communities with hydric (flooded or saturated) soils. Many aquatic species, including the rose-mallow, are adapted to highly variable rates of water flow, including seasonal high and low flows and occasional floods and droughts. For example, the rose-mallow may require high precipitation and flowing water or floods to disperse seed (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3).

Channelization, drainage, dredging, ditching, stream diversion, impoundments, ground water withdrawals, and levees have historically caused wetland loss (North Carolina State University Water Quality Group 2012, *http://www.water.ncsu.edu/watershedss/info/wetlands/wetloss.html*). Some degree of hydrological change is seen at all of the rose-mallow sites. At Boggy Slough, shifts of river and creek beds have left meandering scars and remnant oxbows. Several levees have been built that have changed the natural landscape and flow patterns at this site to make ponds available for duck hunting, thereby converting seasonally inundated wetlands to permanently flooded wetlands (Miller 2011, pers. comm.). On TLC land, rose-mallow plants once lined the perimeter of a flatwoods pond. After 2003, a stock pond was built there (TXNDD 2012a, p. 18) in what was likely part of an overflow channel from Tantabogue Creek. The constructed stock pond altered the natural surface hydrology by retaining overflow from Tantabogue Creek, preventing it from draining south to the rose-mallow site. During the 2011 survey conducted by the Service and TPWD, we observed only 539 rose-mallow stems, most of which were in relatively poor condition. The hydrologic alteration of the site combined with drought conditions reduced the height of rose-mallow stems, thus increasing their vulnerability to browsing by cattle. During 2011, drought also led to increased grazing pressure in rose-mallow habitats. Once normal rainfall has resumed and preferred forage sources become available, grazing pressure is expected to diminish.

All four of the Davy Crockett NF sites may also be affected by hydrological changes. A pine-oak forest on adjacent private land regulates the amount, timing, and possibly the rate of water flow westward into compartment 55. Removal or alteration of the pine-oak forest could change the hydrology of compartment 55, thereby also changing the rose-mallow seed dispersal range; however, the likelihood of these tree removal or habitat alteration activities are unknown but likely minimal. All NF sites censused in 2011 were completely dry except for compartment 20, where a small pond to the south drains into the compartment (Miller 2011, pers. comm.). We found no records of hydrologic alterations in compartments 20 and 11. In 2000, when the rose-mallow was introduced into a wetland on compartment 16, a beaver dam was present. When the dam broke in 2002, water infiltrated the site and the original hydrology was altered (TXNDD 2012a, p. 44). Water depth at the site was likely altered, but rose-mallow plants were still observed as recently as 2011. Additional beaver activity, such as selective cutting and damage to certain tree species, was evident only at Boggy Slough. These activities along with dam building by beavers were not evident and are not considered a threat to the rose-mallow. Although beaver dams could impact the site's hydrology and vegetation, beavers are not currently a threat nor are anticipated to become a threat to the rose-mallow.

Some of the rose-mallow populations occur on private lands where modification of a Federal jurisdictional wetland could require a Clean Water Act permit. However, not all actions affecting wetlands require Federal agency review. These privately owned sites may be affected by wetland and hydrological changes through anthropogenic and natural causes and could cause a loss of a few individuals or a population. Therefore, hydrological changes are a threat to the rose-mallow and its habitat.

Development and Construction Projects

In 1978, the Angelina and Neches River Authority (ANRA) proposed the construction of a reservoir known as Lake Columbia (previously known as Eastex), in Cherokee and Smith Counties, Texas (ANRA 2012, *http://www.anra.org/divisions/reservoirs/columbia/history.html*), to supply water for five surrounding counties (U.S. Army Corps of Engineers (USACE), 2010, pp. 2–4, 3–43). The dam for this reservoir would be constructed on Mud Creek and would impound approximately 195,500 acre-feet (ac-ft)

(241 million cubic meters, mcm) of water in a reservoir reaching 14 mi (22.5 km) upstream (USACE 2010, p. 1–1). Up to 85,507 ac-ft (1105 mcm) of water would be diverted from the downstream flow of Mud Creek (USACE 2010, p. 1–1). An extant rose-mallow population is found at the intersection of Hwy 204 and Mud Creek but is not within the permitted project area reviewed in the draft Environmental Impact Statement. A Habitat Evaluation Procedures analysis of the permitted project area did not document any rose-mallow plants (Walker 2011, pers. comm.). We are also unaware of any rose-mallows inside the proposed project area. The Hwy 204 ROW site is a perennial wetland where plants remain inundated year round; therefore, a change in the water levels at this site could make it unsuitable for rose-mallow or could restrict seed dispersal downstream. Drought conditions could also exacerbate these impacts, and the reduced downstream water flows could completely extirpate the Hwy 204 site (USACE 2010, p. 4–154; Heger 2012, pers. comm.).

Only the Hwy 204 rose-mallow population of Mud Creek will be impacted from this project, constituting nine percent of the total extant population. Consequently, we consider development and construction projects to be a minor threat to the rose-mallow.

Upgrades and Construction for ROWs, Roads, Bridges, and Other Structures

Three rose-mallow populations are located on or near SH ROWs in Houston, Trinity, and Cherokee Counties. These ROW populations are vulnerable to impacts from bridge and road expansion and upgrades, including hydrologic changes, soil movement, and altered wetland or riparian vegetation. For example, in 2005, a proposed bridge replacement on SH 230 would have altered approximately 4.91 ac (2 ha) of rose-mallow habitat south of the ROW and 0.07 ac (0.03 ha) north of the ROW (Adams 2005, p. 1). To mitigate for these impacts, TxDOT proposed to acquire an additional 5 ac (2.02 ha) of rose-mallow habitat located north of the TLC property; unfortunately, the proposed mitigation plans fell through (Adams 2011a, pers. comm.). Bridge replacement is continuing along SH 94, but as of 2011 had not progressed into rose-mallow habitats (Adams 2011c, pers. comm.). Although the human population has increased in Houston, Trinity, and Cherokee Counties in East Texas (U.S. Census Bureau 2012)), no large road expansion projects are anticipated for the two additional ROW sites (Adams 2011c, pers. comm.). Although road projects are mainly restricted to ROW easements, they may potentially impact three populations representing 27 percent of the total known population. Therefore, SH ROW maintenance and bridge and other structural projects will continue to be a threat to the species.

Silviculture

Pine plantations in East Texas are established mainly on uplands that are managed to mimic old fields or grassy savannas (Fox *et al.* 2007, p. 340). Site preparation may include anchor chaining, chopping, burning, root raking, shearing, and disking (Balmer and Little 1978, p. 60). One rose-mallow population on private property south of Hwy 230 was extirpated when the site was converted to a pine plantation sometime after 2003 (Poole 2011b, pers. comm.; TXNDD 2012a, pp. 61–67). Three additional sites in or near rose-mallow populations have evidence of clearing, including: adjacent land south of the Davy Crockett NF compartment 55; an extirpated site located south of the extant Lovelady site, Houston County; and the privately owned site at Champion, Trinity County. Rose-mallow populations may also be potentially impacted by herbicides applied to pine plantations that drift into the rose-mallow habitat (see discussion below). Herbicide treatments are increasingly popular because they remove unwanted plant growth without causing soil erosion from the site; however, herbicide use increases incidents of water pollution and aerial drift to nontarget sites (Balmer and Little 1978, p. 63). Herbicide damage was evident along the Hwy 230 ROW, south of the extant rose-mallow site on TLC property, but whether this damage was the result of herbicide use by the landowner at the pine plantation is unknown. The perennial or intermittent wetlands that the rose-mallow inhabits are usually not suitable habitats for pine plantations. Therefore, we conclude that silviculture currently is not a threat to the rose-mallow.

Herbicide Use

Several incidents have been documented of herbicide impacts to rose-mallow plants on ROWs and on privately owned lands. A subpopulation with approximately 50 plants, on private property in Trinity County south of Hwy 230, was extirpated by herbicide use (USFWS 2010a, p. 7). Herbicide drift along the SH 230 ROW (Gordon 2009, pp. 3–4) caused the rose-mallow population to decline from 14 plants in 1999 (Poole 2001, p. 2) to zero plants in 2002 (Miller 2011, pers. comm.). The Land and Resource Management Plan of Davy Crockett NF restricts the use of nonaquatic herbicides unless hand-applied (USDA 1996, p. 153); there have been no documented herbicide impacts to rose-mallow in any of its four compartments. The TxDOT uses herbicides to remove woody vegetation from ROWs (Miller 2005, pers. comm., in USFWS 2006, p. 7; Adams 2011c, pers. comm.), but mechanical clearing methods have largely replaced the use of herbicides in these ROW areas. Although herbicides can be an effective management tool for the control of some nonnative species, dispersal downstream and unexpected rainfall could impact individual plants or whole populations, depending on the nature of the herbicide. Therefore, we conclude that herbicides are a threat that could impact 7 of 11 (64 percent) total rose-mallow populations.

Trampling by Feral Hog and Cattle

Feral hogs (*Sus scrofa*) were first introduced to the mainland of North America (Wood and Barrett 1979, pp. 237, 238) in Texas in 1542, although large-scale introductions did not occur until the 1930's (Isle and Hellgren 1995, p. 793). Feral hogs are omnivores that dig up the soil in search of roots, tubers, and invertebrates. Feral hogs use their snouts to turn over soil, creating mounds and depressions (Arrington *et al.* 1999, p. 535). Hogs transition from foraging in oak stands during winter months, moving in summer to swamp and marsh edges to feed on grasses, sedges, tubers, and roots (Wood and Roark 1980, pp. 507–509). Feral hogs are able to travel long distances to feed, and often uproot vast areas of habitat. Feral hogs reach sexual maturity at 6–8 months (Wood and Barrett 1979, p. 242) and have large litter sizes. Hogs can inadvertently incur severe damage to other food resources and habitat during their regular foraging activity. Feral hog damage has historically been recorded at Mill Creek Gardens, but uprooting of rose-mallow taproots was not observed (Creech 2011a, pers. comm.; Miller 2011, pers. comm.). Feral hog tracks were observed on all four NF sites; however, plants were not damaged by herbivory or trampling (Miller 2011, pers. comm.). Feral hogs generally do not affect rose-mallow populations because the habitat is permanently or temporarily flooded, limiting their access. However, drought may enhance accessibility to rose-mallow sites, thus increasing their susceptibility to trampling. Growth of the feral hog populations could also lead to increased soil disturbance and impacts to the native vegetative community, which

could create prime conditions for nonnative species to invade. Feral hog tracks have been limited to a few rose-mallow sites with minimal damage to habitat. However, no direct impacts to rose-mallow plants have been observed. Therefore, we determine that feral hogs are not a stressor to the species.

It is estimated that livestock grazing has damaged 80 percent of stream and riparian ecosystems in the southern United States (Belsky *et al.* 1999, p. 419). The damage includes increased sedimentation, decreased water quality, and trampling and overgrazed stream banks where succulent (high water content) forage exists (Armour *et al.* 1994, p. 10; Fleischner 1994, p. 631; Belsky *et al.* 1999, p. 419). Trampling causes soil compaction and damage to both above- and below-ground vegetative plant structures and increases soil erosion (Warren *et al.* 1986, p. 491). Livestock owned by a neighboring landowner were present on TLC's property at Lovelady. TLC has attempted to exclude these livestock, and has proposed constructing an exclusion fence around the current location of the rose-mallow population; however, funding has not been secured (Dietz 2011, pers. comm.). The rose-mallow at Lovelady is concentrated along a low area leading into a stock pond (Miller 2011, pers. comm.). We have not observed damage to rose-mallow from cattle trampling at Lovelady (Miller 2011, pers. comm.), and are not aware of other rose-mallow sites being trampled by livestock. In summary, cattle are present at only one rose-mallow site (9 percent of the total known population), and the effects are small and may be remedied through exclusion devices. Therefore, we conclude that livestock grazing is not a threat to the rose-mallow.

Natural Gas Pipelines and Well Activity

The Haynesville/Bossier and Eagle Ford Shale formations in East Texas are currently being developed for oil and natural gas production. In Harrison County, Texas, there is a single record of rose-mallow at a privately owned site that has not been seen since 1980 (Birnbaum 2011, pers. comm.; TXNDD 2012a, pp. 12–13); we do not know if the site has been affected by ongoing natural gas exploration in that county. The RRC regulates the oil and natural gas industry in the state of Texas and maintains a database with proposed activities. Several of the counties with known populations of rose-mallow, including Houston, Trinity, Nacogdoches, and Cherokee Counties, may be subject to increased oil and natural gas exploration in the future (RRC 2012). However, oil and gas exploration was not observed on or directly adjacent to any of the rose-mallow populations that the Service observed in 2011, and currently there are no proposals near extant rose-mallow populations. Therefore, we determine that oil and natural gas exploration activities are not currently a threat to the rose-mallow.

Climate Change

We discuss the topic of climate change in greater detail in the Factor A Threats Analysis for the Texas golden gladecress, which is also found in East Texas. In summary, the consensus of climate models predicts that the climate in East Texas will become warmer and will experience both more frequent droughts and more extreme precipitation events. Diggs *et al.* (2006, p. 80) states that climate extremes, particularly drought and low temperatures, have greater influence than average conditions do on excluding nonadapted species. Extreme precipitation events (such as tropical storms) may adversely affect the rose-mallow by altering flow regimes and by temporarily increasing the depth of its aquatic habitat to a level it cannot survive. A warmer climate with more precipitation extremes may also increase competition from native and nonnative invasive plant species (USFWS 2010a, p. 8). The timing of precipitation is also crucial for the rose-mallow, since seed dispersal is dependent on flowing water.

In October 2011, all rose-mallow populations and habitats showed evidence of damage from the previous 3 years of drought, including changes in leaf morphology, increased herbivory by livestock, dead plants at specific sites, and lower water levels in perennial wetlands. The survival of rose-mallow populations during previous drought cycles may have been aided by its greater abundance and by greater habitat contiguity; habitat fragmentation and isolation impede the recolonization of sites, following a catastrophic loss, from neighboring seed sources. Plant populations may also recover from the soil seed bank (viable seeds that remain dormant in the soil until conditions become favorable). We do not have information on the abundance or distribution of the rose-mallow seed bank or how long its seeds may remain in a dormant yet viable condition.

Nevertheless, climate change models have less precision at the fine geographic scale of the rose-mallow's range, and we lack specific information on the species' ability to withstand extreme conditions. We conclude that the effects of climate change may be a threat to the rose-mallow in the future, but are not currently a threat to its survival. However, drought conditions, which may worsen with changing climates in the region, may have significant effects on the rose-mallow populations, especially in combination with other threats discussed in this section.

Other Conservation Efforts

Three populations of the rose-mallow exist along SH ROWs in Houston, Trinity, and Cherokee Counties. TxDOT and TPWD currently operate under a revised 1988 Memorandum of Understanding (MOU) that governs management actions targeting conservation of listed species and key habitats on SH ROWs that may potentially affect natural resources within facilities owned or managed by TPWD. Since the rose-mallow is not a listed species, the MOU relates to protection of rose-mallow habitat if the proposed projects include the following: Contains 1.0 ac (0.54 ha) of new ROW within floodplains or creek drainages; requires channel modifications to streams, rivers, or water bodies; and requires realignment of channels with mature woody vegetation; or projects that may impact mature woody or native vegetation (Texas Administrative Code 1999, p. 4). Although a formal mechanism via the MOU has been established to review projects and alleviate or eliminate threats to Federal and State-listed species and key resources, there have not been any projects that fit these standards that have been recently reviewed under the MOU.

The five remaining populations, including a portion of the Hwy 94 site, are located on private lands. Historically, two Candidate Conservation Agreements (CCAs) were formed between the Service and Champion International (Champion) in 1998 and with Temple-Inland Forest Products (Temple-Inland) in 2002 to conserve the rose-mallow on both sites. CCA's are not legally binding and private landowners are not restricted by guidelines outlined in the CCA. Champion's 5-year CCA, included 40 ac (16.2 ha) of wetland and was located east of White Rock Creek in Trinity County (Champion site in Table 4). Management guidelines included: Maintain 100-ft (30-m) buffer around occupied and dispersal habitat, free from timber harvesting, site preparation, and reforestation activities; minimize hydrological alterations; inhibit filling or pilling debris or material on populations; and apply herbicides only

by hand and at times of little or no wind (USFWS 1998, p. 4). The Champion property was sold to Temple-Inland in 2001 and in 2004, the CCA expired (USFWS 2010a, p. 9). The Temple-Inland CCA covered an area that has a 20-ac (8.1-ha) wetland with rose-mallow (Boggy slough site in Table 4); the plants declined due to drought and alteration of an onsite wetland. A smaller wetland with rose-mallow plants was drained in order to regulate water levels of the larger wetland, which was to be used by Temple-Inland for recreational hunting (USFWS 2002, p. 3; USFWS 2010a, p. 9). The Temple-Inland CCA was valid 2002–2004. Contact was made with the owners and the Service and TPWD visited the site in October 2011 where plants appeared healthy, but nonnative and native species encroachment into rose-mallow habitat was observed (Miller 2011, pers. comm.).

Lovelady was once owned by the Natural Area Preservation Association and is now owned by TLC. Thirty acres (12 ha) of land were purchased in 2004, located north of Hwy 230 (TLC 2011, *http://www.texaslandconservancy.org*). Purchase of this easement on private land was specifically for the conservation of the rose-mallow; however plants occur on private land, and they are not offered protection under the Act unless a Federal action or funding is planned. However, TLC has initiated a voluntary effort to construct a cattle-exclusion fence but funds were taken prior to completion of the fence and the project was not completed (Dietz 2011, pers. comm.). The introduced site at Mill Creek Gardens was created in 1995 as a conservation easement by a private donor (SFASU 1999, p.1) and was used as an experimental plot to test fertilizer and mulching effects on the rose-mallow (Scott 1997, pp. 6–7). This site is informally managed through mowing and burning regimes prescribed by SFASU staff, but encroachment from native woody species has been observed in the past (Creech 2011c, pers. comm.). Due to a lack of accessibility, the two remaining private properties, the Harrison County site and Camp Olympia have not been observed since 1980 and 1992, respectively (Warnock 1995, pp. 6, 8; TXNDD 2012a, pp. 58–60).

Summary of Factor A

Based on our evaluation of the best available information, we conclude that the present loss and modification of the rose-mallow's habitat is a significant threat to the species' continued survival. Threats include competition for light and nutrients by invasive plant species, particularly chinese tallow, altered hydrology, and herbicide drift; these threats may be exacerbated by future road and bridge construction and maintenance work. We determine that livestock grazing and feral hogs are not significant threats to the species. Although silvicultural practices have caused some prior impacts to the species, we do not anticipate that silviculture will continue to be a significant threat. The exploration and development of oil and natural gas wells, and predicted effects of climate change, are not currently threats to the species, but do represent potential future stressors. Additional conservation measures that had protected habitat and certain actions on privately owned land have expired and no longer provide protection to habitat of the rose-mallow. Therefore, we conclude that the rose-mallow faces significant threats due to habitat loss, destruction, modification, or curtailment of the species' habitat or range.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The showy flowers produced by the genus *Hibiscus* make it of high horticultural interest (USFWS 2010a, p. 8) to *Hibiscus* enthusiasts (Warnock 1995, p. 25; Poole *et al.* 2007, p. 265). Hybridization within genus *Hibiscus* is repeatedly done in the nursery trade (Creech 2011a, pers. comm.) to produce different colored flowers and modify other traits that may be of commercial interest. Ornamental landscaping companies sell rose-mallow plants online (Creech 2011a, pers. comm.). Rose-mallow plants are easy to cultivate from cuttings, and having plants available for sale in the nursery trade reduces collecting pressures of the species from the wild (Creech 2011a, pers. comm.). Plantings of rose-mallow into garden settings are standard and placement within close proximity to wild populations has not been recorded or observed.

Mercer Arboretum collected seed in 1993, 1994, 1996, 1997, and 2003; these seeds, as well as living plants, are being maintained at the Mercer Arboretum (Tiller 2011, pers. comm.). A portion of the seeds collected were grown out in the Arboretum's Rare and Endangered Gardens, where they have remained; seeds and plants have not been transplanted back into the wild populations (Tiller 2011, pers. comm.). Rose-mallow seed was also sent to the National Seed Storage Laboratory in Fort Collins, Colorado, for long-term storage for conservation purposes (Ellis 2011, pers. comm.).

The scientific and horticultural communities have collected rose-mallow seeds and plants from wild populations; however, we have no evidence that suggests that collection has depleted the seed bank or has adversely affected populations. Plants are easily cultivated and the species is well established as a nursery trade plant, thereby reducing potential collection pressure. Based on the best available information, we conclude that collection for recreational, scientific, or educational purposes is not a threat to the rose-mallow and is not likely to increase in the future.

C. Disease or Predation

Leaves and stems of plants in the *Hibiscus* family (Kroll 1991, p. 392; Everitt *et al.* 1999, pp. 177–193) are often consumed by white-tailed deer (*Odocoileus virginianus*) (Moreland 2005, p. 48). Cattle also consume the stems but to a lesser degree than white-tailed deer (Everitt *et al.* 1999, pp. 187–193). In 1993, evidence of herbivory was present at four rose-mallow subpopulations at Lovelady (Warnock 1995, p. 18) and in 2010, at compartment 20 (Allen and Duty 2010, p. 3). In 2011 at 5 of the 11 populations, above-ground portions of the rose-mallow, mainly the tips, were grazed by white-tail deer, with the most intense herbivory occurring at the Lovelady site. Plants consumed by deer could decrease the reproductive success of the rose-mallow (Adler *et al.* 2001, p. 1). Only at the compartment 20 on the Davy Crockett NF was the evidence of browsing on the flowers observed (Allen and Duty 2010, p. 3); however, the species is able to produce secondary growth (Strauss and Agrawal 1999, p. 179). Drought could exacerbate the consumption of leaves and stems if preferred plants were not available, but we conclude that ungulate (hoofed animal) herbivory is an insignificant stressor to the rose-mallow.

Insect damage and predation has been observed on rose-mallow plants in several populations; however, regrowth of foliage after herbivory incidents may indicate that the rose-mallow is adapted to herbivory (Strauss and Agrawal 1999, p. 179). Ninety percent of the first foliage of rose-mallow leaves at Lovelady had been consumed by insects (USFWS 2010a, p. 8) with insect predation also seen on compartment 11 plants in 2006 (Philipps 2009, p. 1). The scentless plant bug was observed on plants in compartment 55 (Miller 2011, pers. comm.). This bug is known to deposit egg masses on stems, leaves,

flower parts, buds, and seed pods of *Hibiscus* species (Wheeler 1977, p. 632), but to also consume *Hibiscus* seeds (Toth 2007, p. 6). Holes were observed on several rose-mallow plants on all NF sites (Miller 2011, pers. comm.) and were likely caused by this plant bug; however, these bugs are not considered a significant pest because the damage to the plants is minor (Toth 2007, p. 6). Larval forms of the Hibiscus sawfly (*Atomacera decepta*) can consume rose-mallow seed pods in herbaria, but have not been noted to affect wild populations (Wieland 1995, p. 1; Creech 2011a, pers. comm.).

Changes in precipitation are not well understood in relationship to insect herbivory (Bale *et al.* 2002, p. 2). Drought conditions may exacerbate consumption of the vegetative and floral parts if other food resources within the plant community become scarce. Temperature shifts related to climate change may trigger corresponding insect population shifts. Impacts from insect population shifts cannot be predicted; however, if conditions favor the growth of insect populations, the effects of insect herbivory on the rose-mallow could increase.

Summary of Factor C

Mammalian herbivory has affected the majority of sites; however, grazing pressures are largely attributed to the lack of other available food resources during periods of drought. Rose-mallow recovers quickly from herbivory incidents and can produce secondary growth, minimizing the overall negative effects of mammalian herbivory. This type of herbivory is not considered to be a threat to the species. Insect herbivory was also observed on several of the sites and was not range-wide but, with anticipated climate change shifts in temperature and the likelihood that insect populations will increase, we conclude that insect predation is a minor stressor that will likely continue into the future.

D. The Inadequacy of Existing Regulatory Mechanisms

Under this factor, we examine whether existing regulatory mechanisms are inadequate to address the threats to the species discussed under the other factors. Section 4(b)(1)(A) of the Act requires the Service to take into account ''those efforts, if any, being made by any State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species * * *'' In relation to Factor D under the Act, we interpret this language to require the Service to consider relevant Federal, State, and tribal laws, regulations, and other such mechanisms that may minimize any of the threats we describe in threat analyses under the other four factors, or otherwise enhance conservation of the species. We give strongest weight to statutes and their implementing regulations and to management direction that stems from those laws and regulations. An example would be State governmental actions enforced under a State statute or constitution, or Federal action under statute.

Having evaluated the significance of the threat as mitigated by any such conservation efforts, we analyze under Factor D the extent to which existing regulatory mechanisms are inadequate to address the specific threats to the species. Regulatory mechanisms, if they exist, may reduce or eliminate the impacts from one or more identified threats. In this section, we review existing State and Federal regulatory mechanisms to determine whether they effectively reduce or remove threats to the rose-mallow.

Davy Crockett NF lands are federally owned and managed by the USDA Forest Service for the general public. Four populations of the rose-mallow occur on the Davy Crockett NF. The NF classifies the rose-mallow as a Regional Forester's Sensitive Species (Philipps 2012, pers. comm.) and habitat is within Management Area Zone 4, according to the Revised Land and Resource Management Plan (1996). This management zone includes the bed, bank, and water resources of the rivers, perennial and intermittent streams and wetlands, and their adjacent areas (USDA 1996, p. 145). This area is managed to maintain the role and function of aquatic, riparian, and wetland ecosystems while providing opportunities for compatible multiple uses and will be managed to meet recommendations stated in the Texas Wetland Plan (TPWD 1988) and Best Management Practices established by the State (USDA 1996, p. 151). Relative Management Area Zone 4 standards and guidelines include: Maintenance or restoration of native plant communities; prohibition of nonaquatic herbicide uses except hand applications or noxious weed control following restriction on the herbicide label; and use of prescribed fire when necessary to enhance riparian vegetation or wildlife habitat (USDA 1996, pp. 153, 155). Herbicides are not currently being used on the Davy Crockett NF and have been replaced by prescribed fire, with the goal of routinely burning compartments every 3 years (Stiles 2011, pers. comm.). As discussed previously (see *Factor A;* Nonnative Species), routine fires may play a role in reducing chinese tallow. Actions that may affect rose-mallow habitat need to be assessed using these standards and guidelines because these are considered regulations that need to be followed (Phillips 2012, pers. comm.). The encroachment of nonnative and native vegetation in rose-mallow habitat is not addressed in the Revised Land and Resource Management Plan; however, the application of prescribed fire in some areas may benefit the rose-mallow.

The rose-mallow is considered by the Forest Service to be a sensitive species on the Davy Crockett NF. A sensitive species is defined as one not yet warranting listing as an endangered or threatened species, but which is sufficiently rare that its future survival is of concern (Forest Service Manual (FSM) 2670). The management of sensitive species is described in FSM 2670, and the management objectives are to develop and implement management practices to ensure that species do not become an endangered or threatened species because of Forest Service actions; maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands; and develop and implement management objectives for populations or habitat of sensitive species or both. In addition, the Forest Service has to consider the effects of their actions on the viability of sensitive species through the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et. seq.*) process. As defined by Forest Service policy, actions must not result in loss of species viability or create significant trends toward the need for Federal listing. This designation does not provide specific habitat or species protection, but does provide some benefits to the species because of increased awareness and evaluating projects that may affect the species through the NEPA process. Significant threats to the rose-mallow are not addressed with this designation.

Existing regulatory mechanisms do not provide protection for plants on private lands. Rose-mallow populations on NF lands receive some protection from habitat modification, and the application of the Forest Service standards and guidelines are not mandatory. In addition, not all threats are addressed, such as encroachment of nonnative and native species into rose-mallow habitat. The designation of sensitive species for the rose-mallow does not address the threats to the species. Therefore, based on our review of available information, we conclude

that existing regulatory mechanisms provide some protection against threats, but not all of the threats are addressed. Therefore, the existing regulatory mechanisms are inadequate.

E. Other Natural or Manmade Factors Affecting Its Continued Existence

Small Population Size

Small population size can result in a decrease in genetic diversity due to genetic drift (the random change in genetic variation each generation) and inbreeding (mating of related individuals) (Antonovics 1976, p. 238; Ellstram and Elam 1993, pp. 218–219). Genetic drift can decrease genetic variation within a population by favoring certain characteristics and, thereby, increasing differences between populations (Ellstram and Elam 1993, pp. 218–219). Self-fertilization and low dispersal rates can cause low genetic diversity due to inbreeding (Antonovics 1976, p. 238; Barrett and Kohn 1991, p. 21). This decreased genetic diversity diminishes a species' ability to adapt to the selective pressures of a changing environment (Ellstrand 1992, p. 77; Newman and Pilson 1997, p. 360).

No genetic studies have been conducted on the rose-mallow. There is no evidence that rose-mallow populations are experiencing genetic drift or inbreeding. We conclude that small population size is not a threat to the rose-mallow.

Hybridization

The genus *Hibiscus* easily hybridizes in the nursery trade (Creech 2011a, pers. comm.). Hybridization under natural conditions has not been verified, but several rose-mallow sites contain individuals that may be products of crosses between the rose-mallow with *H. laevis* or *H. moscheutos.* In some locations, *H. laevis* or *H. moscheutos,* or both, grow in close proximity to the rose-mallow. These plants have leaves, flowers, and floral parts resembling both parent species (USFWS 2010a, p. 3; TXNDD 2012a, entire). So far, these are only observations and no genetic studies have taken place to verify if hybridization is occurring. We do not consider hybridization to be a threat to the rose-mallow.

Proposed Determination

We have carefully assessed the best scientific and commercial available information regarding the past, present, and future threats to the rose-mallow and have determined that the species warrants listing as a threatened species throughout its range. Significant factors that support this determination include the following:

- The significant and ongoing threat from nonnative species at all sites (Factor A);
- The potential extirpation of an occupied rose-mallow site from a reservoir project (Factor A);
- Ongoing and potential changes to key hydrological features of the species' habitat (Factor A);
- The potential threat from future construction and ROW projects (Factor A);
- Ongoing threats from aerial herbicide drift incidents (Factor A); and
- Sustained drought that affects habitat quality and reproductive output of the species (Factor A).

Existing threats may be exacerbated by the effects of ongoing and future climate change, especially projected increases in temperature and decreases in precipitation that may increase the frequency and severity of droughts. The species receives some level of protection from habitat modification on NF lands through the standards and guidelines for Management Area Zone 4, which encompasses rose-mallow sites. However, these guidelines do not address all the significant threats to the species. Four of the 11 existing rose-mallow populations, including the largest and most robust population, occur on NF lands. Therefore, existing regulatory mechanisms are inadequate.

Some threats (such as herbicide spraying and nonnative species encroachment) are significant and occur throughout the range of the species, but the threats do not affect all rose-mallow populations. For instance, drift from herbicide spraying likely resulted in the extirpation of the rose-mallow in the SH 230 ROW, and the other two populations within SH ROWs may be affected by herbicide spraying in the future; however, rose-mallow populations on NF lands are not threatened by this activity. All populations are threatened by the invasion of nonnatives, resulting in competition for light and nutrients, but maintenance activities occur within different populations to minimize this threat. To our knowledge, this species has not experienced a reduction in its range, all of the known populations and sites are still present on the landscape, and the natural populations have maintained viable population numbers. In addition, there are four introduced populations that remain viable, although the introduced populations on NF lands have declined in recent years. Some threats are likely to occur in the foreseeable future, but are not ongoing. The potential effects from the construction of the Lake Columbia reservoir have not taken place, and there is uncertainty if the downstream population of rose-mallow would be affected by changes in hydrology. Therefore, we conclude that the species does not meet the definition of an endangered species (in danger of extinction throughout all or a significant portion of its range), but meets the definition of a threatened species (likely to become an endangered species in the foreseeable future throughout all or a significant portion of its range).

The Act defines threatened as ''any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' A major part of the analysis of ''significant portion of the range'' requires considering whether the threats to the rose-mallow are geographically concentrated in any way. If the threats are consistently uniform throughout the species' range, then no portion is likely to warrant further consideration.

Since threats extend throughout its entire range and are not geographically concentrated, it is unnecessary to determine whether the rose-mallow should be considered an endangered species within a significant portion of its range. Therefore, on the basis of the best available scientific and commercial information, we propose listing the Neches River rose-mallow as a threatened species throughout its range in accordance with sections 3(6) and 4(a)(1) of the Act.

Available Conservation Measures

Conservation measures provided to species listed as an endangered or threatened species under the Act include recognition, 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 requires that recovery actions be carried out for all listed species. The protection required by Federal agencies 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. Subsection 4(f) of the Act requires the Service to develop

and implement recovery plans for the conservation of endangered and threatened species. The recovery planning process involves the identification of actions that are necessary to halt or reverse the species' decline by addressing the threats to its survival and recovery. 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.

Recovery planning includes the development of a recovery outline shortly after a species is listed, preparation of a draft and final recovery plan, and revisions to the plan as significant new information becomes available. The recovery outline guides the immediate implementation of urgent recovery actions and describes the process to be used to develop a recovery plan. The recovery plan identifies site-specific management actions that will achieve recovery of the species, measurable criteria that determine when a species may be downlisted or delisted, 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. Recovery teams (comprising species experts, Federal and State agencies, nongovernmental organizations, and stakeholders) are often established to develop recovery plans. When completed, the recovery outline, draft recovery plan, and the final recovery plan will be available on our Web site (*http://www.fws.gov/endangered*), or from our Corpus Christi Ecological Service Fish and Wildlife Office (see **FOR FURTHER INFORMATION CONTACT,** above).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, Tribal, 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 range 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.

If 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 would be eligible for Federal funds to implement management actions that promote the protection and recovery of the gladecress and the rose-mallow. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Although the gladecress and rose-mallow are only proposed for listing under the Act at this time, please let us know if you are interested in participating in recovery efforts for this species. Additionally, we invite you to submit any new information on this species whenever it becomes available and any information you may have for recovery planning purposes (see **FOR FURTHER INFORMATION CONTACT**, above).

Section 7(a) of the Act requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any action that is likely to jeopardize the continued existence of a species proposed for listing or result in destruction or adverse modification of proposed critical habitat. If a species is listed subsequently, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into formal consultation with the Service.

For the gladecress, Federal agency actions that may require consultation would include federally funded or permitted actions occurring within the species' habitat, specifically within the zone of Weches outcrops in Sabine and San Augustine Counties. Anticipated actions include provision of Federal financial and technical assistance through the United States Department of Agriculture; permits issued by the Federal Energy Regulatory Commission for installation of interstate pipelines and associated infrastructure; provision of Federal Highway Administration funds for road projects; provision of Department of Housing and Urban Development funds for municipal and residential construction and infrastructure projects in small towns along SH 21 within the range of gladecress; U.S. Army Corps of Engineers (USACE)-issued section 404 and section 10 permits for wetland crossings that are part of linear projects such as roads, transmission lines, or pipelines; and Federal Emergency Management Agency-funded actions. Also subject to consultation would be provision of Federal funds to State and private entities through Federal programs such as the Service's Partners for Fish and Wildlife Program, State Wildlife Grant Program, and Federal Aid in Wildlife Restoration Program.

For the rose-mallow, Federal agency actions that may require consultation would include federally funded or permitted actions occurring within the species habitat. These actions could include: (1) New construction and maintenance of roads or highways by the Federal Highway Administration; (2) issuance of section 404 Clean Water Act and section 10 permits by the USACE for Federally funded activities within Federal jurisdictional wetlands; (3) management and any other landscape altering activities on Federal lands administered by the Fish and Wildlife Service and USDA Forest Service; and (4) Federal Highway Administration funds given to TxDOT for SH ROW maintenance.

The Act and its implementing regulations set forth a series of general prohibitions and exceptions that apply to endangered and threatened plants. The prohibitions of section 9(a)(2) of the Act, codified at 50 CFR 17.61, apply to endangered plants. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export, transport in interstate or foreign commerce in the course of a commercial activity, sell or offer for sale in interstate or foreign commerce, or remove and reduce the species to possession from areas under Federal jurisdiction. In addition, for plants listed as endangered, the Act prohibits the malicious damage or destruction on areas under Federal jurisdiction and the removal, cutting, digging up, or damaging or destroying of such plants in knowing violation of any State law or regulation, including State criminal trespass law. It is also unlawful to violate any regulation pertaining to plant species listed as threatened or endangered (section 9(a)(2)(E) of the Act). Certain exceptions apply to agents of the Service and State conservation agencies. Chapter 88 of the Texas Parks and Wildlife Code lists plant species as State threatened or endangered, with the same status as the Federal designation, immediately upon completion of final Federal listing. The State prohibits taking and or possession for commercial

sale of all or any part of an endangered, threatened, or protected plant from public land (defined as State-owned and land belonging to local governments). The TPWD requires commercial permits for the commercial use of listed plants collected from private land. Scientific permits are required for collection of endangered plants or plant parts from public lands for scientific or education purposes.

We may issue permits to carry out otherwise prohibited activities involving endangered and threatened wildlife species under certain circumstances. Regulations governing permits are codified at 50 CFR 17.62 for endangered plants, and at 17.72 for threatened plants. With regard to endangered plants, a permit must be issued for the following purposes: For scientific purposes or to enhance the propagation or survival of the species.

It is our policy, as published in the **Federal Register** on July 1, 1994 (59 FR 34272), to identify to the maximum extent practicable at the time a species is listed, those activities that would or would not constitute a violation of section 9 of the Act. The intent of this policy is to increase public awareness of the effect of a proposed listing on proposed and ongoing activities within the range of species proposed for listing. The following activities could potentially result in a violation of section 9 of the Act; this list is not comprehensive:

(1) Unauthorized collecting, handling, possessing, selling, delivering, carrying, or transporting of the gladecress or the rose-mallow, including import or export across State lines and international boundaries, except for properly documented antique specimens of these taxa at least 100 years old, as defined by section 10(h)(1) of the Act.

(2) Unauthorized removal, damage, or destruction of gladecress or rose-mallow plants from populations located on State-owned land (highway ROW's) or on land owned by local governments.

(3) Unauthorized removal, damage, or destruction of gladecress or rose-mallow plants on private land in violation of any State regulation, including criminal trespass.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Corpus Christi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed animals and general inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Endangered Species Permits, 6300 Ocean Drive, Unit 5837, Corpus Christi, Texas 78412–5837 (telephone 361–994–9005; facsimile 361–994–8262).

If the gladecress and the rose-mallow are listed under the Act, the State of Texas's Endangered Species Act (Texas Administrative Code Chapter 88:88.001–88.012) is automatically invoked, which would also prohibit take of these species and encourage conservation by State government agencies. Further, the State may enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered species. Funds for these activities could be made available under section 6 of the Act (Cooperation with the States). Thus, the Federal protection afforded to these species by listing them as endangered species will be reinforced and supplemented by protection under State law.

Critical Habitat

Background

It is our intent to discuss below only those topics directly relevant to the designation of critical habitat for Texas golden gladecress and Neches River rose-mallow in this section of the proposed rule.

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.

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 Federal agencies 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 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 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. Where a landowner requests Federal agency funding or authorization for an action that may affect a listed species or critical habitat, the consultation requirements of section 7(a)(2) of the Act would apply, but even in the event of a destruction or adverse modification finding, the obligation of the Federal action agency and the landowner is not to restore or recover the species, but to 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 geographic 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) 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 and commercial data available, those physical or biological features that are essential to the conservation of the species (such as space, food, cover, and protected habitat). In identifying those physical and biological features within an area, we focus on the principal biological or physical constituent elements (primary constituent elements such as roost sites, nesting grounds, seasonal wetlands, water quality, tide, soil type) that are essential to the conservation of the species. Primary constituent elements are the elements of physical or biological features that, when laid out in the appropriate quantity and spatial arrangement to provide for a species' life-history processes, are essential to the conservation of the species.

Under the second prong of the Act's definition of critical habitat, we can

designate critical habitat in areas outside the geographic 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. For example, an area currently occupied by the species but that was not occupied at the time of listing may be essential to the conservation of the species and may be included in the critical habitat designation. We designate critical habitat in areas outside the geographic area occupied by a species only when a designation limited to its range would be inadequate to ensure 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 developed during the listing process for the species. Additional information sources may include 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 of section 9 of the Act if actions occurring in these areas may affect the 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.

Prudency Determination

Section 4 of the Act, as amended, and implementing regulations (50 CFR 424.12), require that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time the species is determined to be an endangered or threatened species. Our regulations at 50 CFR 424.12(a)(1) state that the designation of critical habitat is not prudent when one or both of the following situations exist: (1) The species is threatened by taking or other activity and the identification of critical habitat can be expected to increase the degree of threat to the species; or (2) the designation of critical habitat would not be beneficial to the species.

There is no evidence that the Texas golden gladecress or Neches River rose-mallow are threatened by collection and no evidence to support the conclusion that there would be increases in threats to both species if critical habitat were designated. These species are not targets of collection and the areas proposed for critical habitat designation either have restricted public access or are already readily open to the public. Several of the identified threats to both species are associated with human access to the sites; however, we do not anticipate the designation of critical habitat to increase the level of these threats. Threats to gladecress associated with human access are the loss and degradation of gladecress habitat due to quarry excavations, natural gas-related construction, land conversion to pine plantations, and exposure to agricultural herbicides. These activities take place primarily on private lands, and the designation of critical habitat will not likely influence whether these activities continue. For the rose-mallow, 10 of the 12 sites are accessible with landowner permission having been granted to the quarry companies. Road and SH ROW maintenance and construction projects, exposure of plants to herbicide, nonnative species and native woody vegetation encroachment, and the alteration of the sites' hydrology have been ongoing throughout the range of the species. These threats, or any other identified threat, are not expected to increase as a result of critical habitat designation.

In the absence of finding that the designation of critical habitat would increase threats to a species, if there are any benefits to a critical habitat designation, then a prudent finding is warranted. The potential benefits of critical habitat to the Texas golden gladecress and Neches River rose-mallow include: (1) Triggering consultation under section 7 of the Act, in new areas for actions in which there may be a Federal nexus where it would not otherwise occur, because, for example, Federal agencies were not aware of the potential impacts of an action on the species; (2) focusing conservation activities on the species and its habitat; (3) providing educational benefits to State or county governments or private entities; and (4) preventing people from causing inadvertent harm to the species. Therefore, because we have determined that the designation of critical habitat will not likely increase the degree of threat to Texas golden gladecress and Neches River rose-mallow and may provide some measure of benefit, we find that designation of critical habitat is prudent for the Texas golden gladecress and Neches River rose-mallow.

Critical Habitat Determinability

As alluded to above, section 4(a)(3) of the Act requires the designation of critical habitat concurrently with the species' listing ''to the maximum extent prudent and determinable.'' Our regulations at 50 CFR 424.12(a)(2) state that critical habitat is not determinable when one or both of the following situations exist:

(i) Information sufficient to perform required analyses of the impacts of the designation is lacking, or

(ii) The biological needs of the species are not sufficiently well known to permit identification of an area as critical habitat.

When critical habitat is not determinable, the Act provides for an additional year to publish a critical habitat designation (16 U.S.C. 1533(b)(6)(C)(ii)).

We reviewed the available information pertaining to the biological needs of these species and habitat characteristics where these species are located. This and other information represent the best scientific data available, and the available information is sufficient for us to identify areas to propose as critical habitat. Therefore, we conclude that the designation of critical habitat is determinable for the Texas golden gladecress and the Neches River rose-mallow.

Physical or Biological Features for Texas Golden Gladecress

In accordance with sections 3(5)(A)(i) and 4(b)(1)(A) of the Act and regulations at 50 CFR 424.12, in determining which areas within the geographic area occupied by the species at the time of listing to designate as critical habitat, 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. These include, but are not limited to:

(1) Space for individual and population growth and for normal behavior;

(2) Food, water, air, light, minerals, or other nutritional or physiological requirements;

(3) Cover or shelter;

(4) Sites for breeding, reproduction, or rearing (or development) of offspring; and

(5) Habitats that are protected from disturbance or are representative of the historical, geographic, and ecological distributions of a species.

We derive the specific physical or biological features required for Texas golden gladecress from studies of the species' habitat, ecology, and life history as described below. We have determined that the following physical or biological features are essential for Texas golden gladecress:

Space for Individual and Population Growth and for Normal Behavior

The Weches Glades form a small patch system of habitats, endemic to the outcrops of marine sediment and glauconitic clays that occur primarily in Nacogdoches, San Augustine, and Sabine Counties (Nature Serve 2009, p. 6). The average width of the Weches outcrop region varies from 2–5 mi (3.2–8 km) (Sellards *et al.* 1932 in Diggs *et al.* 2006, p. 56) and encompasses the route of SH 21. All known Texas golden gladecress populations occur, or formerly occurred, within 1 mi (1.6 km) of SH 21. Populations in the closest proximity to each other were part of the Caney Creek Glade Complex that contained five of the eight known sites. This entire complex was located within an area that did not exceed 1 mi (1.6 km) from the most northern to most southern plant occurrences, and extended less than 0.32 miles (0.53 km) from east to west. The Chapel Hill and Geneva sites were outliers to the Caney Creek Complex, located 4.5 mi (7.24 km) and 11.4 mi (18.3 km), respectively, to the southeast. Multiple glades in close proximity to one another, as exemplified by the Caney Creek Glade Complex, may have facilitated cross fertilization between populations, enhancing genetic diversity, and perhaps providing space for population expansion. Potential exists for other areas within the range of the gladecress to support glade complexes. Singhurst (2011, pers. comm.), using aerial photography and maps of geology and soils, has identified clusters of potential glade sites in additional areas within the Weches Formation within 1 mi (1.6 km) to the north and south of SH 21 as it traverses San Augustine County, as well as into Sabine County. We are also aware that areas adjacent to the Chapel Hill and Geneva sites have a high likelihood of suitable habitat.

Due to loss, degradation, and fragmentation of habitat, optimal glade size or density of glade complexes needed to support long-term survival of Texas golden gladecress is not well understood, but monitoring of the extant sites between 1999–2009 showed that the gladecress could persist on small, disjunct sites where it is able to grow and reproduce, at least in the short term. Based on the best available information, a better model of a healthy population and habitat site may be found by looking at the historic CCG Site 6, which supported the largest population ever documented. This former site was contained within an area of approximately 10 ac (4 ha) and supported thousands of plants until the mid-1990's, when it was destroyed by mining excavation. This glade complex consisted of long, sheeted openings that presented a patchwork appearance of soil, rock, and glades (Singhurst 2012d, pers. comm.). This site likely represented ideal glade conditions for this species because it supported a healthy and robust population.

The best available information regarding gene flow between gladecress populations is that seed dispersal may be limited. Seeds appear to fall to the ground near the parent plant and probably stay in place unless water movement, such as flooding, carries them to other suitable habitats. The Weches outcrops occur in a scattered fashion across the landscape with habitat that is unsuitable for gladecress lying between outcrops.

Pollinators specific to Texas golden gladecress have not been identified. Native bees in the Families Andrenidae and Halictidae (sweat bees), including the species *Halictus ligatus* (sweat bee), were observed carrying pollen from *Leavenworthia crassa* (fleshyfruit gladecress) and *L. stylosa* (cedar gladecress) in northern Alabama (Llyod 1965, pp. 106–115). Although representatives of these bee families are found across eastern Texas (Warriner 2012b, pers. comm.), there is no documentation of them visiting Texas golden gladecress. Busch and Urban (2011, p. 18) indicated the efficacy of these pollinators has not been studied in *Leavenworthia.* Texas golden gladecress is believed to be self-compatible and may not rely solely on pollinators for fertilization (see Biology section). Based on this information, close proximity of glade outcrops to one another may help to facilitate cross pollination and seed dispersal.

Therefore, based on the information above, we identify glauconite exposures (outcrops) of the Weches Geologic Formation, found within Weches glades and prairies, as an essential physical feature for the species' continued existence. Although these individual exposures can be small in size and scattered throughout a glade or glades, ideally the glades will occur in multiples (a complex).

Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements

The geology and soils of Texas golden gladecress sites are unique in East Texas, and the species shows a tight association with these features (Singhurst, 2011, pers. comm.). The Weches Formation is characterized by the mineral glauconite and contains glauconitic clays, calcareous marls, rich marine fossil deposits, and mudstone (George and Nixon 1990, pp. 117–118). In some areas, leaching of the soluble ingredients in the glauconite has concentrated iron in ironstone (iron-bearing limonite). Surface exposures of the Weches Formation are usually on slopes (due to erosion) and typically are small; 16.4–65.6 ft (5–20 m) in width, and generally not exceeding 328 ft (100 m) in length (George and Nixon 1990 p. 118). The Weches Formation affects the local topography and vegetation, with cap hills and escarpments where the

erosion-resistant ironstone layers occur, and more rolling topography where ironstone is not present (Diggs *et al.* 2006, p. 56).

The Weches outcrops create limited areas of relatively thin alkaline soils in a region of mostly sandy soils (USFWS 1992, pp. 3–4) resulting in natural glade communities on the shallow, seasonally saturated, but frequently dry soils (Bezanson 2000 in Diggs *et al.* 2006, p. 56). Soils associated with Weches glades are shallow, rocky, and basic in pH (alkaline), inhibiting the presence of woody species (Nature Serve, 2009, p. 6). Soils underlying known Texas golden gladecress sites appear to be inclusions in the Nacogdoches, Trawick, or Bub soils series (USDA 2009, entire). George (1987, p. 18) found that the soil profile of three Weches outcrops had a surface layer of sandy loam or sandy clay loam with impermeable glauconite clay at a depth of about 19.7 inches (50 cm). Measurements of soil pH ranged from 7.6 to 8.1 (George 1987, p. 18). Weches soils contain exceptionally high levels of calcium (2,500–6,000 parts per million (ppm)) from fossilized shells, as well as high levels of potassium (170–250 ppm) and magnesium (250–400 ppm). The basic pH at these sites results from dissolution of the calcareous component of the rich marine fossil fauna of the Weches Formation (George 1987, p. 47). These conditions produce a harsh, variable environment that becomes saturated and seepy in cool moist months and during rainy seasons, but that dries out, becoming parched and hard, during hot summer months (USFWS 1992, pp. 3–4). *Leavenworthia* species are dormant by early summer, helping them to survive the dry period as seed; this dormancy is likely one of the major evolutionary adaptations in this genus enabling its species to endure the extreme droughty conditions of late summer (Quarterman 1950, p. 5).

Texas golden gladecress is dependent on late fall-winter precipitation levels that keep the glade sediments saturated and leave pooled water on the small outcrop ledges. Based on observations of gladecress population sites over a 10-year period within the Weches outcrops and glade complexes, Texas golden gladecress appeared to be highly restricted to wet microhabitats and ''even within suitable sites, the species seems limited to only seasonal seep runs and vernal pools within the site'' (Singhurst 2011a, pers. comm.). The species' apparent requirement for direct contact with seeps and shallow puddles on exposed ledges of outcrop implies reliance on precipitation that falls directly onto the ledges and possibly on down-slope movement of water percolating through the sediment atop the clay layer. George (1988, pp. 2–4) observed that the Weches outcrops were waterlogged in the spring due to the clay stratum, with water percolating until it hit the clay, then moving laterally and exiting on the hillsides where the outcrops are. At the Chapel Hill site, gladecress was found on and around a few spots where the glauconite was exposed rather than in the dense cover of the herbaceous matrix (Carr 2005, p. 2). The glauconite exposures at this site were wet from seeps or due to percolating water moving laterally on top of the bedrock.

All known Texas golden gladecress populations have been found on open, sunny exposures on Weches outcrops. Baskin and Baskin (1988, p. 837) indicated that a high light requirement was common among the endemic plants of rock outcrop plant communities in the unglaciated eastern United States. This obligate need for high light has been supported by field observations showing that these eastern outcrop endemics, such as Texas golden gladecress: Grow on well-lighted portion of the outcrops but not in adjacent shaded forests; photosynthesize best in full sun, with a reduction in the presence of heavy shading; and compete poorly with plants that shade them (Baskin and Baskin 1988, p. 837).

Texas golden gladecress apparently persists on its specialized habitat, at least in part, due to a lack of competition from taller or more vigorous plants. Rollins (1963, p. 17) found that, while *Leavenworthia alabamica* and *L. crassa* grew normally and produced seed in a weeded portion of an experimental plot, plants from both species died in the unweeded portion of the plot where *Poa annua* (annual bluegrass) was allowed unrestricted growth. Lloyd (1965, pp. 86–87) observed that plants of these two species competed poorly with the invading weed flora in abandoned agricultural fields.

The Weches outcrops and surrounding glade sites show large seasonal variation in species dominance as a result of the shift from saturated soils in winter-spring to hard, dry soil in summer (George and Nixon 1990, pp. 120–124). Singhurst (2012, pers. comm.) described the Chapel Hill site as having bare spots on the tops of the glade with seasonal pools of water (similar to vernal pools). At this site the gladecress would bloom, seed, dry out, and die back to be replaced in summer by drier, more succulent plants. Quarterman (1986 in George and Nixon 1990, p. 124) found that the thinner soils in Tennessee glades were dominated in spring by *Leavenworthia* spp., *Minuartia patula* (Pitcher's sandwort), and *Sedum pulchellum* (stonecrop), and that *Sporobolus vaginiflorus* (poverty dropseed) would be the dominant grass on these soils in summer. Singhurst observed similar species composition shifts at Texas golden gladecress sites (Singhurst 2012e, pers. comm.). Even with this seasonal shift, there are a number of characteristic herbaceous species that occur in association with gladecress (Table 6) (Bridges 1988, p. II–35; TNC 2003, p. 4; Carr 2006, p. 4). Carr (2006, p. 2) found that gladecress at the Chapel Hill site shared the rocky outcrop ledges with a sparse covering of *Eleocharis* sp. (spike sedge), *Calamintha arkansana* (Ozark savory), and an unidentified moss. He described the 40–50 gladecress plants as ''growing on or among clumps of moss on these soggy, unshaded glauconite exposures.''

TABLE 6—CHARACTERISTIC FLORA OF WECHES OUTCROPS

Scientific name	Common name
Primary Characteristic Herbs	
*Sedum pulchellum**	stonecrop.
*Clinopodium arkansanum**	Ozark savory.
*Minuartia patula**	Pitcher's sandwort.
*Minuartia drummondii**	Drummond sandwort.
*Valerianella radiata**	beaked cornsalad.
Isoetes butleri	Butler's quillwort.
*Allium drummondii**	Drummond wild-garlic.
Calamintha arkansana	low calamint.

TABLE 6—CHARACTERISTIC FLORA OF WECHES OUTCROPS—Continued

Scientific name	Common name
*Portulaca oleracea**	common purslane.
*Phemeranthus parviflorus**	sunbright.
*Eleocharis occulata**	limestone spikerush.
Some Other Potential Species	
Erigeron sp.	fleabane.
Physaria pallida	white bladderpod.
Desmanthus illinoensis	Illinois bundleflower.
Euphorbia dentate	toothed spurge.
Croton monanthogynus	doveweed.
Dalea purpurea	prairie clover.
Houstonia spp.	Bluetts.
Nassella leucotricha	Texas wintergrass.
B*outelous curtipendula*	sideoats grama.
Eleocharis compressa	flat-stemmed spikerush.
*Sporobolus vaginiflorus**	poverty dropseed.
Thelesperma filifolium	slender greenthread.
Arnoglossum plantagineum	groovestem Indian plantain.
Plantago virginica	Virginia plantain.
Schizachyrium scoparium	little bluestem.
Polytaenia nuttallii	Nuttall's prairie parsley.
Onosmodium bejariense	softhair marbleseed.
Liatris mucronata	narrowleaf gayfeather.
Draba cuneifolia	wedgeleaf draba.
Paronychia virginica	Whitlow wort.
Camassia scilloides	wild hyacinth.
Zigadenus nuttallii	Nuttall's death cama.
Algae	
Nostoc spp	Cyanobacteria.
Frequent Woody Species	
Juniperus virginiana	eastern redcedar.
Pinus taeda	loblolly pine.
Liquidambar styraciflua	sweetgum.
Cornus drummondii	roughleaf dogwood.
Sideroxylon lanuginosum	gum bumelia.
Sophora affinis	Texas sophora.
Quercus muhlengergii	Chinquapin oak.
Opuntia sp.	prickly pear cactus.
Rhus glabra	smooth sumac.
Rhamnus lanceolata	sanceleaf buckthorn.

* Strong association with gladecress sites.

Therefore, based on the information above, we identify as essential physical features for Texas golden gladecress the following: Open, sunny exposures of Weches outcrops within Weches glade plant communities that are characterized by the species listed in Table 6. These exposures should have relatively thin rocky soils that are classified within Nacogdoches, Trawick, or Bub soils mapping units. There must be bare, exposed bedrock on top-level surfaces or rocky ledges with very shallow depressions where rainwater can pool or seepage can collect.

Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

In order to undergo successful reproduction, Texas golden gladecress requires sufficient moisture in late fall to germinate, and in winter-spring to support growth, flowering, and fruit production. At sites where the gladecress depends on seeps to provide its water, there must be sufficient sediment and/or slope at elevations above its habitat site in order to catch rainfall and allow its slow percolation down to the plant's location. For those gladecress plants growing in what appear to be microdepressions that occur on fairly level spots in more gently sloping ground, the water supply may be more due to direct rainfall and dew collection. The species appears to be dependent on its seedbank for its continued existence, so habitat should not be subjected to activities that would remove the seedbank. Therefore, based on the information above, we identify as essential physical features needed for Texas golden gladecress' successful reproduction outcrops that have intact hydrology and for which the surface features and gladecress seedbed are undisturbed.

Habitats Protected From Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

Texas golden gladecress has a restricted geographic distribution. Its historic range did not extend further than approximately 12 miles (19 km) from the most southeastern to the most northwestern documented locations and all occurrences were located within a 3.1-mile-wide band (5 km-wide) around SH 21. The gladecress is also an endemic species, highly restricted to a specific habitat type that occurs in a

scattered or patchy fashion across the landscape, with large areas of unsuitable habitat interspersed. The extant populations exhibit a high degree of isolation, being separated from each other by distances of 4.5 mi (7.2 km) and 7 mi (11.3 km), respectively, between the northern (CCG Site 1), central (Chapel Hill), and southern (Geneva) populations. All three populations are small in terms of areal extent and number of individual plants. Given their geographic isolation and small size, all of the sites are important for the conservation of the species. In addition, we have determined that gladecress likely persists at the CCG Site 7, even though access has been denied since 1988. Combined, these sites represent the best habitat for the species throughout the geographic range. The loss of any of the known populations would result in a high risk of extinction for the remaining populations. Mapping of potential glade sites by TPWD shows that there is suitable habitat near the three extant populations, providing sites for population expansion, thereby increasing its resiliency. These areas are representative of habitat across the species range and provide the potential for populations to spread, thereby enhancing recovery opportunities. Therefore, we do not believe that unoccupied areas outside of the geographic range are needed.

The long-term effects of climate change on the species are less clear with regard to whether any additional areas outside of those discussed above are needed for the species' future. See the Factor A discussion of Climate Change for a summary of projected climate changes in Texas and how these changes may affect the Texas golden gladecress. The information currently available on the effects of global climate change and increasing temperatures does not make sufficiently precise estimates of the location and severity of the effects. Nor are we currently aware of any climate change information specific to the habitat of Texas golden gladecress that would indicate what areas may become important to the species in the future. We do not believe the species can easily adapt and colonize new habitats due to its habitat specificity. Therefore, based on the best available information, we are not identifying areas outside of those currently occupied as areas that may be suitable due to the effects of climate change.

Primary Constituent Elements for Texas Golden Gladecress

Under the Act and its implementing regulations, we are required to identify the physical or biological features essential to the conservation of Texas golden gladecress in areas occupied at the time of listing, focusing on the features' primary constituent elements. We consider primary constituent elements to be the specific elements of physical or biological features that, when laid out in the appropriate quantity and spatial arrangement to provide for a species' life-history processes, are essential to the conservation of the species.

Based on our current knowledge of the physical or biological features and habitat characteristics required to sustain the species' life-history processes, we determine that the primary constituent elements specific to Texas golden gladecress are:

(1) Exposed outcrops of the Weches Formation within Weches prairies. Within the outcrop sites, there must be bare, exposed bedrock on top-level surfaces or rocky ledges with small depressions where rainwater or seepage can collect. The prairie openings should support Weches Glade herbaceous plant communities.

(2) Thin layers of rocky, alkaline soils, underlain by glauconite clay (greenstone, ironstone, bluestone), that are found only on the Weches Formation. Appropriate soils are in the series classifications Nacogdoches clay loam, Trawick gravelly clay loam, or Bub clay loam, ranging in slope 1–15 percent.

(3) The outcrop ledges should occur within the glade such that Texas golden gladecress plants remain unshaded for a significant portion of the day and trees should be far enough away from the outcrop(s) that leaves do not accumulate within the gladecress habitat. The habitat should be relatively clear of nonnative and native invasive plants, especially woody species, or with only a minimal level of invasion.

Special Management Considerations or Protection for Texas Golden Gladecress

When designating critical habitat, we assess whether the specific areas within the geographic area occupied by the species at the time of listing contain features that are essential to the conservation of the species and which may require special management considerations or protection.

The features essential to the conservation of gladecress may require special management considerations or protection to reduce the following threats:

- Actions that remove the soils and alter the surface geology of the glades;
- Building or paving over the glades;
- Construction or excavation upslope that alters water movement (sheet flow or seepage) downslope to gladecress sites;
- Planting trees adjacent to the edges of an outcrop resulting in shading of the glade and accumulations of leaf litter and tree debris;
- Encroachment by nonnative and native invading trees, shrubs, and vines that shade the glade;
- The use and timing of application of certain herbicides that can harm gladecress seedlings; and
- Access by cattle to gladecress sites where habitat and plants may be trampled.

Management activities that could ameliorate these threats include (but are not limited to):

- Avoiding Weches glades when planning the location of quarries, well pads, roads, other facilities or structures, or pipeline routes, through glade complexes;
- Avoiding above-ground construction and/or excavations in locations that would interfere with natural water movement to gladecress habitat sites;
- Locating suitable habitat and determining the presence or absence of the species and identifying areas with glade complexes and protecting or restoring as many complexes as possible;
- Extending outreach to all landowners, including private and State, to raise awareness of the plant and its specialized habitat;
- Providing technical or financial assistance to landowners to help in the design and implementation of management actions that protect the plant and its habitat;
- Avoiding pine tree plantings near glades; and
- Management, including brush removal, to maintain an intact native glade vegetation community.

Criteria Used To Identify Critical Habitat for Texas Golden Gladecress

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. We reviewed all available information pertaining to the habitat requirements of the species. We are proposing to designate critical habitat in areas within the geographic area occupied by the Texas golden gladecress. In accordance with the Act and its implementing regulation at 50 CFR 424.12(e), we also considered whether designating additional areas—outside those currently occupied as well as those occupied at the time of listing—are necessary to ensure the conservation of

the species. We are not currently proposing to designate any areas outside the geographic area currently occupied by the species because we found that the currently occupied areas are sufficient for the conservation of the species.

Areas Occupied by the Texas Golden Gladecress

As required by section 3(5)(A)(i) of the Act, for the purpose of designating critical habitat for Texas golden gladecress, we defined the geographic area currently occupied by the species. Generally, we define occupied areas as those where recent surveys in 2012 confirmed the species was present (Singhurst 2012f, pers. comm.). For one area, occupancy by the species has not been confirmed since 1988 (TXNDD 2012, entire); however, there have been no recent surveys due to lack of access to the properties. For the purposes of designation of critical habitat, we are considering this area to be currently occupied because the species was known from this area in the past and the habitat conditions that support the species appear intact (based on aerial imagery), except for the growth of some woody vegetation in some areas. In total, we found four areas currently occupied by the Texas golden gladecress at the time it is listed.

Areas Unoccupied at the Time of Listing

We considered whether there were any specific areas outside the geographic area found to be occupied by the Texas golden gladecress that are essential for the conservation of the species as required by section 3(5)(A)(ii) of the Act. First, we evaluated whether there was sufficient area for the conservation of the species within the occupied areas determined above.

To guide what would be considered needed for the conservation of the species, we relied upon recommendations in a conservation plan for the San Augustine Glades developed by TNC (TNC 2003, p. 8). This served as a basis for the number of populations considered necessary for the conservation of Texas golden gladecress. This plan came from TNC's structured conservation planning process that relied on a science team with expertise in the habitats and flora of East Texas. The plan was developed with input from representative experts from academia, botanical institutions, and Federal and State agencies. We consider this plan the best available scientific information to determine what is essential for the conservation of the Texas golden gladecress.

This conservation plan concluded that at least eight viable populations of Texas golden gladecress, containing an average of 500 individuals each, was the target conservation goal for the species (TNC 2003, p. 8). We currently know of four confirmed populations of the species within the areas occupied by the species (see Mapping Texas Golden Gladecress Critical Habitat section below for how we mapped the occupied areas). We used information provided by a TPWD botanist to evaluate whether the four proposed areas might be sufficient to support eight viable populations of the species (Singhurst 2012a, pers. comm.; Singhurst 2012b, pers. comm.). The maps provided by this species expert identified potential glades within these areas by using: Soil map units; a time series of aerial photographs that depicted changes in land cover; and personal experience and expertise with the species, the habitat, and this area of East Texas (Singhurst 2012b, pers. comm.). These sites occur in discrete areas across the entire historic range of the species and include sites that represent the different landscape settings and soil types that have been documented at gladecress occurrences.

Based on this analysis and our site visits, we determined that the proposed occupied areas contain suitable habitat (with special management) to expand current populations and support additional populations of Texas golden gladecress to meet the conservation goals for the species. We judge there to be suitable sites within the occupied areas that can be used for natural expansion of existing populations or possible future augmentation if needed and advised during future recovery planning and implementation. The habitat in the four occupied areas is sufficient for attaining the goal of eight viable populations throughout the geographic range of the species. Therefore, proposing additional areas as critical habitat outside of the currently occupied geographic areas would not be essential for the conservation of the species, and we have not proposed any additional areas.

Mapping Texas Golden Gladecress Critical Habitat

To determine the boundaries of proposed critical habitat units around the species areas occupied by the species, we used a geographic information system to overlay the appropriate soil maps over the occupied areas. The Texas golden gladecress is restricted to the Weches Formation, being found on only three soil map units: Nacogdoches clay loam 1–5 percent slope (NeE); Trawick gravelly clay loam 5–15 percent slope (TuD); and Bub clay loam 2–5 percent slope (BuB). We drew the proposed boundaries around contiguous segments of these soil mapping units from the online San Augustine and Sabine County's soils survey (*http://WebSoilSurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx*) encompassing the occupied areas to form the boundary of the four critical units by using the edge of the soil type layer.

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, unpaved roads, and other structures because such lands lack physical or biological features for Texas golden gladecress. 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 proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

Summary

In conclusion, we are proposing for designation as critical habitat specific areas that we have determined will be occupied at the time of listing and contain sufficient elements of the physical or biological features to support life-history processes essential for the conservation of the Texas golden gladecress that may require special management. We proposed four areas that meet the criteria for critical habitat. We determined that no additional areas are considered essential for the conservation of the species because the proposed occupied areas provide sufficient habitat to conserve the species.

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 in the rule portion. 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 *http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0064, on our Internet sites *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm,* and at the field office responsible for the designation (see **FOR FURTHER INFORMATION CONTACT** above).

Proposed Critical Habitat Designation for Texas Golden Gladecress

We are proposing four units as critical habitat for Texas golden gladecress. The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for Texas golden gladecress and all are considered to be occupied at the time of listing. The four areas we propose as critical habitat are: (1) Geneva; (2) Chapel Hill; (3) Southeast Caney Creek Glades; and (4) Northwest Caney Creek Glades. The approximate area of each proposed critical habitat unit is shown in Table 7.

TABLE 7—PROPOSED CRITICAL HABITAT UNITS FOR TEXAS GOLDEN GLADECRESS

Critical habitat unit	Private ac (ha)	State ac (ha)	Total size of all units ac (ha)
1. Geneva	381 (154)	7(3)	388 (157)
2. Chapel Hill	147 (59)	*3 (1)	150 (61)
3. Southeast Caney Creek Glades	37 (15)	3 (1)	40 (16)
4. Northwest Caney Creek Glades	767 (310)	8 (4)	775 (314)
Total	1,332 (539)	21 (9)	1,353 (548)

* County owned
Note: Area sizes may not sum due to rounding.

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

Unit 1: Geneva

Unit 1 consists of 388 ac (157 ha) of private and State land located in northwest Sabine County, Texas. The unit is located 1.5 mi (2.3 km) south of Geneva, Texas, and 4.8 mi (7.7 km) north of Milam, Texas, and is bisected by SH 21. This unit is occupied at the time of listing and contains all of the features essential to the conservation of the species. Approximately 2 percent (7.3 ac (3 ha)) of the land is State-owned and is managed TxDOT ROW, and the Geneva Site gladecress population occurs, in part, within this ROW. The remaining 98 percent of the land is privately owned. The area directly adjacent to the ROW gladecress population has been cleared of woody vegetation within the recent past but is not fenced, so future land use is unknown. The geology and soils (PCE1 and PCE2) occur throughout the unit and aerial photography indicates that at least three other small, scattered open glades (as identified by TPWD) occur within the critical habitat unit.

The features essential to the conservation of the species in this unit may require special management considerations or protection to address threats of woody plant invasion into open glades, possible changes in land use, including planting of loblolly or long-leaf pine to establish tree plantations, potential agricultural herbicide use to control woody plants, and destruction of the features by excavation, pipeline construction, or buildings.

Unit 2: Chapel Hill

Unit 2 consists of 150 ac (61 ha) of privately owned land, with one county road ROW, in northwestern San Augustine County, Texas. This unit is located 1.0 mi (1.6 km) south of SH 21, due west of the San Augustine-Sabine County line, and lies alongside County Road (CR) 151. This unit is linear in shape, running from southeast to northwest. Aside from CR 151, all other land in Unit 2 is privately owned. Current land cover appears to be approximately 70 percent woody cover; much of the forest being rows of pine trees. This unit was occupied at the time of listing by a population that grows on a privately owned, unfenced tract of land that measures approximately 0.25 ac (0.1 ha) in size. The geology and soils PCEs occur throughout the unit, and aerial photography indicates that at least two other small, scattered, open glades (as identified by TPWD) occur within the critical habitat unit.

The features essential to the conservation of the species in this unit may require special management considerations or protection to address threats of woody plant invasion into open glades throughout the unit, conversion of pasture to pine plantations, pipeline construction, and herbicide application.

Unit 3: Southeast Caney Creek Glades

Unit 3 consists of 39.9 ac (16.2 ha) just southeast of the City of San Augustine, San Augustine County, Texas. Approximately 99 percent of the land within this unit is privately owned, with the other 1 percent being county ROW under the management of TxDOT. This unit is located 0.8 mi (1.2 km) south from SH 21 near San Augustine, Texas, along the north side of FM 3483. This unit is located across Sunrise Road from a glauconite quarry. Although this site has not been visited since the late 1980's, we determined that the site still contains all the physical or biological features; therefore, we consider the unit occupied at the time of listing.

The features essential to the conservation of the species in this unit may require special management considerations or protection to address threats of woody plant invasion into the natural prairie and glade habitat, and pipeline construction.

Unit 4: Northwest Caney Creek Glades

Unit 4 consists of 775.3 ac (313.7 ha) that extends in a diagonal line from northeast to southwest, to the north and south of SH 21 just east of the City of San Augustine, San Augustine County, Texas. The unit is approximately 0.7 mi (1.1 km) wide. This unit is occupied at the time of listing. The geology and soils PCEs occur throughout the unit and aerial photography indicates that at least five other small, scattered, open glades (as identified by TPWD) occur within the critical habitat unit. Approximately 1 percent (7.8 ac) of the land is State-owned and managed ROW by the TxDOT. The remaining 99 percent is privately owned. Approximately 75–80 percent of the southern portion of Unit 4 is forested. Historically, this unit was occupied by four of the eight known occurrences of Texas golden gladecress;

however, three of the four have been lost to glauconite quarrying activities.

The features essential to the conservation of the species in this unit may require special management considerations or protection to address threats of glauconite mining, woody plant invasion into the natural prairie and glade habitat, and pipeline construction.

Physical or Biological Features for Neches River Rose-mallow

We derive the specific physical or biological features required for the Neches River rose-mallow from studies of the species' habitat, ecology, and life history as described below. We have determined that the following physical or biological features are essential for the Neches River rose-mallow:

Space for Individual and Population Growth and for Normal Behavior

Neches River rose-mallow is endemic to open habitats in wetlands of the Pineywoods of East Texas (Gould 1975, p. 1; Correll and Johnston 1979, p. 1). This ecoregion contains hardwood (oaks, hickory, and maple), pine species (loblolly, shortleaf, longleaf, and slash) (Gould 1975, p. 10), and native woody and herbaceous plant associates (Warnock 1995, pp. 14–15; Poole *et al.* 2007, pp. 264–265; see Table 3). Partial to full sun is required to allow for blooming.

Habitat is characterized as sloughs, oxbows, terraces, and sand bars, and habitat is found along depressional or low-lying areas of the Neches River floodplains and Mud and Tantabogue Creek basins (Warnock 1995, p. 11). Sites include both intermittent and perennial wetlands with plants located within 3.2 ft (1.0 m) of standing water, depending on current drought and precipitation levels (Warnock 1995, p. 14). Water levels at each site are variable, depending on proximity to water, amount of rainfall, and floodwaters. Habitat elevations range from 170 to 265 ft (51–80 m) above sea level (Warnock 1995, p. 13).

Based on the best available information, we identify intermittent and perennial open waters in the Neches River basin and Mud and Tantabogue Creeks, with areas of seasonal or permanent inundation with native woody vegetation, as an essential physical feature for the species.

Food, Water, Air, Light, Minerals, or Other Nutritional or Physiological Requirements

The rose-mallow is typically found in open, flat areas of wetlands with hydric, alluvial sands or sandy loams of the Inceptisol or Entisol orders (Gould 1975, p. 10; Warnock 1995, pp. 11, 13; Diggs *et al.* 2006, pp. 46, 79). Intermittent wetlands are inundated during the winter months but become dry during the summer months (Warnock 1995, p. 11), yet flowing water is required for seed dispersal downstream (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3). Rivers of East Texas tend to overflow onto banks and floodplains (Diggs *et al.* 2006, p. 78), especially during the rainy season, thereby dispersing seed. Precipitation in Texas increases from the west to the east, making East Texas an area with comparatively higher annual precipitation, generally ranging from 35 to 50 in (89–127 cm) (Gould 1975, p. 10). Therefore, based on the information above, we identify hydric alluvial soils of seasonally or permanently inundated wetlands to be a physical or biological feature for the rose-mallow.

Sites for Breeding, Reproduction, or Rearing (or Development) of Offspring

Flowing water is required for seed dispersal, and seeds can remain buoyant for several hours (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3). Long-distance seed dispersal ranges and upstream dispersal methods are unknown, but may be facilitated by avian species. Therefore, we identify flowing water for seed dispersal as a physical and biological feature for the rose-mallow.

Habitats Protected From Disturbance or Representative of the Historical, Geographic, and Ecological Distributions of the Species

East Texas is subtropical with a wide range of extremes in weather (Diggs *et al.* 2006, p. 65). The native vegetation of this region evolved with, and is adapted to, recurrent temperature extremes (Diggs *et al.* 2006, p. 67). The Pineywoods region of East Texas is vulnerable to even small climatic shifts because it is ''balanced'' on the eastern edge of a dramatic precipitation gradient. Temperature increases that are projected in climate change scenarios will likely be associated with increases in transpiration and more frequent summer droughts. Decreased rainfall may result in an eastward shift in the forest boundary and replacement of the Pineywoods forest with scrubland (Diggs *et al.* 2006, p. 80). There may also be a northerly shift of southerly species based on climate models that predict increasing temperatures and, therefore, increasing evapotranspiration and decreasing regional precipitation and soil moisture (Diggs *et al.* 2006 p. 73).

In October 2011, the Service observed that all known rose-mallow sites were impacted by extreme drought conditions. Normal habitat conditions include a cyclical pattern of wet winters and dry summers so the rose-mallow may have some tolerance of drought; however, the species may not be able to thrive in an environment with a higher frequency and intensity of droughts. Soil compaction from hogs and cattle, invasion from nonnative species, and herbivory may increase during periods of drought. Predictions of climate change are variable, and effects from climate change on this species are not fully understood. The information currently available on the effects of global climate change and increasing temperatures does not make sufficiently precise estimates of the location and severity of the effects specific to East Texas. Nor are we currently aware of any climate change information specific to the habitat of the rose-mallow that would indicate what areas may become important to this species in the future. Therefore, we are not identifying any areas outside of those currently occupied as areas that may be suitable for rose-mallow due to the effects of climate change.

Primary Constituent Elements for Neches River Rose-mallow

Based on our current knowledge of the physical or biological features and habitat characteristics required to sustain the species' life-history processes, we determine that the primary constituent elements specific to the rose-mallow are intermittent or perennial wetlands within the Neches River floodplains or Mud and Tantabogue Creek basins that contain:

(a) Hydric alluvial soils and flowing water when found in depressional sloughs, oxbows, terraces, side channels, or sand bars;

(b) Native woody or associated herbaceous vegetation that has an open canopy providing partial to full sun exposure without nonnative species.

With these proposed designations of critical habitat, we intend to identify the physical or biological features essential to the conservation of both species, through the identification of the appropriate quantity and spatial arrangement of the primary constituent elements sufficient to support the life-history processes of the species.

Special Management Considerations or Protection for Neches River Rose-mallow

When designating critical habitat, we assess whether the specific areas within the geographic area occupied by the

species at the time of listing contain features that are essential to the conservation of the species and which may require special management considerations or protection.

Threats to those features that define the primary constituent elements for the rose-mallow include: (1) Alteration of naturalized flow regimes through projects that require channelization; (2) water diversions from streams and rivers and changes to the overall hydrology; (3) encroachment from native woody riparian species and nonnative species; (4) detrimental roadside management practices including inappropriate frequency and timing of mowing during the species' blooming period; (5) herbivory; and, (6) drought. Special management considerations or protection are required within critical habitat areas to address these threats. Management activities that could ameliorate these threats include, but are not limited to:

- Construction of cattle exclusion fencing to remedy herbivory at Lovelady;
- Restoration of the cattle stock pond back to a natural flatwoods pond at Lovelady;
- Coordination with TxDOT to establish and continue effective management along ROWs for control of native woody species and nonnatives (including, but not limited to mowing, brush-hogging, or other hand-clearing techniques) and completion of these techniques only during the appropriate life stages of the rose-mallow;
- Coordination with the ANRA and consultation with the USACE on the proposed construction of Lake Columbia Reservoir;
- Consultation between the Service and the USACE for any filling or draining of Federal jurisdictional wetlands; and
- Clearing or burning on the Davy Crockett NF for control of chinese tallow and to maintain an adequate level of openness in habitat.

Criteria Used To Identify Critical Habitat for Neches River Rose-mallow

As required by section 4(b)(2) of the Act, we use the best scientific data available to designate critical habitat. We reviewed all available information pertaining to the habitat requirements of the species. We are proposing to designate critical habitat in areas within thegeographic area occupied by the rose-mallow. In accordance with the Act and its implementing regulation at 50 CFR 424.12(e), we also considered whether designating additional areas—outside those currently occupied as well as those occupied at the time of listing—are necessary to ensure the conservation of the species. We are not currently proposing to designate any areas outside the geographic area currently occupied by the species because we found that the currently occupied areas are sufficient for the conservation of the species.

Areas Occupied by the Neches River Rose-mallow

For the purpose of designating critical habitat for the rose-mallow, we defined the geographic area currently occupied by the species as required by section 3(5)(A)(i) of the Act. Generally, we define occupied areas based on the most recent field surveys available in 2011 and recent reports and survey information from the Davy Crockett NF, TPWD, TxDOT, and observations by species experts (Miller 2011, pers. comm.; TXNDD 2012a, entire). Currently occupied areas for the Neches River rose-mallow are found in Trinity, Houston, Cherokee, Nacogdoches, and Harrison Counties in East Texas.

In total, we found 11 areas currently occupied by the rose-mallow. Two of these areas have not been verified since the 1980s and mid-1990s. However, the sites have not been modified to our knowledge such that they no longer have the physical or biological features essential for the rose-mallow, so we consider them still occupied. Four of the proposed critical habitat units currently occupied are introduction sites, three of which are located on Davy Crockett NF compartments and one in Mill Creek Gardens. The remaining five units support existing populations of rose-mallow and the plants were observed at each of these nine areas in 2011 (Creech 2011b, pers. comm.; Miller 2011, pers. comm.; TXNDD 2012a, entire).

Areas Unoccupied by the Neches River Rose-mallow

We considered whether there were any specific areas outside the geographic area found to be occupied by the rose-mallow that are essential for the conservation of the species, as required by section 3(5)(A)(ii) of the Act. We first evaluated whether there was sufficient area for the conservation of the species within the occupied areas determined above.

To guide what would be considered needed for the conservation of the species, we relied upon Pavlik's 1996 (pp. 127–155) Minimum Viable Population (MVP) analysis tool, using the best known and available scientific information on the species' life history and reproductive characteristics and input from a species expert (Poole 2012a, pers. comm.). Based on this analysis, we concluded that at least 10 viable populations of the rose-mallow, containing an average of about 1,400 individuals each, was the conservation goal for the species.

We considered whether the 11 occupied areas contained sufficient habitat to meet these conservation goals. Each area currently has one population, so the occupied areas are sufficient for the ten populations needed. However, the overall estimates of the number of individuals in each population are low, with the largest population estimated to contain 750 individuals at compartment 55 in October 2010 (Allen and Duty 2010, p. 4). All of the known populations currently have much fewer individuals than the conservation goals. Considering the size and amount of suitable habitat in the areas occupied by the species (see Mapping Neches River Rose-mallow Critical Habitat section below for how we mapped the occupied areas), we found that the 11 areas contain suitable habitat (with special management) to support increased population sizes to meet the conservation goals for the species.

Based on this analysis and our site visits, we determined that the proposed occupied areas contain suitable habitat (with future special management) to support larger populations of rose-mallow to meet the conservation goals for the species. We judge there to be suitable sites within the occupied areas that can be used for natural expansion of the populations during future recovery planning and implementation. The habitat in the 11 occupied areas is sufficient for attaining the goal of 10 viable populations throughout the geographic range of the species. Therefore, proposing additional areas as critical habitat outside of the currently occupied geographic areas would not be essential for the conservation of the species, and we have not proposed any additional areas.

Mapping Neches River Rose-mallow Critical Habitat

Once we determined the occupied areas, we next delineated the primary constituent elements. We estimated the area of habitat based on several key features determined through our 2011 field surveys and in past reports on habitat requirements. Since the rose-mallow prefers depressional or palustrine areas, we used topographic maps to identify changes in slope where the species was not anticipated to occur and where seeds were not likely to be dispersed by flowing water (i.e., the uplands). National Wetland Inventory (NWI) maps were used to determine

habitat types within palustrine systems. All areas, when mapped with this layer in GIS, were associated with emergent, forested, or scrub-shrub, with one area having an undetermined bottom (open water). All proposed critical habitat units are seasonally, permanently, or semipermanently flooded, which is consistent with our observations and available data. Due to the high variation of alluvial and hydric soils of rose-mallow habitat, soils were not mapped during this analysis but are still a general wetland indicator.

To determine the boundaries of proposed critical habitat units around the areas occupied by the species, we focused primarily on available canopy openness. We used topographic and NWI maps for confirmation of suitable habitat, then used aerial imagery available through GoogleEarth to determine dense cover in the habitat. We drew boundaries around the open areas that delineate the outer boundary of our proposed critical habitat units. Critical habitat boundaries did not expand into heavily forested areas because those areas are too shady for the rose-mallow.

When determining proposed critical habitat boundaries, we made every effort to avoid including developed areas such as lands covered by buildings, pavement, ROWs, and other structures because such lands lack physical or biological features for the rose-mallow. 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, as is the case with Unit 4, where the rose-mallow is known to occur in habitat beneath the Hwy 204 overpass. Any such lands inadvertently left inside critical habitat boundaries shown on the maps of this proposed rule have been excluded by text in the proposed rule and are not proposed for designation as critical habitat. Therefore, if the critical habitat is finalized as proposed, a Federal action involving these lands would not trigger section 7 consultation with respect to critical habitat and the requirement of no adverse modification unless the specific action would affect the physical or biological features in the adjacent critical habitat.

Summary

In conclusion, we are proposing for designation of critical habitat specific areas that we have determined will be occupied at the time of listing and contain sufficient elements of the physical or biological features essential in supporting life-history processes essential in the conservation of the rose-mallow that may require special management. We proposed 11 areas that meet the criteria for critical habitat. We determined that no additional areas are considered essential for the conservation of the species because the proposed occupied areas provided sufficient habitat to conserve the species.

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 in the rule portion. 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 *http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0064, on our Internet sites *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm,* and at the field office responsible for the designation (see **FOR FURTHER INFORMATION CONTACT** above).

Proposed Critical Habitat Designation for Neches River Rose-mallow

The critical habitat areas we describe below constitute our current best assessment of areas that meet the definition of critical habitat for the rose mallow. The 11 areas we propose as critical habitat are: (1) Hwy 94 ROW, Trinity County; (2) Harrison County; (3) Lovelady, Houston County; (4) Hwy 204 ROW, Cherokee County; (5) Davy Crockett NF, compartment 55, Houston County; (6) Davy Crockett NF, compartment 11, Houston County; (7) Davy Crockett NF, compartment 20, Houston County; (8) Davy Crockett NF, compartment 16, Houston County; (9) Champion, Trinity County; (10) Mill Creek Gardens, Nacogdoches County; and (11) Camp Olympia, Trinity County. The approximate area of each proposed critical habitat unit is shown in Table 8.

TABLE 8—PROPOSED CRITICAL HABITAT UNITS FOR THE NECHES RIVER ROSE-MALLOW

Critical habitat unit	Private ac (ha)	State ac (ha)	Federal ac (ha)	Size of unit ac (ha)
1. Highway 94 ROW	2.3 (0.9)	1.1 (0.5)	0	3.4 (1.4)
2. Harrison County	20.8 (8.4)	0	0	20.8 (8.4)
3. Lovelady	6.3 (2.5)	0	0	6.3 (2.5)
4. Highway 204 ROW	0	8.7 (3.5)	0	8.7 (3.5)
5. Davy Crockett NF, compartment 55	0	0	3.8 (1.5)	3.8 (1.5)
6. Davy Crockett NF, compartment 11	0	0	7.3 (3.0)	7.3 (3.0)
7. Davy Crockett NF, compartment 20	0	0	3.4 (1.4)	3.4 (1.4)
8. Davy Crockett NF, compartment 16	0	0	32.8 (13.3)	32.8 (13.3)
9. Champion	2.9 (1.2)	0	0	2.9 (1.2)
10. Mill Creek Gardens	95.3 (38. 6)	0	0	95.3 (38. 6)
11. Camp Olympia	0.2 (0.1)	0	0	0.2 (0.1)
Total Acreages for All Critical Habitat Units:				187.8 (76.0)

Note: Area sizes may not sum due to rounding.

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

Unit 1: Hwy 94 ROW

Unit 1 consists of 3.4 ac (1.4 ha) on both the Hwy 94 ROW and on private land in Trinity County. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. The unit parallels Hwy 94 for 0.1 mi (0.2 km) to the north, beginning about 0.06 mi (0.09 km) from the now abandoned rest stop. From the easternmost boundary, Unit 1 then extends onto private lands (about 0.06 mi (0.09 km)) where it ends, abutting a

drainage ditch and levee. The unit parallels the ditch for about 0.8 mi (1.3 km) until vegetation becomes thick and the canopy cover increases. Hwy 94 ROW was first observed in 1955 with only herbarium specimens collected, and in 1968, over 100 plants were censused (TXNDD 2012a, pp. 1–11). A total of 128 plants were counted in October 2011. Unit 1 is optimal habitat for the rose-mallow and is so indicated by the abundance of species observed this fall even during drought conditions.

The features essential to the conservation of the species in Unit 1 may require special management considerations or protection to address the threats of: hydrologic changes on the private lands, management of nonnative species and native woody vegetation, and appropriate timing and frequency of mowing and maintenance along the ROW.

Unit 2: Harrison County

Unit 2 is between 0. 2–0.4 mi (0.3–0.6 km) north of Farm to Market road 2625 in Harrison County. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. A specimen of the rose-mallow was first collected from the site in 1980 by Elray Nixon from SFASU and was originally thought to have been *H. laevis;* the specimen was recently reexamined and confirmed as the rose-mallow (TXNDD 2012a, p. 12). Warnock (1995) provided only generic coordinates for the location of this site, but, using aerial photography, we were able to determine the location of this unit. Unit 2 is composed of 8.4 ha (20.8 ac) of occupied habitat entirely on private land; the landowner of the site is unknown. The physical and biological features essential to the conservation of the species include the large wetland or pond of hydric alluvial soils and open canopy.

The features essential to the conservation of the species in Unit 2 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the wetland.

Unit 3: Lovelady

Unit 3 was habitat within Houston County, found northwest of FM 230, extending 0.3 mi (0.5 km) north and contains 6.3 ac (2.5 ha) of private land. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. The majority of land in Unit 3 belongs to TLC, who purchased the property in 2004 for the direct conservation of the rose-mallow. This unit extends northward onto private lands where a known population of the rose-mallow was found during a 2004 TxDOT survey. Essential biological features within Unit 3 include a depressional creek bed within Tantabogue Creek basin; inundation from overflow of the creek from the northwest or from rain events that may allow ponding in low-lying areas; open habitat with native woody vegetation; and frequently inundated alluvial soils.

The features essential to the conservation of the species in Unit 3 may require special management considerations or protection to address the following threats: Management of nonnative species and native woody vegetation; maintenance of natural hydrology of habitat and adjacent areas, including rebuilding the stock pond to mimic natural flow regimes; construction of a cattle-exclusion fence to restrict grazing; and long-term maintenance of Tantabogue Creek flows by obtaining a conservation easement or agreement.

Unit 4: Hwy 204 ROW

Unit 4 in Cherokee County contains 8.7 ac (3.5 ha) of occupied habitat along Hwy 204 ROW and within the Mud Creek basin. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. Unit 4 extends about 0.3 mi (0.5 km) from east to west and about 0.01 mi (0.02 km) from Hwy 204 on both the north and south sides, each to the private fence. Unit 4 also includes a 0.1-mi (0.2-km) section of the Mud Creek basin where rose-mallow could expand or where seeds could be dispersed. This site was first observed in 1992 with a single plant. Since that time, a maximum number of seven plants has been counted. Since 2003, the rose-mallow has been observed underneath most overpasses (TXNDD 2012a, pp. 20–28). Essential biological features of Unit 4 include its location within the Mud Creek basin, open habitat with full sun, and association with alluvial, hydric soils.

The features essential to the conservation of the species in Unit 4 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the wetland, and appropriate timing and frequency of mowing and maintenance along the ROW.

Unit 5: Davy Crockett NF, Compartment 55

Unit 5 is the only unit that contains a natural population of the rose-mallow on Federal lands within the Davy Crockett NF. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. Occupied habitat of Unit 5 includes 3.8 ac (1.5 ha). An open flatwood or forested (Cowardin *et al.* 1979, p. 20) pond is surrounded by pine-oak forest. Unit 5 is 0.09 mi (0.14 km) in diameter and includes a palustrine flatwood pond and the surrounding open habitat. Essential habitat features of Unit 5 include its location within the Neches River basin, potential proximity to standing water contained within the flatwood pond, surrounding native woody vegetation, and associated alluvial soils.

The features essential to the conservation of the species in unit 6 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the wetland, and controlled use of herbicides.

Unit 6: Davy Crockett NF, Compartment 11

Unit 6 includes 7.3 ac (3.0 ha) of occupied habitat on compartment 11 on Federal land of the NF within Houston County. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. SFASU introduced 200 plants into a seasonally flooded and low-lying wetland. Unit 6 is 0.2 mi (0.3 km) in diameter, and essential habitat features include a partially open, depressional pond, surrounded by native vegetation.

The features essential to the conservation of the species in Unit 6 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the wetland, and controlled use of herbicides.

Unit 7: Davy Crockett NF, Compartment 20

Unit 7 includes 3.4 ac (1.4 ha) of Federal land on compartment 20 of the Davy Crockett NF, Houston County. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. SFASU introduced 350–400 plants in 2000, and the site was

occupied at the time of listing. Essential habitat features to the unit include the hydric alluvial soils, native woody vegetation, natural flows and hydrology of the draining pond, and an open canopy of the perennial wetland where the rose-mallow is located.

The features essential to the conservation of the species in Unit 7 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the wetland, maintenance and repair of habitat from hog damage, and controlled use of herbicides.

Unit 8: Davy Crockett NF, Compartment 16

Unit 8 encompasses 32.8 ac (13.3 ha) of occupied Federal habitat on NF lands. SFASU introduced 450 plants at this site in 2000, but only 43 stem clusters were observed in 2011. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. Essential habitat and biological features include a partially open, depressional wetland within the Neches River floodplain, native riparian plant associates, and alluvial soils.

The features essential to the conservation of the species in Unit 8 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the wetland, restriction of wetland conversion to beaver dams, and controlled use of herbicides.

Unit 9: Champion

The Champion site, Trinity County, is located on private land approximately 0.7 mi (1.1 km) south-southeast of the Houston County line, about 0.8 mi (1.2 km) north of the confluence of White Rock Creek and Cedar Creek (TXNDD 2012a, p. 55). The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. Two small polygons are being designated as occupied critical habitat, both encompassing 1.2 ha (2.9 ac). Essential habitat features on the unit include palustrine wetlands with an open canopy.

The features essential to the conservation of the species in Unit 9 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintenance of natural hydrology of the entire site, and habitat conversion to planted pine and other hardwoods.

Unit 10: Mill Creek Gardens

Unit 10 is an introduced site at Mill Creek Gardens, Nacogdoches County. SFASU Mass Arboretum purchased the land and created the gardens in 1995 as part of a conservation agreement. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species. Plants grown from cuttings by SFASU were introduced within research plots in an area that overflows from an adjacent pond. Vegetation around the site is well adapted to full and partial water inundation (TXNDD 2012a, p. 50). The unit contains 95.3 ac (38. 6 ha) of occupied habitat.

The features essential to the conservation of the species in Unit 10 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation, maintaining natural hydrology of the entire site, and maintaining the natural hydrology of the adjacent pond.

Unit 11: Camp Olympia

Unit 11 is located on private property in Trinity County. The unit contains 0.2 ac (0.1 ha) of palustrine wetland habitat north of Lake Livingston. Warnock (1995, p. 6) suggested that the rose-mallow was highly dependent on the water levels of Lake Livingston; therefore, complete inundation of the site may cause extirpation of this population. The unit was occupied at the time of listing and contains the physical and biological features essential to the conservation of the species.

The features essential to the conservation of the species in Unit 11 may require special management considerations or protection to address the threats of management of nonnative species and native woody vegetation to maintain openness, and hydrological changes through potential site alteration or construction projects.

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 fund, authorize, 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. In addition, section 7(a)(4) of the Act requires Federal agencies to confer with the Service on any agency action that is likely to jeopardize the continued existence of any species proposed to be listed under the Act or result in the destruction or adverse modification of proposed critical habitat.

Decisions by the 5th and 9th Circuit Courts of Appeals have invalidated our regulatory definition of ''destruction or adverse modification'' (50 CFR 402.02) (see *Gifford Pinchot Task Force* v. *U.S. Fish and Wildlife Service,* 378 F. 3d 1059 (9th Cir. 2004) and *Sierra Club* v. *U.S. Fish and Wildlife Service et al.,* 245 F.3d 434, 442 (5th Cir. 2001)), and we do not rely on this regulatory definition when analyzing whether an action is likely to destroy or adversely modify critical habitat. Under the statutory provisions of the Act, we determine destruction or adverse modification on the basis of whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species.

If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us. Examples of actions that are subject to the section 7 consultation process are 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 or authorized, do not require section 7 consultation.

As a result of section 7 consultation, we document compliance with the requirements of section 7(a)(2) 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, or 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 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 require Federal agencies to reinitiate consultation on previously reviewed actions in instances where we have listed a new species or subsequently designated critical habitat that may be affected and the Federal agency has retained discretionary involvement or control over the action (or the agency's discretionary involvement or control is authorized by law). Consequently, Federal agencies sometimes may need to request reinitiation of consultation with us on actions for which formal consultation has been completed, if those actions with discretionary involvement or control may affect subsequently listed species or designated critical habitat.

Application of the ''Adverse Modification'' Standard

The key factor related to the adverse modification determination is whether, with implementation of the proposed Federal action, the affected critical habitat would continue to serve its intended conservation role for the species. Activities that may destroy or adversely modify critical habitat are those that alter the physical or biological features to an extent that appreciably reduces the conservation value of critical habitat for Texas golden gladecress and Neches River rose-mallow. As discussed above, the role of critical habitat is to support life-history needs of the species and provide for the conservation of the species. Section 4(b)(8) of the Act requires us to briefly evaluate and describe, in any proposed or final regulation that designates critical habitat, activities involving a Federal action that may destroy or adversely modify such habitat, or that may be affected by such designation.

Activities that may affect critical habitat, when carried out, funded, or authorized by a Federal agency, should result in consultation for the gladecress. These activities include, but are not limited to:

Actions that would significantly reduce available habitat could include, but are not limited to construction of interstate pipelines and associated structures that are regulated by the Federal Energy Regulatory Commission; U.S. Army Corps of Engineers-issued Clean Water Act section 404 and River and Harbors Act section 10 permits for wetland crossings for linear projects (pipelines, transmission lines, and roads); road development (expansions and improvements) funded by the Federal Highway Administration; and U.S. Department of Agriculture funding and technical assistance for conversion of glades and surroundings to pine plantations or for brush control programs involving herbicide applications. These actions could directly eliminate a site or alter the hydrology, open sunny aspect, and substrate conditions, reducing suitability of a location to a point that it no longer provides the environment necessary to sustain the species. In the case of some types of herbicide applications, the habitat may become unsuitable for germination and successful growth of seedlings. Activities that may affect critical habitat, when carried out, funded, or authorized by a Federal agency, should result in section 7 consultation for the rose-mallow. These activities include, but are not limited to: actions that would significantly alter flow regimes, such as impoundment, channelization, water restriction, water withdrawal, and hydropower generation.

In addition, activities that may affect critical habitat include actions that would significantly alter natural flora, such as disturbance activities like digging, disking, blading or construction work; introduction of nonnative species for erosion control along ROWs or in other areas; and a lack of management of nonnative or native woody species.

Exemptions

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

The Sikes Act Improvement Act of 1997 (Sikes Act) (16 U.S.C. 670a) required each military installation that includes land and water suitable for the conservation and management of natural resources to complete an integrated natural resources management plan (INRMP) by November 17, 2001. An INRMP integrates implementation of the military mission of the installation with stewardship of the natural resources found on the base. Each INRMP includes:

(1) An assessment of the ecological needs on the installation, including the need to provide for the conservation of listed species;

(2) A statement of goals and priorities;

(3) A detailed description of management actions to be implemented to provide for these ecological needs; and

(4) A monitoring and adaptive management plan.

Among other things, each INRMP must, to the extent appropriate and applicable, provide for fish and wildlife management; fish and wildlife habitat enhancement or modification; wetland protection, enhancement, and restoration where necessary to support fish and wildlife; and enforcement of applicable natural resource laws.

The National Defense Authorization Act for Fiscal Year 2004 (Pub. L. 108–136) amended the Act to limit areas eligible for designation as critical habitat. Specifically, section 4(a)(3)(B)(i) of the Act (16 U.S.C. 1533(a)(3)(B)(i)) now provides: ''The Secretary shall not designate as critical habitat any lands or other geographic areas owned or controlled by the Department of Defense, or designated for its use, that are subject to an integrated natural resources management plan prepared under section 101 of the Sikes Act (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 Department of Defense lands within these proposed critical habitat designations.

Application of Section 4(b)(2) of the Act

Exclusions

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 if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he 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 that determination, 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.

Under section 4(b)(2) of the Act, we may exclude an area from designated critical habitat based on economic impacts, impacts on national security, or any other relevant impacts. In considering whether to exclude a particular area from the designation, we identify the benefits of including the area in the designation, identify the benefits of excluding the area from the designation, and evaluate whether the benefits of exclusion outweigh the benefits of inclusion. If the analysis indicates that the benefits of exclusion outweigh the benefits of inclusion, the Secretary may exercise his discretion to exclude the area only if such exclusion would not result in the extinction of the species.

Exclusions Based on Economic Impacts

Under section 4(b)(2) of the Act, we consider the economic impacts of specifying any particular area as critical habitat. In order to consider economic impacts, we are preparing an analysis of the economic impacts of the proposed critical habitat designation and related factors.

We will announce the availability of the draft economic analysis as soon as it is completed. At that time, copies of the draft economic analysis will be available for downloading from the Internet at *http://www.regulations.gov,* or by contacting the Corpus Christi Ecological Services Fish and Wildlife Office directly (see **FOR FURTHER INFORMATION CONTACT**, above). During the development of a final designation, we will consider economic impacts, public comments, and other new information, and areas may be excluded from the final critical habitat designation under section 4(b)(2) of the Act and our implementing regulations at 50 CFR 424.19.

Exclusions Based on National Security Impacts

Under section 4(b)(2) of the Act, we consider whether there are lands owned or managed by the Department of Defense where a national security impact might exist.

In preparing this proposal, we have determined that the lands within the proposed designation of critical habitat for the Texas golden gladecress and the Neches River rose-mallow are not owned or managed by the Department of Defense. Therefore, we anticipate no impact on national security. Consequently, the Secretary does not propose to exert his discretion to exclude any areas from the final designation based on impacts on national security.

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. We consider a number of factors, including whether the landowners have developed any HCPs or other management plans for the area, or whether there are conservation partnerships that would be encouraged by designation of, or exclusion from, critical habitat. In addition, we look at any tribal issues, and consider the government-to-government relationship of the United States with tribal entities. We also consider any social impacts that might occur because of the designation.

Other Exclusions

We are not considering any exclusion at this time from the proposed designation under section 4(b)(2) of the Act based on partnerships, management, or protection afforded by cooperative management efforts. In preparing this proposal, we have determined that there are currently no HCPs or other management plans for the gladecress or the rose-mallow, and the proposed designations do not include any tribal lands or trust resources.

Peer Review

In accordance with our joint policy on peer review published in the **Federal Register** on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of peer review is to ensure that our critical habitat designation is based on scientifically sound data, assumptions, and analyses. We have invited these peer reviewers to comment during this public comment period on our proposed listing determination and designation of critical habitat for these species.

We will consider all comments and information received during this comment period on this proposed rule during our preparation of a final determination. Accordingly, the final decision may differ from this proposal.

Public Hearings

Section 4(b)(5) of the Act provides for one or more public hearings on this proposal, if requested. Requests must be received within 45 days after the date of publication of this proposed rule in the **Federal Register**. Such requests must be sent to the address shown in **FOR FURTHER INFORMATION CONTACT**. We will schedule public hearings on this proposal, if any are requested, and announce the dates, times, and places of those hearings, as well as how to obtain reasonable accommodations, in the **Federal Register** and local newspapers at least 15 days before the hearing.

Required Determinations

Regulatory Planning and Review—Executive Orders 12866 and 13563

Executive Order 12866 provides that the Office of Information and Regulatory Affairs (OIRA) in the Office of Management and Budget (OMB) will review all significant rules. The Office of Information and Regulatory Affairs has determined that this rule is not significant.

Executive Order 13563 reaffirms the principles of E.O. 12866, while calling for improvements in the nation's regulatory system to promote predictability, to reduce uncertainty, and to use the best, most innovative, and least burdensome tools for achieving regulatory ends. The executive order directs agencies to consider regulatory approaches that reduce burdens and maintain flexibility and freedom of choice for the public where these approaches are relevant, feasible, and consistent with regulatory objectives. 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 (SBREFA) of 1996 (5 U.S.C 801 *et seq.*), whenever an agency must 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 (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 a certification statement of the factual basis for certifying that the rule will not have a significant economic impact on a substantial number of small entities.

At this time, we lack the available economic information necessary to provide an adequate factual basis for the required RFA finding. Therefore, we defer the RFA finding until completion of the draft economic analysis prepared under section 4(b)(2) of the Act and Executive Order 12866. This draft economic analysis will provide the required factual basis for the RFA finding. Upon completion of the draft economic analysis, we will announce availability of the draft economic analysis of the proposed designation in the **Federal Register** and reopen the public comment period for the proposed designation. We will include with this announcement, as appropriate, an initial regulatory flexibility analysis or a certification that the rule will not have a significant economic impact on a substantial number of small entities accompanied by the factual basis for that determination.

We have concluded that deferring the RFA finding until completion of the draft economic analysis is necessary to meet the purposes and requirements of the RFA. Deferring the RFA finding in this manner will ensure that we make a sufficiently informed determination based on adequate economic information and provide the necessary opportunity for public comment.

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 when undertaking certain actions. We do not expect the designation of this proposed critical habitat to significantly affect energy supplies, distribution, or use. Therefore, this action is not a significant energy action, and no Statement of Energy Effects is required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

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 findings:

(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 do not 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. The majority of lands being proposed for critical habitat designation are owned by private landowners, although the Federal Government and the State of Texas own small portions. None of these government entities fit the definition of ''small governmental jurisdiction.'' Therefore, a Small Government Agency Plan is not required. However, we will further evaluate this issue as we conduct our economic analysis, and review and revise this assessment as warranted.

Takings—Executive Order 12630

In accordance with Executive Order 12630 (Government Actions and Interference with Constitutionally Protected Private Property Rights), we will analyze the potential takings implications of designating critical habitat for Texas golden gladecress and Neches River rose-mallow in a takings implications assessment. Critical habitat designation 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.

Federalism—Executive Order 13132

In accordance with Executive Order 13132 (Federalism), this proposed 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 proposed critical habitat designation with appropriate State resource agencies in Texas. The designation may have some benefit to these governments because the areas that contain the physical or biological features essential to the conservation of the species are more clearly defined, and the elements of the features of the habitat necessary to 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 local governments in long-range planning (rather than having them 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) would 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 the rule does not unduly burden the judicial system and that it meets the requirements of sections 3(a) and 3(b)(2) of the Order. We have proposed designating critical habitat in accordance with the provisions of the Act. This proposed rule uses standard property descriptions and identifies the elements of physical or biological features essential to the conservation of the Texas golden gladecress and Neches River rose-mallow within the designated areas to assist the public in understanding the habitat needs of the species.

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

This rule does not contain any new collections of information that require approval by OMB under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 *et seq.*). This rule will not impose recordkeeping or reporting requirements on State or local governments, individuals, businesses, or organizations. An agency may not conduct or sponsor, and a person is 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.)

We have determined that environmental assessments and environmental impact statements, as defined under the authority of the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 *et seq.*), need not be prepared under the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

It is our position that, outside the jurisdiction of the U.S. Court of Appeals for the Tenth Circuit, we do not need to prepare environmental analyses pursuant to NEPA in connection with designating critical habitat under the Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244). This position was upheld by the U.S. Court of Appeals for the Ninth Circuit (*Douglas County* v. *Babbitt,* 48 F.3d 1495 (9th Cir. 1995), cert. denied 516 U.S. 1042 (1996)).]

Clarity of the Rule

We are required by Executive Orders 12866 and 12988 and by the Presidential Memorandum of June 1, 1998, to write all rules in plain language. This means that each rule we publish must:

(1) Be logically organized;

(2) Use the active voice to address readers directly;

(3) Use clear language rather than jargon;

(4) Be divided into short sections and sentences; and

(5) Use lists and tables wherever possible.

If you feel that we have not met these requirements, send us comments by one of the methods listed in the **ADDRESSES** section. To better help us revise the rule, your comments should be as specific as possible. For example, you should tell us the numbers of the sections or paragraphs that are unclearly written, which sections or sentences are too long, the sections where you feel lists or tables would be useful, etc.

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 recognized Federal Tribes on a government-to-government basis. In accordance with Secretarial 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 determined that there are no tribal lands that are occupied by the gladecress or the rose-mallow that contain the features essential for conservation of either species, and no tribal lands unoccupied by the gladecress or the rose-mallow that are essential for the conservation of the species. Therefore, we are not proposing to designate critical habitat for the gladecress or the rose-mallow on tribal lands.

References Cited

A complete list of references cited in this rulemaking is available on the Internet at *http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0064 and upon request from the Corpus Christi Ecological Services Field Office (see **FOR FURTHER INFORMATION CONTACT**).

Authors

The primary authors of this package are the staff members of the Corpus Christi Ecological Services Field Office.

List of Subjects in 50 CFR Part 17

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

Proposed Regulation Promulgation

Accordingly, we propose to amend part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361–1407; 16 U.S.C. 1531–1544; 16 U.S.C. 4201–4245; Pub. L. 99–625, 100 Stat. 3500; unless otherwise noted.

2. Amend § 17.12(h) by adding entries for ''*Hibiscus dasycalyx''* and *''Leavenworthia texana''* to the List of Endangered and Threatened Plants in alphabetical order under ''Flowering Plants'', to read as follows:

§ 17.12 Endangered and threatened plants.

* * * * *

(h) * * *

Species		Historic range	Family	Status	When listed	Critical habitat	Special rules
Scientific name	Common name						
FLOWERING PLANTS							
*	*	*	*	*	*		*
Hibiscus dasycalyx	Neches River rose-mallow	U.S.A. (TX).	Malvaceae	T	.....	17.96(a)	NA
*	*	*	*	*	*		*
Leavenworthia texana	Texas golden gladecress ..	U.S.A. (TX).	Brassicaceae	E	.....	17.96(a)	NA
*	*	*	*	*	*		*

3. Amend § 17.96(a) by adding an entry for ''*Leavenworthia texana* (Texas golden gladecress)'' in alphabetical order under the family Brassicaceae and an entry for ''*Hibiscus dasycalyx* (Neches River rose-mallow)'' in alphabetical order under the family Malvaceae, to read as follows:

§ 17.96 Critical habitat—plants.

(a) *Flowering plants.*

* * * * *

Family Brassicaceae: *Leavenworthia texana* (Texas golden gladecress)

(1) Critical habitat units are depicted for San Augustine and Sabine Counties, Texas, on the maps below.

(2) Within these areas, the primary constituent elements of the physical or biological features essential to the conservation of *Leavenworthia texana* consist of the three primary constituent elements identified for the species:

(i) Exposed outcrops of the Weches Formation within Weches prairies. Within the outcrop sites, there must be bare, exposed bedrock on top-level surfaces or rocky ledges with small depressions where rainwater or seepage can collect. The prairie openings should support Weches Glade herbaceous plant communities.

(ii) Thin layers of rocky, alkaline soils, underlain by glauconite clay (greenstone, ironstone, bluestone), that are found only on the Weches Formation. Appropriate soils are in the series classifications Nacogdoches clay loam, Trawick gravelly clay loam, or Bub clay loam, ranging in slope from 1–15 percent.

(iii) The outcrop ledges should occur within the glade such that Texas golden gladecress plants remain unshaded for a significant portion of the day, and trees should be far enough away from the outcrop(s) that leaves do not accumulate within the gladecress habitat. The habitat should be relatively clear of nonnative and native invasive plants, especially woody species, or with only a minimal level of invasion.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, well pads, metering stations, other paved areas, or unpaved roads) and the land on which they are located, existing within the legal boundaries on [DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE].

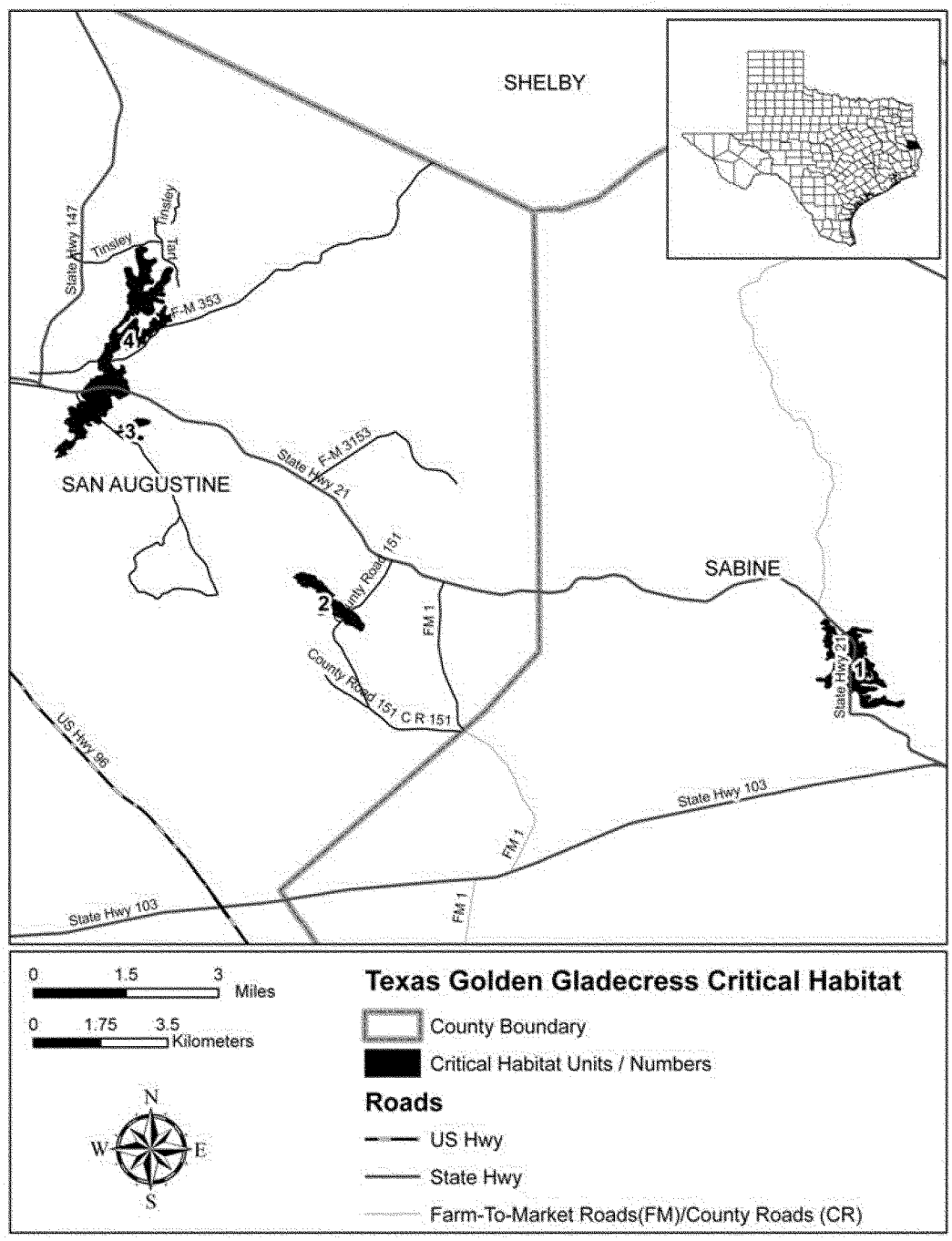
(4) *Critical habitat map units.* Soil Survey Geographic Dataset (SSURGO) was used as a base map layer. SSURGO is an updated digital version of the National Resource Conservation Service (NRCS) county soil surveys. SSURGO uses recent digital orthophotos and fieldwork to update the original printed surveys. Data layers defining map units were created using the Texas golden gladecress' restriction to the Weches Formation and its tight association with the three soil map units: Nacogdoches clay loam 1–5 percent slope, Trawick gravelly clay loam 5–15 percent slope, or Bub clay loam 2–5 percent slope. In San Augustine and Sabine Counties, these soil types are restricted to the Weches Formation. Locations of all known gladecress populations, as well as potential glade sites, were overlaid on the three aforenamed soil mapping units from the San Augustine and Sabine County's soils survey. Potential glade sites were identified using soil map units and a time series of aerial photographs that depicted changes in land cover. 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 each map is based are available to the public at the Service's internet site, at *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm, http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0064 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 follows:

BILLING CODE 4310–55–P

Index Map

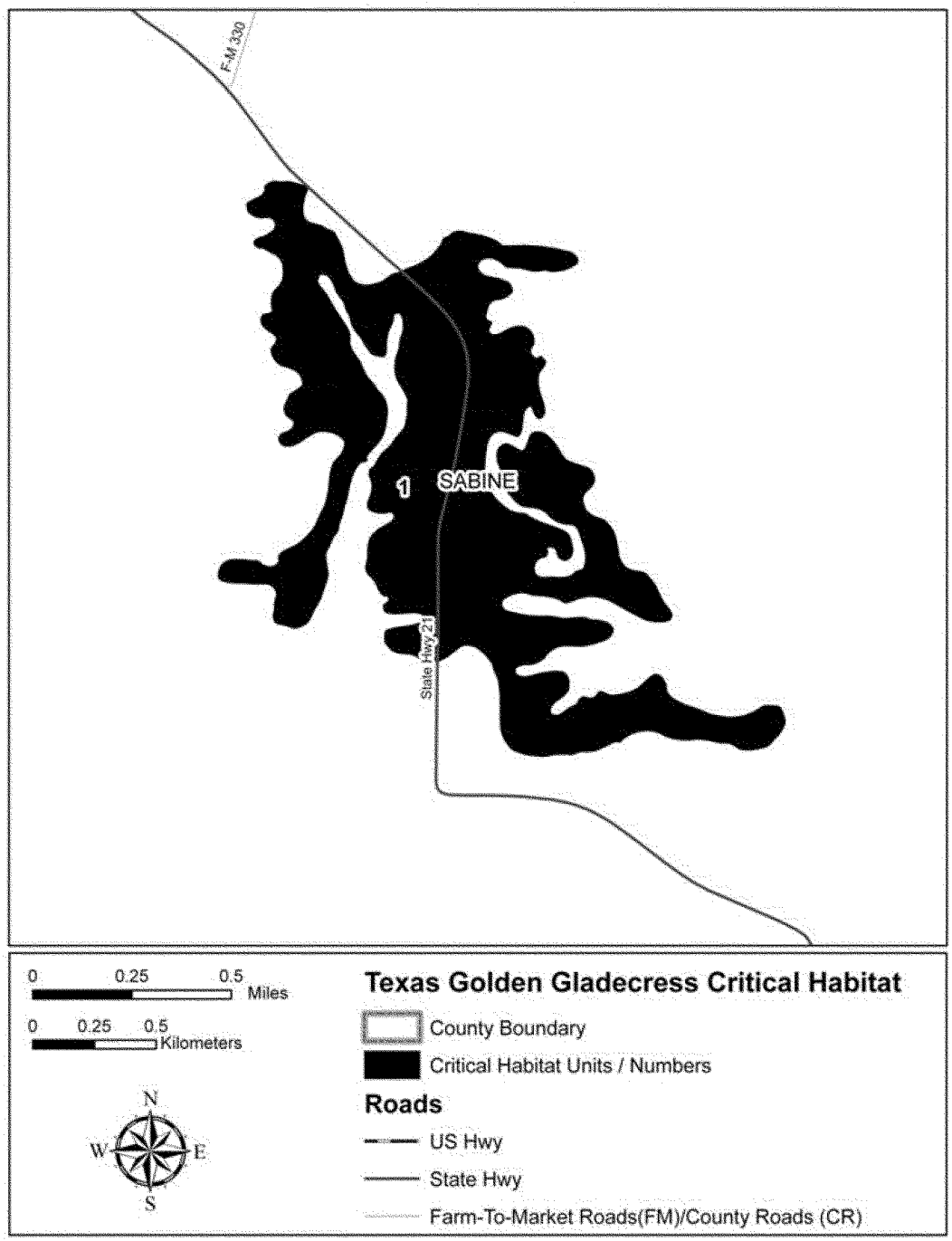
Critical Habitat for *Leavenworthia texana* (Texas golden gladecress)



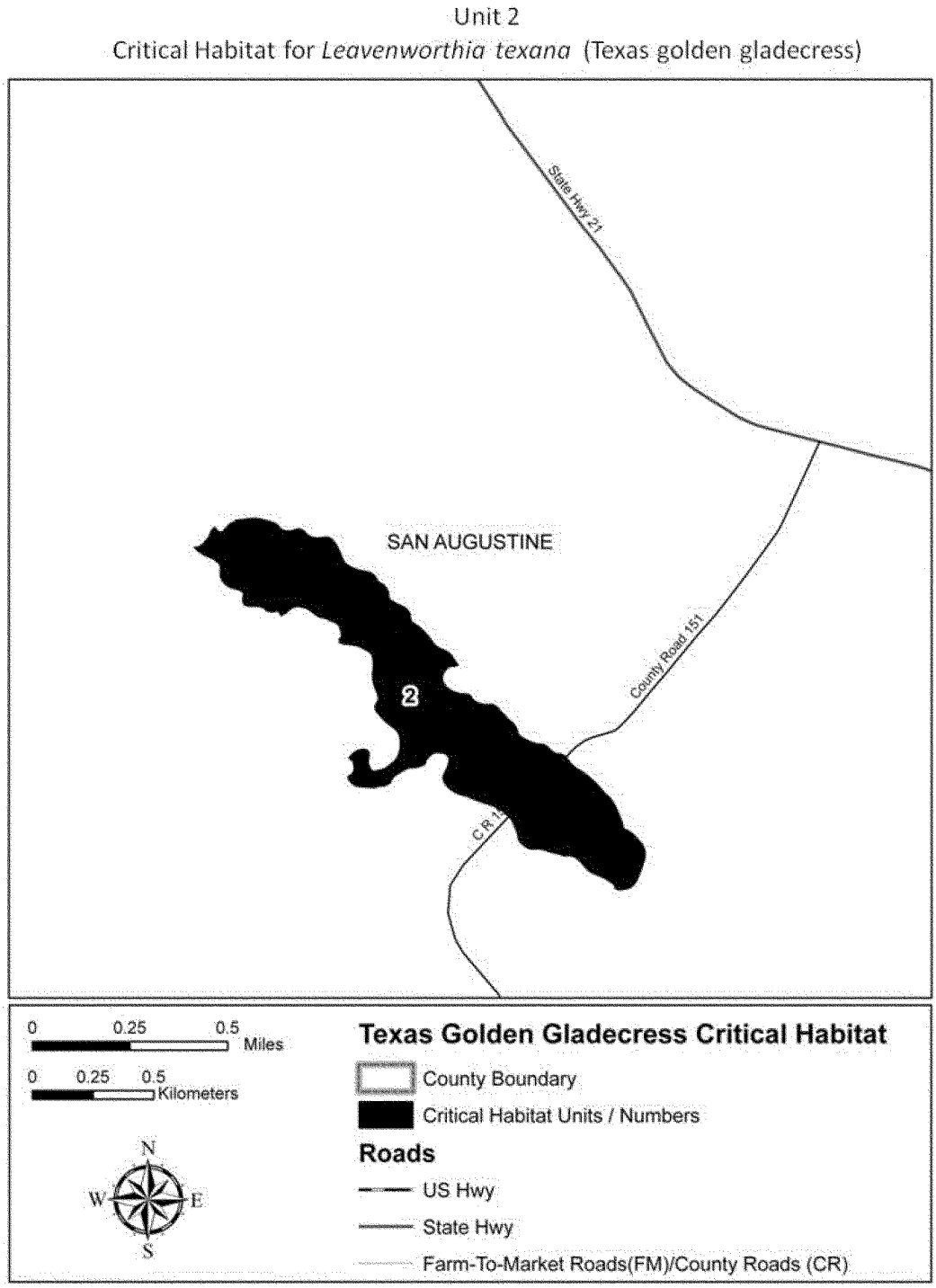
(6) Unit 1: Geneva Unit, Sabine County, Texas. Map of Unit 1 follows:

Unit 1

Critical Habitat for *Leavenworthia texana* (Texas golden gladecress)



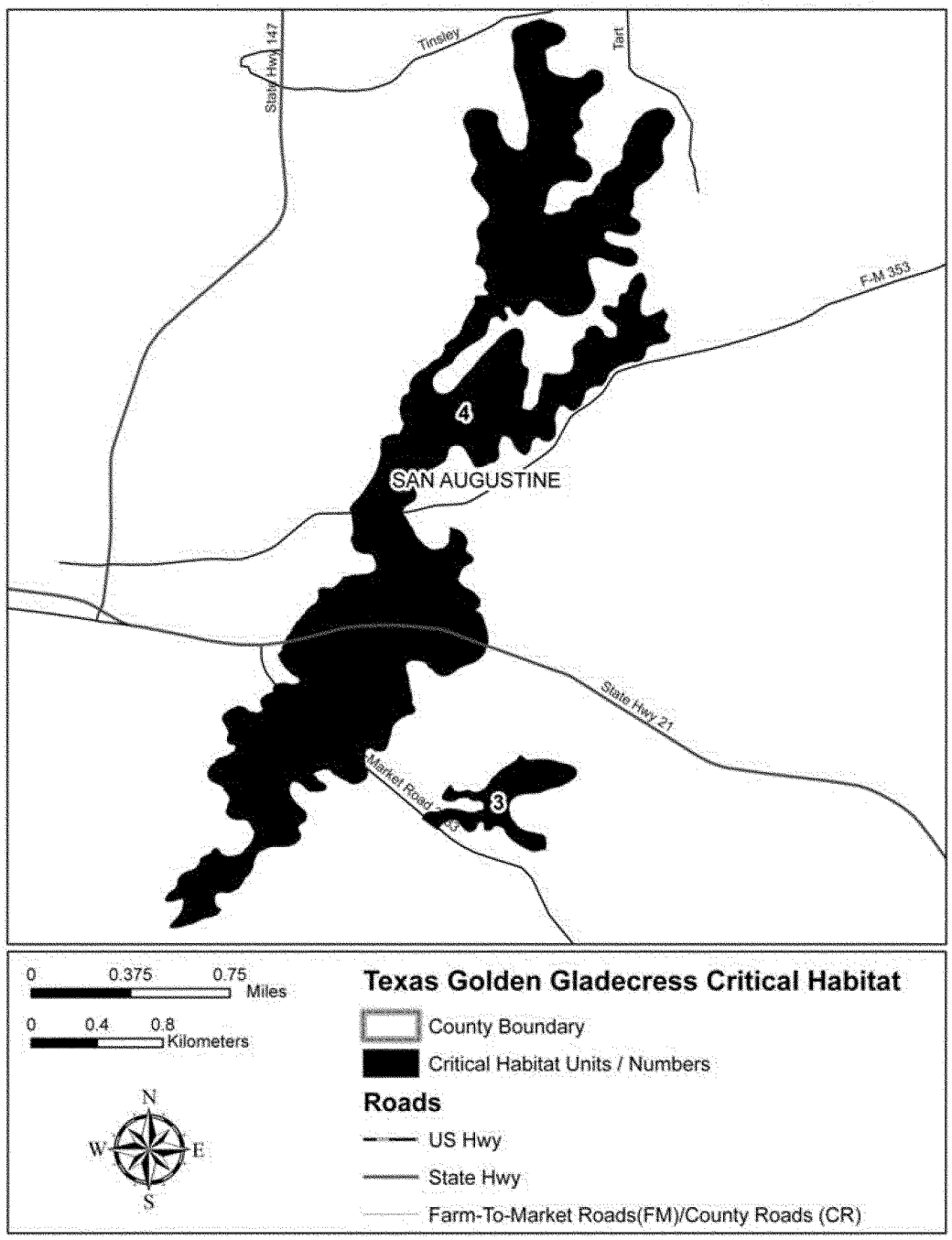
(7) Unit 2: Chapel Hill, San Augustine County. Map of Unit 2 follows:



(10) Unit 3: Southeast Caney Creek Glades, San Augustine County, Texas. Map of Units 3 and 4 follows:

Units 3 & 4

Critical Habitat for *Leavenworthia texana* (Texas golden gladecress)



BILLING CODE 4310–55–C

(11) Unit 4: Northwest Caney Creek Glades, San Augustine County, Texas. Map of Unit 4 is depicted in paragraph (10) of this entry.

* * * * *

Family Malvaceae: *Hibiscus dasycalyx* (Neches River rose-mallow)

(1) Critical habitat units are depicted for Cherokee, Harrison, Houston, Nacogdoches, and Trinity Counties, Texas, on the maps below.

(2) Within these areas, the primary constituent element of the physical or biological features essential to the conservation of *Hibiscus dasycalyx* is intermittent or perennial wetlands within the Neches River floodplains or Mud and Tantabogue Creek basins that contain:

(i) Hydric alluvial soils and flowing water when found in depressional sloughs, oxbows, terraces, side channels, or sand bars; and

(ii) Native woody or associated herbaceous vegetation that has an open canopy providing partial to full sun exposure without nonnative species.

(3) Critical habitat does not include manmade structures (such as buildings, aqueducts, runways, roads, ROWs, and other paved areas) and the land on which they are located existing within the legal boundaries on [DATE 30 DAYS AFTER THE DATE OF PUBLICATION OF THE FINAL RULE].

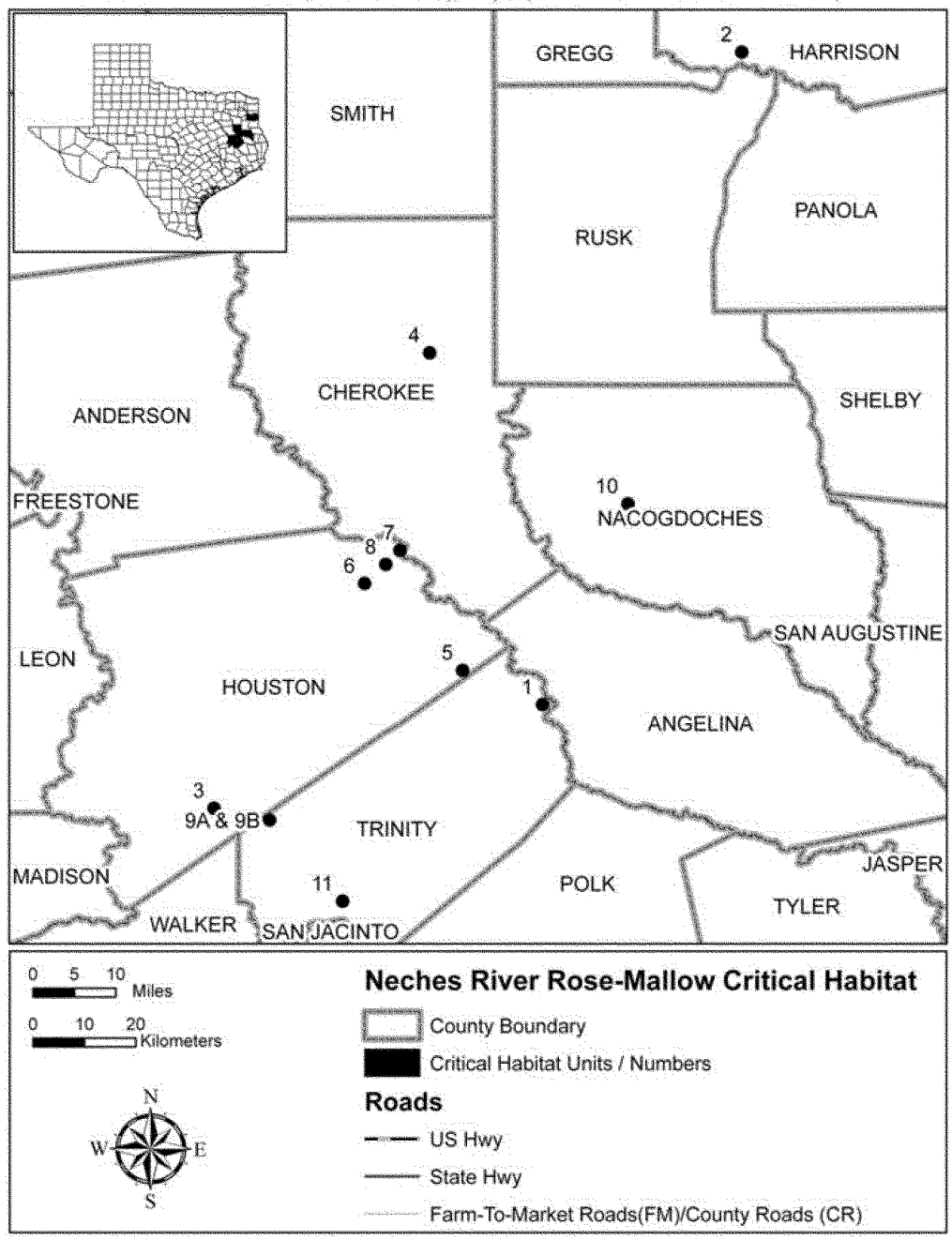
(4) *Critical habitat map units.* Data layers defining map units were created on a base of Strategic Mapping Program (StratMap) digital orthophoto quarter-quadrangles (DOQQs), with layers for boundaries and roads. The Service's National Wetlands Inventory maps for the appropriate USGS quads were also downloaded as layers. Critical habitat units were mapped using Geographic Coordinate System (GCS), North American, 1983. 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 each map is based are available to the public at the Service's internet site, at *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm, http://www.regulations.gov* at Docket No. FWS–R2–ES–2012–0064 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 follows:

BILLING CODE 4310–55–P

Index Map

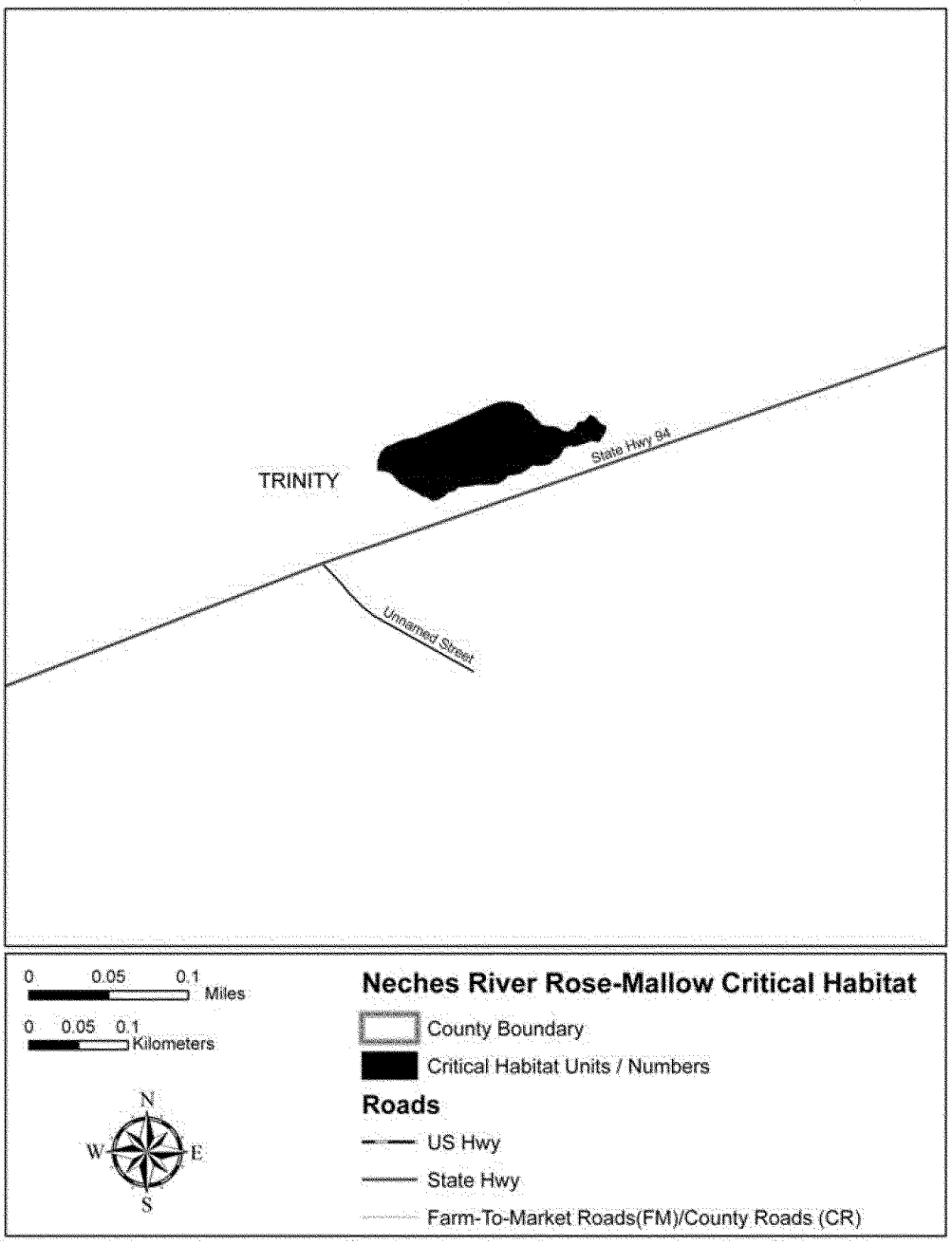
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(6) Unit 1: Highway 94 ROW, Trinity County, Texas. Map of Unit 1 follows:

Unit 1

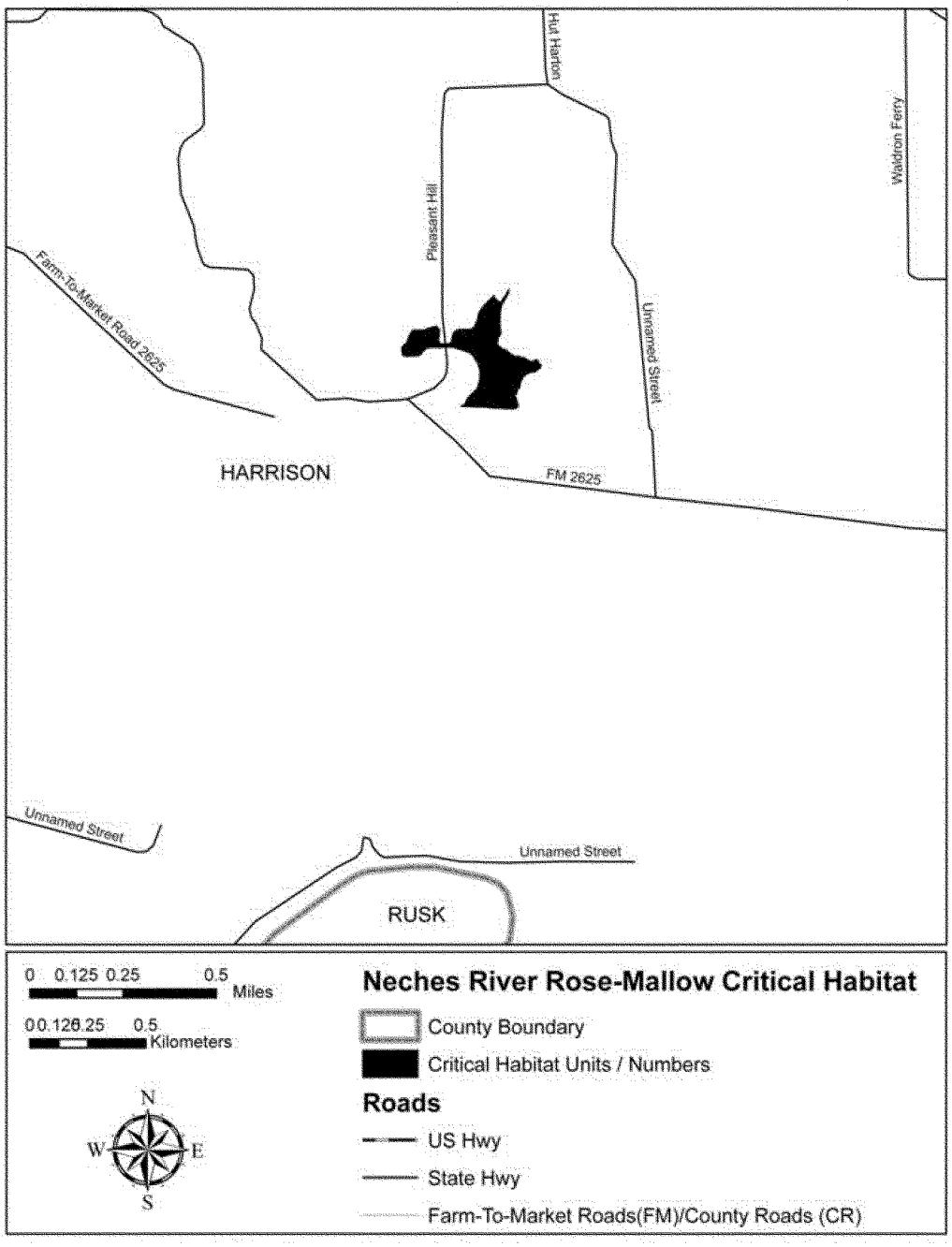
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(7) Unit 2: Harrison site, Harrison County, Texas. Map of Unit 2 follows:

Unit 2

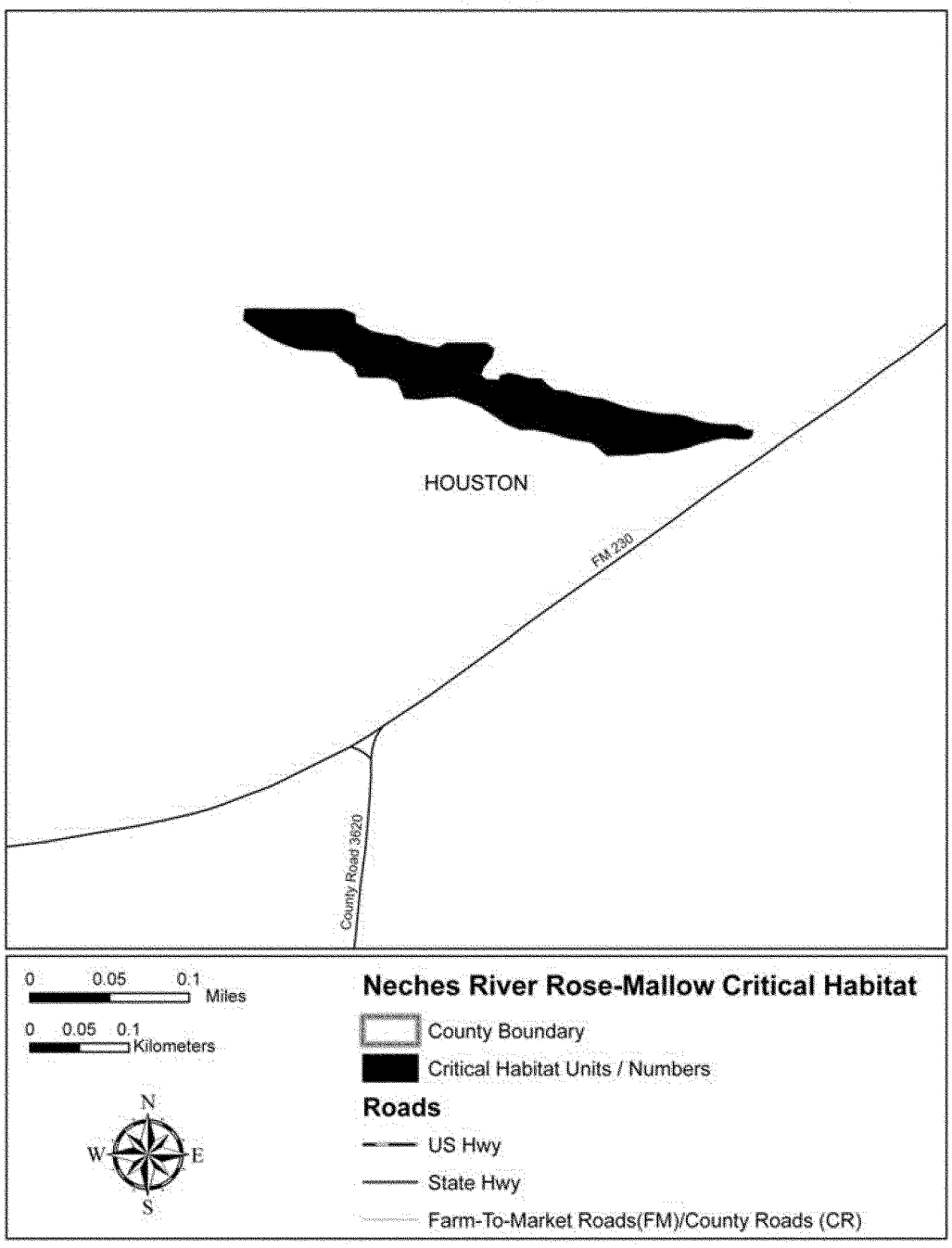
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(8) Unit 3: Lovelady, Houston County, Texas. Map of Unit 3 follows:

Unit 3

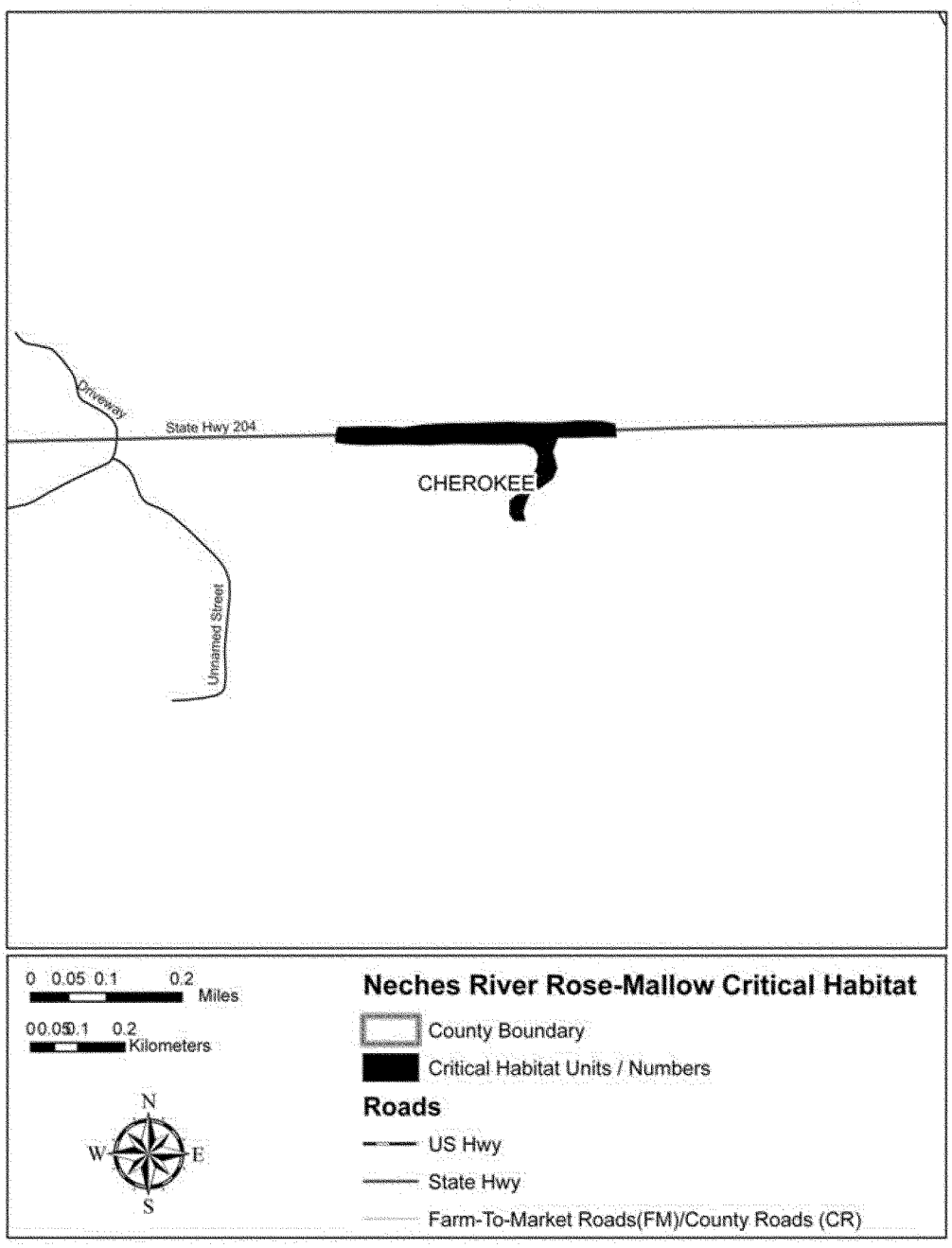
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(9) Unit 4: Highway 204 ROW, Cherokee County, Texas. Map of Unit 4 follows:

Unit 4

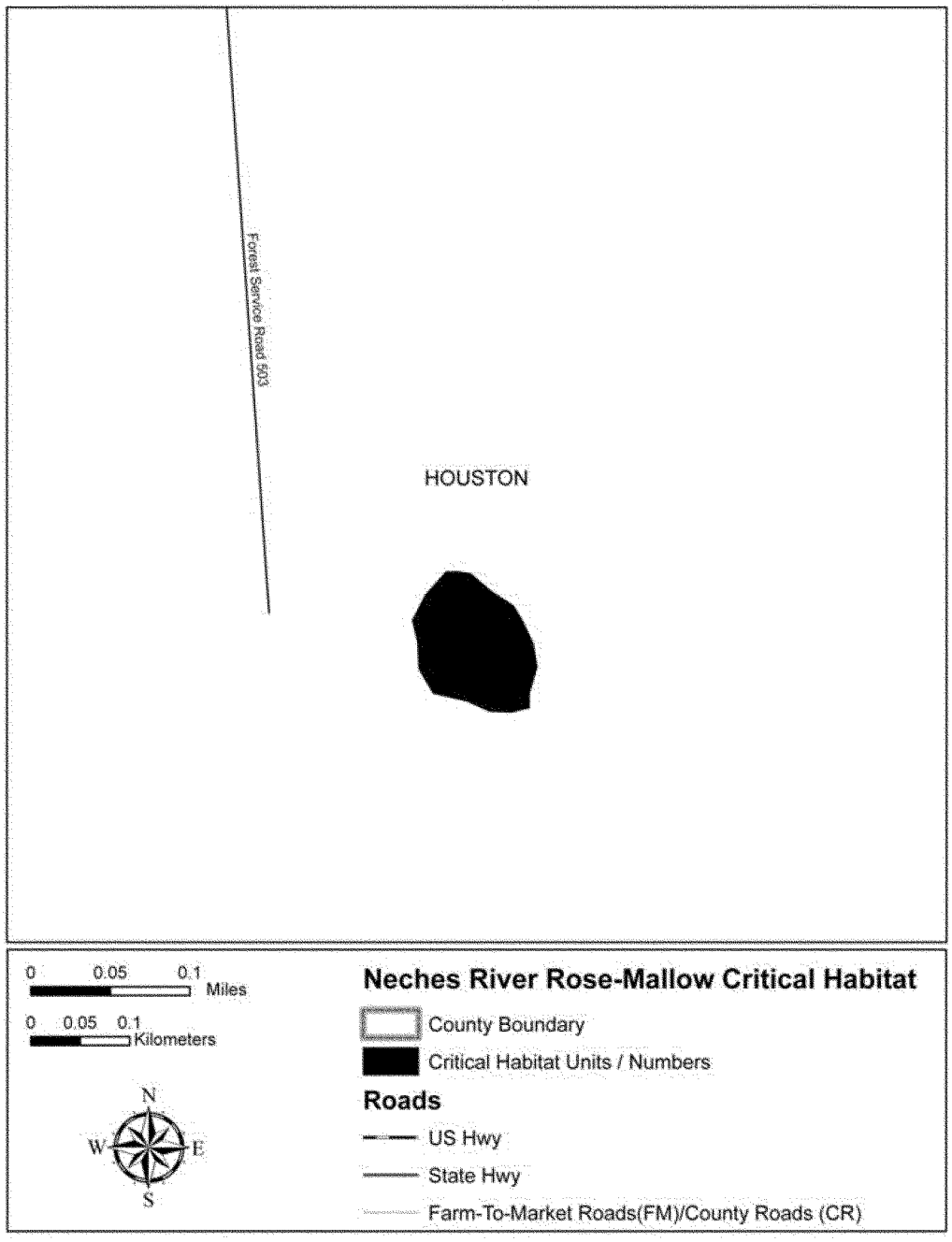
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(10) Unit 5: Davy Crockett National Forest, compartment 55, Houston County, Texas. Map of Unit 5 follows:

Unit 5

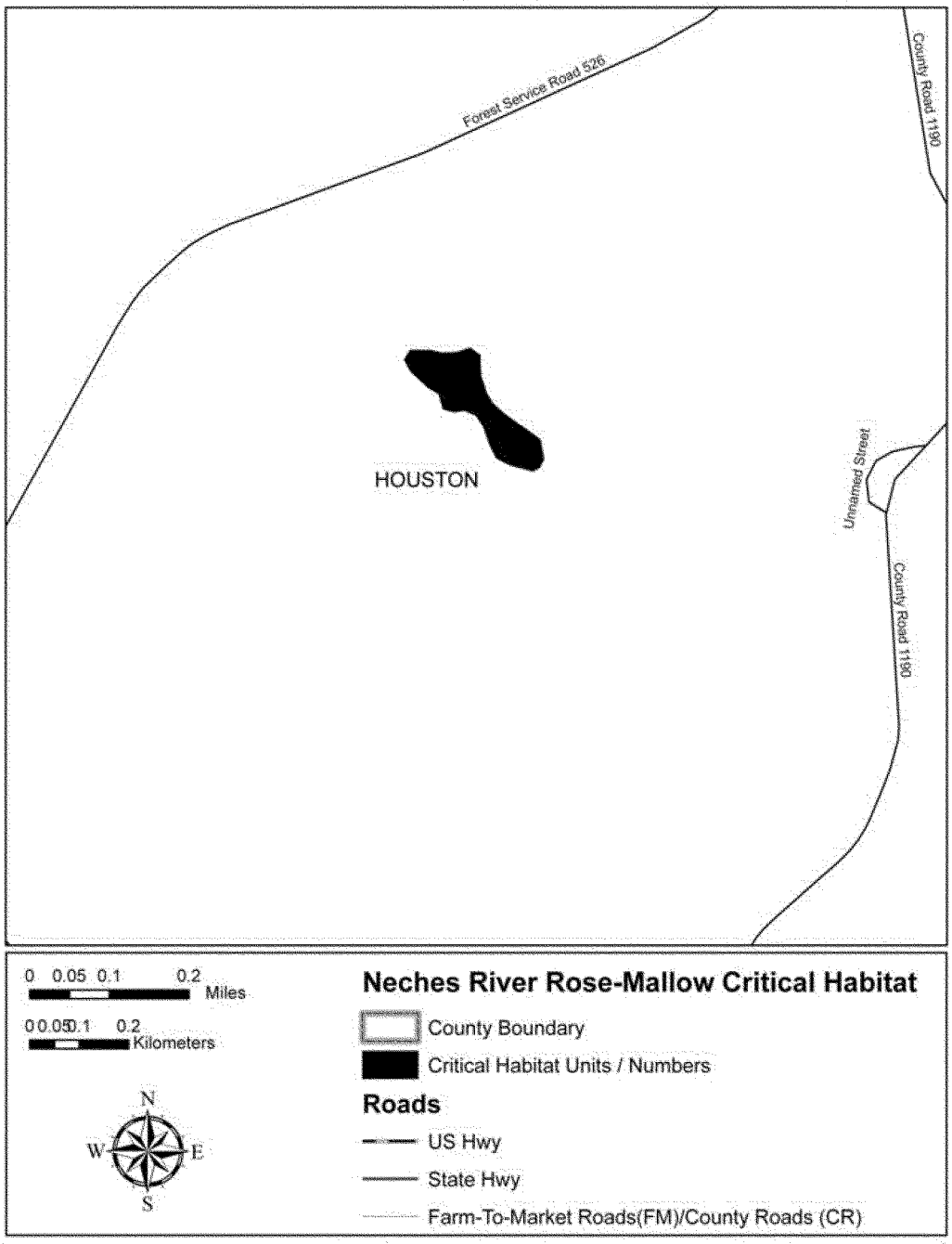
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(11) Unit 6: Davy Crockett NF, compartment 11, Houston County, Texas. Map of Unit 6 follows:

Unit 6

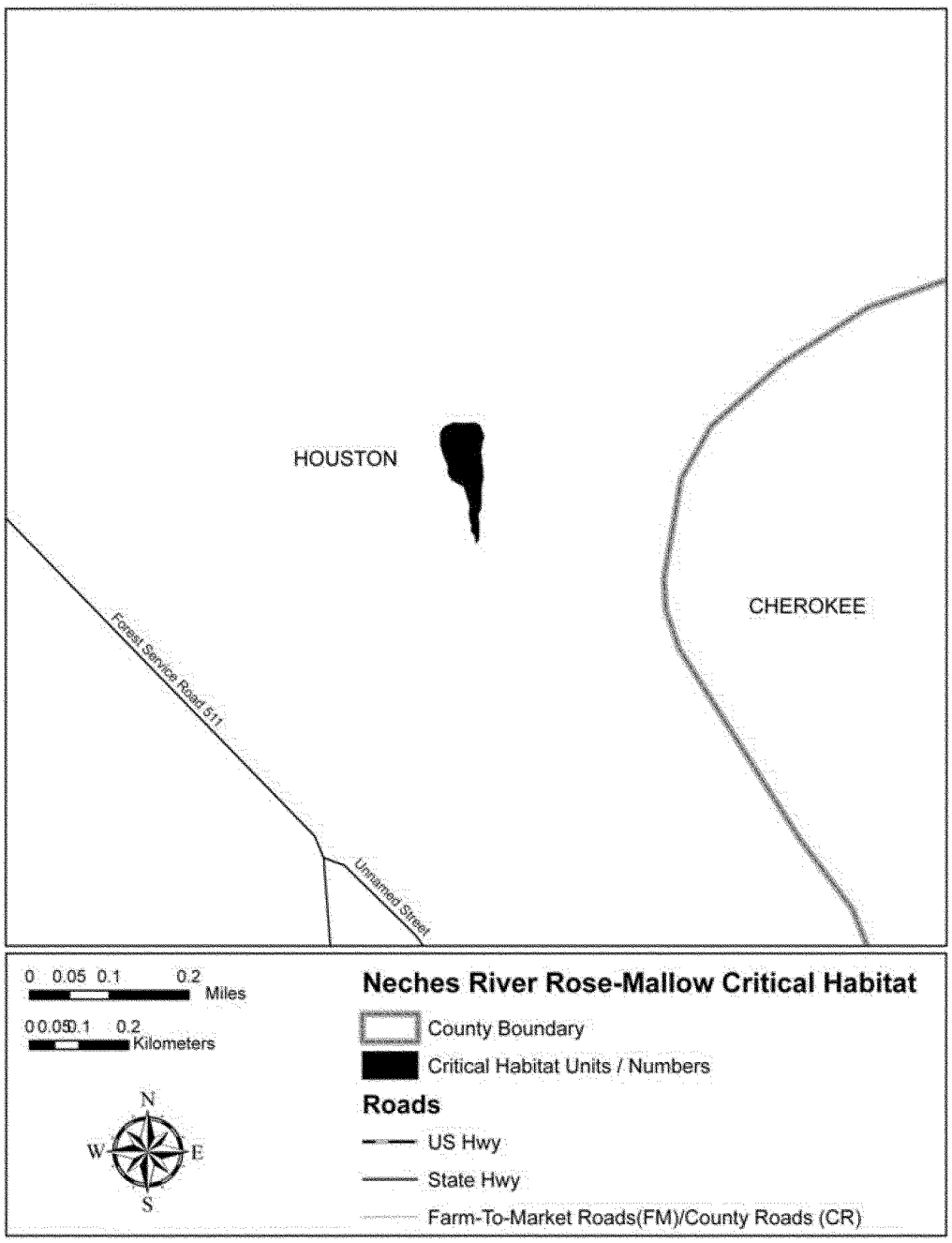
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(12) Unit 7: Davy Crockett NF, compartment 20, Houston County, Texas. Map of Unit 7 follows:

Unit 7

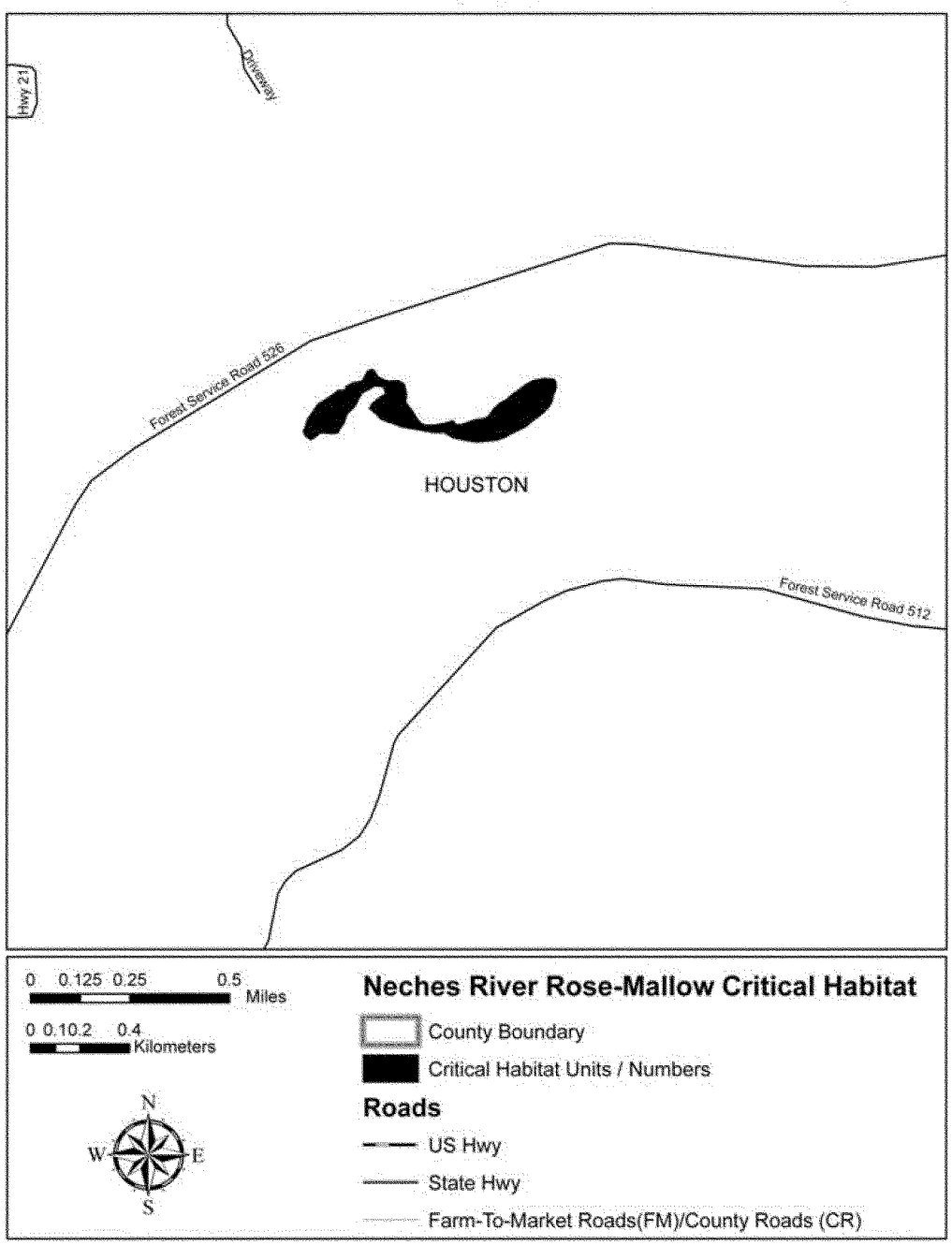
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



(13) Unit 8: Davy Crockett NF, compartment 16, Houston County, Texas. Map of Unit 8 follows:

Unit 8

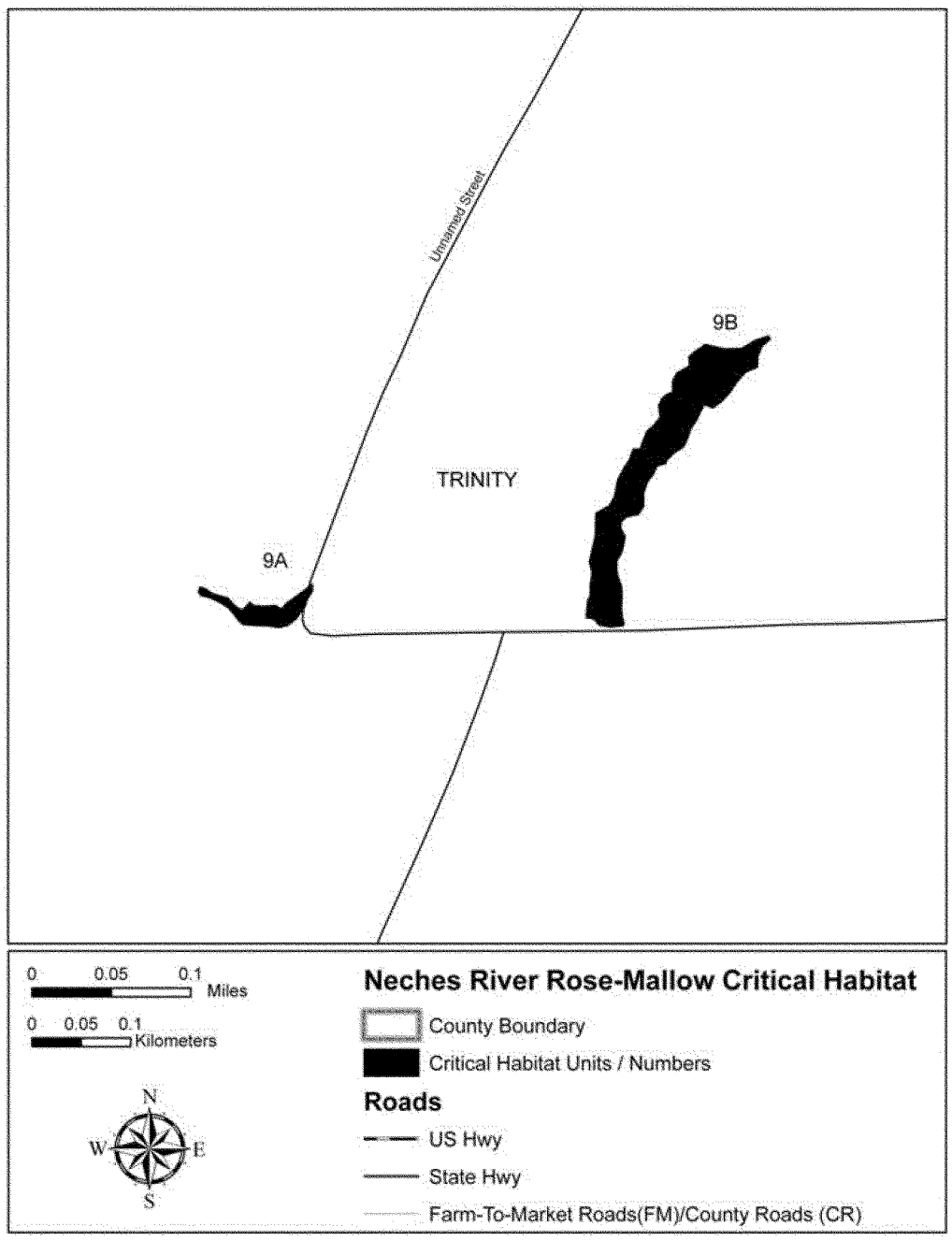
Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



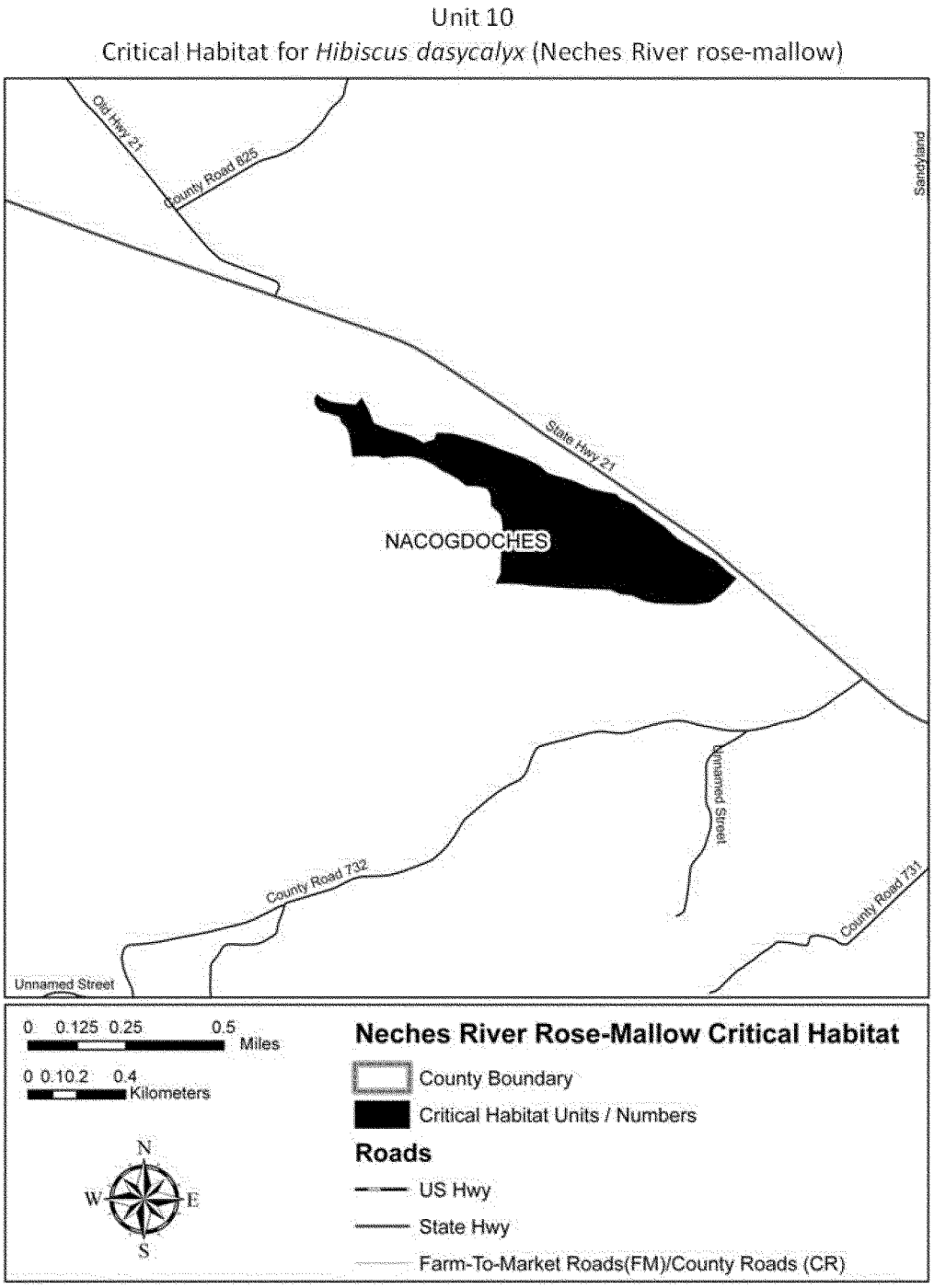
(14) Unit 9: Champion site, Trinity County, Texas. Map of Unit 9 follows:

Units 9A & 9B

Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



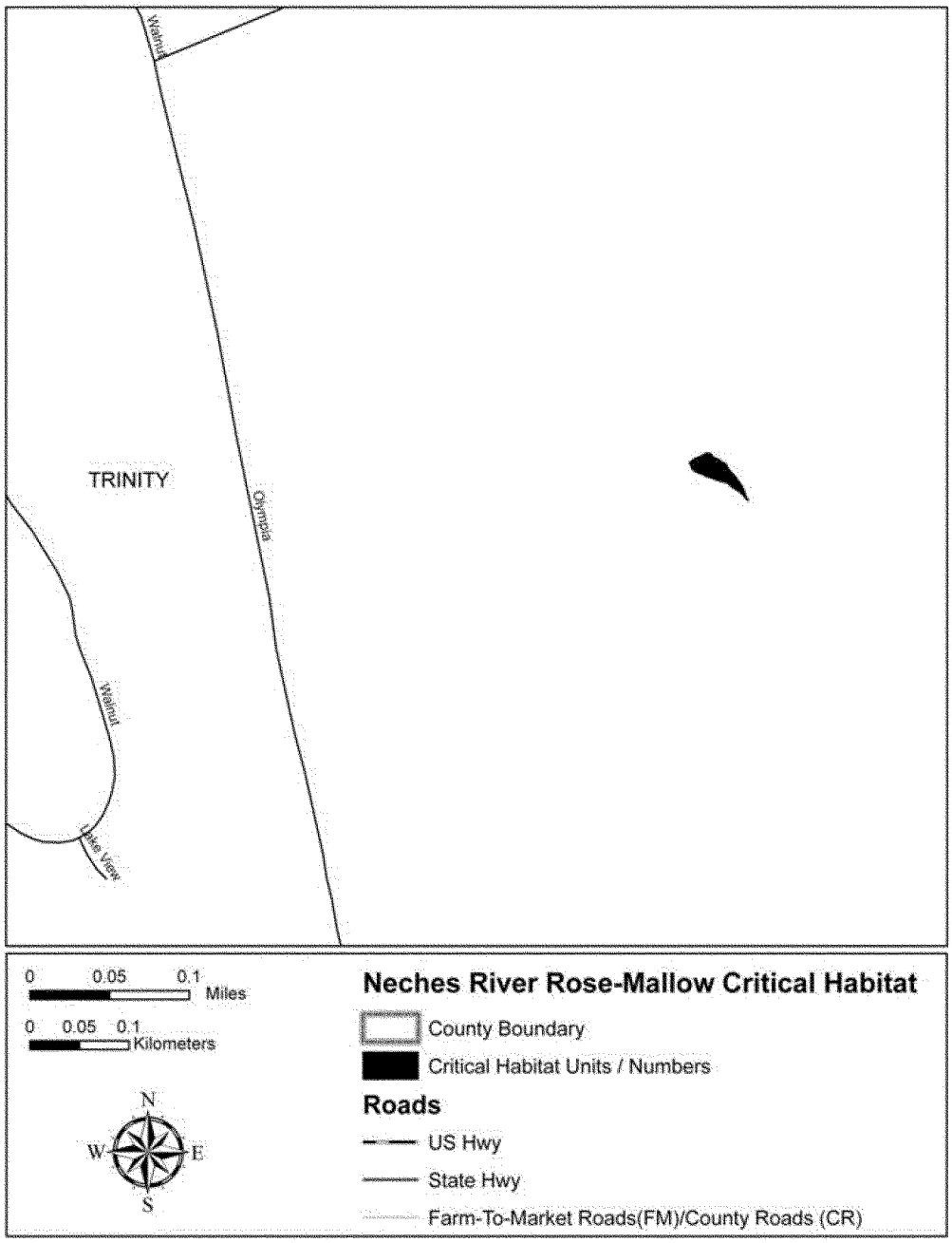
(15) Unit 10: Mill Creek Gardens, Nacogdoches County, Texas. Map of Unit 10 follows:



(16) Unit 11: Camp Olympia, Trinity County, Texas. Map of Unit 11 follows:

Unit 11

Critical Habitat for *Hibiscus dasycalyx* (Neches River rose-mallow)



* * * * *

Dated: August 28, 2012.

Michael J. Bean,

Acting Principal Deputy Assistant Secretary for Fish and Wildlife and Parks.

[FR Doc. 2012–22061 Filed 9–10–12; 8:45 am]

BILLING CODE 4310–55–C