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Endangered and Threatened Wildlife and Plants; Determination of Endangered Status for Texas Golden Gladecress and Threatened Status for Neches River Rose-Mallow; Final 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 Endangered Status for Texas Golden Gladecress and Threatened Status for Neches River Rose-Mallow

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: We, the U.S. Fish and Wildlife Service, determine *Leavenworthia texana* (Texas golden gladecress) meets the definition of an endangered species and *Hibiscus dasycalyx* (Neches River rose-mallow) meets the definition of a threatened species under the Endangered Species Act of 1973, as amended (Act). This final rule adds these species to the List of Endangered and Threatened Plants and implements the Federal protections provided by the Act for these species.

DATES: This rule is effective on October 11, 2013.

ADDRESSES: This final rule and other supplementary information are available on the Internet at *http://www.regulations.gov* (Docket No. FWS–R2–ES–2012–0064), *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm*, or *http://www.fws.gov/southwest/es/ClearLakeTexas/*. These documents, as well as all supporting information are also available for public inspection, by appointment, during normal business hours at, or by requesting electronic copies from: U.S. Fish and Wildlife Service, Texas Coastal Ecological Services Field Office, 6300 Ocean Drive, Unit 5837, Corpus Christi, TX 78412–5837; by telephone at 361–994–9005; or by facsimile at 361–994–8262.

FOR FURTHER INFORMATION CONTACT: Edith Erfling, Field Supervisor, U.S. Fish and Wildlife Service, Texas Coastal Ecological Services Field Office (see **ADDRESSES**); by telephone 281–286–8282; or by facsimile 281–488–5882. 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. On September 11, 2012 (77 FR 55968), we published a proposed rule to list *Leavenworthia texana* (Texas golden gladecress) as an endangered species and *Hibiscus dasycalyx* (Neches River rose-mallow) as a threatened species. In this rule, we are finalizing our proposed determinations for these species under the Act. The Act requires that a final rule be published in order to add any plant species to the List of Endangered and Threatened Plants and to provide that species protections under the Act. We are publishing a final rule on the designation of critical habitat for the Texas golden gladecress and the Neches River rose-mallow under the Act elsewhere in today's **Federal Register**. The critical habitat designation final rule and its supporting documents will publish under Docket No. FWS–R2–ES–2013–0027, and can also be found at the locations listed in the **ADDRESSES** section of this rule.

The basis for our action. Under the Act, a species may be determined to be endangered or threatened 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; or (E) other natural or manmade factors affecting its continued existence.

We have determined that the Texas golden gladecress meets the definition of an endangered species due to the following threats:

- In some cases, a total loss of habitat and plants, and in others a degradation of the herbaceous glade plant communities supporting the Texas golden gladecress. Activities or factors that continue to negatively impact the habitat of the Texas golden gladecress include glauconite quarrying; natural gas and oil exploration, production, and distribution; 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; herbicide applications that have potential to kill emerging seedlings; and the installation of service improvements, including water and sewer lines, domestic gas lines, or electric lines.
- The inadequacy of existing regulatory mechanisms to protect the Texas golden gladecress or its habitats.
- Other natural or manmade factors, including low numbers of individual plants and few remaining populations.
- The above threats are likely exacerbated by climate change.

We have determined that the Neches River rose-mallow meets the definition of a threatened species due to the following threats:

- Habitat loss and degradation of open habitats on hydric alluvial soils along sloughs, oxbows, terraces, and wetlands of the Neches, Sabine, and Angelina River basins and Mud Creek and Tantabogue Creek basins that support the Neches River rose-mallow. The Neches River rose-mallow's habitat is being lost and degraded by encroachment of nonnative and native plant species, particularly trees; herbicide use; livestock and hog trampling; and alteration of the natural hydrology associated with 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.
- Inadequacy of existing regulatory mechanisms to protect the Neches River rose-mallow or its habitats.
- The above threats are likely exacerbated by climate change.

Peer review and public comment. We sought comments from six independent specialists to ensure that our designation is based on scientifically sound data and analyses. We obtained opinions from four knowledgeable individuals with scientific expertise to review our technical assumptions and analysis, and to determine whether or not we had used the best available information. The peer reviewers generally agreed with portions of our assessment, including the threats analysis, and most of our conclusions, although they pointed out areas where additional research would refine our understanding of the two species' habitat requirements and range. The peer reviewers pointed out additional information, clarifications, and suggestions for future research that would inform future surveys to refine the geographic range, and help with management and recovery efforts. Information we received from peer review is incorporated in this final revised designation. We also considered all comments and information we received from the public during the comment periods.

Previous Federal Actions

On September 11, 2012 (77 FR 55968), we published a proposed rule to list the Texas golden gladecress as endangered and the Neches River rose-mallow as threatened, both with critical habitat. On April 16, 2013 (78 FR 22506), we reopened public comment period on the

proposed rule. On May 1, 2013, we held a public hearing to accept oral and written comments on the proposals.

We are publishing a final rule on the designation of critical habitat under the Act (16 U.S.C. 1531 *et seq.*) for the Texas golden gladecress and the Neches River rose-mallow elsewhere in today's **Federal Register**.

Background

Species Information

It is our intent to discuss below only those topics directly relevant to the listing of the Texas golden gladecress as endangered, and the Neches River rose-mallow as threatened, in this final rule. Species information for the Texas golden gladecress and Neches River rose-mallow can also be found in the September 11, 2012 (77 FR 55968), proposed rule.

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.* E. J. Palmer (1915 and 1918), and D. S. and H. B. Correll (1961 to 1962) as cited by Mahler (1981, pp. 83) made later collections of the plant in the San Augustine area. George and Nixon (1990, pp. 117–127) studied and mapped populations in this area between 1979 and 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 (Nixon 1987, 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 to 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 uplands that are forested by pine dominated woodlands, interspersed with bottomland, mesic slope, and bald cypress-tupelo swamp forests. Water oak and willow oak are prominent in the large stream floodplains, while some ancient sloughs are fringed by planer tree and overcup oaks (Dolezel 2012, pers. comm.). Many of the rare plants of the Pineywoods region, including the Texas golden gladecress and the federally endangered *Lesquerella pallida* (=*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).

Based on all documented occurrence records, the Texas golden gladecress is endemic to glade habitats in northern San Augustine and northwest Sabine Counties, Texas, where it 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. Within the Weches Formation glades, gladecress habitat occurs on thin soils that overlie calcium-rich parent materials where the calcium is derived from a myriad of fossilized, calcium-dominated oyster shells and other marine life (Dolezel 2012, pers. comm., p. 1).

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 square miles (mi^2) (1 square kilometer (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 Eocene-age deposits that lie mostly in an east-west band of ancient marine sediments. These sediments were deposited in a line roughly parallel to the Gulf of Mexico, running from Sabine to Frio Counties, Texas. The Weches Formation also extends over 100 miles to the north of Nacogdoches County into Smith, Wood, Upshur, Marion, and Cass Counties, Texas, and even into Miller County, Arkansas

(Godwin 2012, pers. comm., p. 2). 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 (United States Department of Agriculture 2009, entire).

Within the known range of the Texas golden gladecress, 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, pp. 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 *Eleocharis 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 Texas golden gladecress's 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, 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) a thick growth of the invasive, nonnative shrub, *Rosa bracteata* (Macartney rose) was removed in 1995. Post-brush removal, the Texas golden 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 United States 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. Even so, the presence of other flowering plants at gladecress sites could help to attract and maintain a reservoir of potential pollinators, thereby increasing the chances for the gladecress to be cross-pollinated. This would benefit the species by potentially providing, or maintaining, a higher level of genetic diversity.

Distribution and Status

Texas golden gladecress is known from eight locations (historic and extant), 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 Glade Site 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	By 2001, was less than 100 ft^2 (9 m^2).	Private & State ROW.
San Augustine	Chapel Hill (also known as Tiger Creek).	Extant	Tract on which Texas golden gladecress was found was less than 0.25 ac (0.1 ha).	Private.
Sabine	Geneva	Extant	Size of site was ~ 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 ~ 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 ~ 3 ac (1.21 ha)	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 (Caney Creek Glade 1, Chapel Hill, Geneva, and Simpson Farms) were present through 2009, the last year that the plants were surveyed and counted (Singhurst 2011a, pers. comm.). In October 2011, Service and Texas Parks and Wildlife Department (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 in October 2011 (Cobb 2011, pers. comm.), and the presence of the plants themselves was subsequently observed at the three accessible sites in February 2012 (Singhurst 2012f, p. 1).

Three San Augustine County occurrences (Caney Creek Glade Sites 2, 6, and 8) were believed extirpated, at least in large part, by construction of glauconite mines (open pits) beginning in the late 1990s. 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 Caney Creek Glade 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.

For Caney Creek Glade Site 7, the last TXNDD (2012b, unpaginated) element of occurrence record was from 1988, a time when the presence of Texas golden gladecress was confirmed at the site. The site was visited by a forestry consultant in 1996, who described the glade as being intact at that time. This individual revisited the site in 2000, and found invasive woody plants encroaching into the glade (Walker 2012, p. 4). There were no further site visits due to lack of access to this privately owned tract. Satellite images taken as recently as 2008 show this 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 (Service 2010a, 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 through it. This represents a loss of 65 percent of the known plants. After 2009, approximately 400 plants in three populations were all that remained of this species. The number of Texas golden gladecress plants fluctuated widely from year to year, likely due to differences in precipitation levels between years. The Texas golden 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 Caney Creek Glade Site 1 decreased from 490 to 96 plants (Service 2010a, p. 5).

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

Year	Chapel Hill	Caney Creek Glade 1	Geneva	Simpson Farms
1999	91	490	319	*NS
2000	67	96	NS	NS
2001	96	520	NS	270

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

Year	Chapel Hill	Caney Creek Glade 1	Geneva	Simpson Farms
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 Texas golden 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 (Singhurst 2009, p. 1) 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 Caney Creek Glade 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 Caney Creek Glade Site 1 is less than 100 feet squared (ft^2) (9 meters squared (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 Texas golden 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 Texas golden 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, and 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 Texas golden gladecress and white bladderpod occurrence in the San Augustine glades. The San Augustine glades were delineated by TNC as a subset of the Weches glades for purposes of developing an area conservation plan. The San Augustine glades are located in north-central and northeastern San Augustine County. TNC was granted access to 14 of the 44 sites, but found little Weches glade habitat, and no new Texas golden gladecress or white bladderpod sites (Turner 2003, in Service 2010a, p. 3).

Conservation

The Texas golden gladecress was included as a nested element within the Coastal Plain Carbonate Glades conservation element of the San Augustine Glades Area Conservation Plan developed by TNC of Texas in 2003 (TNC 2003, entire). This plan was envisioned to provide guidance for the conservation and restoration of a network of ecologically functional forests and glades along the Weches Geological Formation in San Augustine County. The plan was generated through TNC's structured conservation planning process, which relied on a science team with expertise in east Texas flora and habitats, including members from academia, botanical institutions, and Federal and State agencies. The conservation planning process concluded that at least 8 viable (self-sustaining, ecologically functioning) populations of Texas golden gladecress, containing an average of 500 individual plants each, at least 1 out of every 5 years, was the target conservation goal for the species (TNC 2003, pp. 8, 12).

Neches River Rose-Mallow

Taxonomy and Description

Hibiscus dasycalyx (Neches River rose-mallow) (Blake and Shiller) 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). The Neches River rose-mallow generally produces a single creamy white (rarely pink) flower at the base of the leaf stalks along the uppermost branches or stems (Blanchard 1976, pp. 27–28; Warnock 1995, p. 2; Poole *et al.* 2007, pp. 264–265). Because the plants are single to multi-stemmed and each branch or stem can have numerous leaves, the total number of flowers per plant can number in the hundreds (Poole 2013b, pers. comm.). Flowering occurs 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). Large and numerous stamens are monodelphous, forming a tube that is united with the base of the petals (Klips 1999, p. 270).

The Neches River rose-mallow was first collected by Ivan Shiller on June 23, 1955, at the type locality at SH 94 (also referred to as Apple Springs), Trinity County, Texas, and it was later recognized it as a distinct species (Correll and Johnston 1979, pp. 1030–1031). Blake (1958, p. 277) determined that the Neches River 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 (all in Warnock 1995, pp. 1–2; Poole 2002, pers. comm.) all recognized the Neches River rose-mallow as a distinct species.

Two similar-looking *Hibiscus* species, *H. laevis* (halberdleaf rose-mallow) and *H. moscheutos* (crimsoneyed or wooly rose-mallow) are wetland species documented in areas where the Neches River rose-mallow occurs. 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). Similar to *H. moscheutos,* the Neches River rose-mallow has a hairy calyx but with larger, spreading hairs rather than a covering of small, short hairs (Warnock 1995, pp. 2–3).

Geographically, these three species can be found within similar habitats, but the halberdleaf and the crimsoneyed rose-mallows prefer areas near deeper water and are found along edges of major rivers and streams (Blanchard 1976, pp. 10–14; Poole 2011b, pers. comm.), compared with the Neches River rose-mallow, which is found in side channels and floodplains of major river drainages. Based on the best scientific and commercial data available on the species' morphology, biology, and habitat-specific needs, we conclude that the Neches River rose-mallow is a valid taxon.

Habitat

The Neches River rose-mallow is endemic to the 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, Harrison, and Trinity Counties, and has been introduced into Nacogdoches and Houston Counties. Shortleaf-loblolly pine-hardwood forests, longleaf pine (*Pinus palustris*), and loblolly pine forest (*Pinus taeda*) dominate the Pineywoods vegetation region (Telfair 1983, p. 29; Diggs *et al.* 2006, p. 6). More specifically, Neches River rose-mallow is found within seasonally flooded river floodplains as described by Diggs *et al.* (2006), where the natural bottomlands occupy flat, broad portions of the floodplains of major rivers and are seasonally inundated. Loamy to clayey soils seasonally flood and host flood-tolerant species of *Quercus* sp. (oak), *Liquidambar styraciflua* (sweetgum), *Ulmus americana* (American elm), *Nyssa biflora* (swamp tupelo), and *Acer rubrum* (red maple) (Diggs *et al.* 2006, p. 103). Bottomland and floodplain areas may be dominated by *Q. lyrata* (overcup oak). Stands of shortleaf, longleaf, and loblolly pine are not occupied by the Neches River rose-mallow. 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 aquatica	water hickory.
Cephalanthus occidentalis	common buttonbush.
Celtis laevigata var. *laevigata*	sugar berry.
Fraxinus sp	ash.
Quercus lyrata	overcup oak.
Q. nigra	wateroak.
Liquidambar styraciflua	sweetgum.
Salix nigra	black willow.
Native Herbaceous Plant Associates	
Boehmeria cylindrica	smallspike false nettle.
Brunnichia ovata	buckwheat vine.
Carex lupulina	common hop sedge.
Chasmanthium sessilifolium	longleaf woodoats.
Diodia virginiana	Virginia buttonweed.
Eichhornia crassipes	water hyacinth.
Heliotropium indicum	Indian heliotrope.
Hibiscus moscheutos	crimsoneyed rose-mallow.
H. moscheutos	wooly rose-mallow.
H. laevis (= *H. militaris*)	halberdleaf rose-mallow.
Hydrolea ovata	ovate false fiddleleaf.
Hydrocotyle ranunculoides	floating pennywort.
Juncus effusus	common rush.
Ludwigia leptocarpa	anglestem primrose-willow.
Nuphar lutea	yellow pond-lily.
Phanopyrum gymnocarpon	Savannah-panicgrass.
Panicum rigidulum	redtop panicgrass.
Pluchea foetida	stinking camphorweed.
Polygonum hydropiperoides	swamp smartweed.
Pontederia cordata	pickerelweed.
Rhynchospora corniculata	shortbristle horned beaksedge.
Sesbania herbacea	bigpod sesbania.
Scirpus cyperinus	woolgrass.
Thalia dealbata	powdery alligator-flag.
Trachelospermum difforme	climbing dogbane.

Sites where the Neches River rose-mallow has been found have been described as sloughs, oxbows, terraces, and sand bars. Sites are seasonally inundated or regularly flooded bottomlands (Diggs *et al.* 2006, p. 103) that include low areas (Warnock 1995, p. 13) within the Neches, Sabine, and Angelina River basins and Mud and Tantabogue Creek basins. Soils are classified generically as hydric alluvials (water-saturated soils) of the Inceptisol or Entisol orders (Diggs *et al.* 2006, pp. 46, 79) and although generally water-saturated, can often be surficially dry. The U.S. Department of Agriculture's (USDA) Natural Resources Conservation Service (NRCS) completed soils surveys for all counties with known occurrences of the Neches River 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). Warnock (1995) noted that seed dispersal is likely by water, and Scott (1997, p. 5) also stated that seed dispersal appears to be entirely water dependent. While water-mediated seed dispersal of the Neches River rose-mallow is highly likely, it is not known that flowing water is required for downstream dispersal of rose-mallow seeds. 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 Neches River rose-mallow is a perennial that dies back to the ground every year and resprouts from the base; however, the plant still maintains aboveground stems. Longevity of the species is unknown, but it may be long-lived. Cross-pollination occurs (Blanchard 1976, p. 38) within the Neches River 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 Neches River rose-mallow along 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 is typical within Neches River rose-mallow habitat (Warnock 1995, pp. 11, 13), but plants also grow in partial sun (as is the case at SH 204). Sunlight is needed for blooming, as the blooming period may only last 1 day (Snow and Spira 1993, p. 160).

Potential pollinators of the Neches River 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 *Hibiscus 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, in 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 Neches River 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) (Gathmann 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 Neches River rose-mallow plants, suggesting that the scentless plant bug may be a pollinator as well as a consumer of the Neches River rose-mallow.

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

Distribution and Status

The natural geographic range of the Neches River rose-mallow is within Trinity, Houston, Harrison, and Cherokee Counties, Texas, on 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 Neches River rose-mallow have been introduced within their natural geographic range on Federal lands in Houston County. In total, there are 12 occurrences of Neches River rose-mallow (see Table 4). However, only 11 of these are within the known geographic range and, as of October 2011, are considered occupied by the Neches River rose-mallow. The Neches River rose-mallow plants within the SH 230 ROW have not been seen since 2002, and the site was considered extirpated. In 2011, Neches River rose-mallow plants were not located at this site, but in 2012, a graduate student from Stephen F. Austin State University reported seeing the Neches River rose-mallow along SH 230 in the ROW somewhere near the former site (Melinchuk 2012, p. 3).

TABLE 4—POPULATION ESTIMATES FOR KNOWN NECHES RIVER ROSE-MALLOW OCCURRENCES

Site	County	First and last observation	Plant estimates (or otherwise noted)
1. Compartment 55, Davy Crockett National Forest (NF).	Houston	2002–2003; 2011	750 in 2002; 500 in 2005; 1,000 in 2006; in 2007 and 2008, no changes from 2006; 750 in 2010; 100–200 plants in October 2011; 407 stems in October 2011.
2. Compartment 16, Davy Crockett NF (introduced).	Houston	2000; 2011	450 in 2000; 115 in 2002; 78 stems in 2003; 40 in 2004; between 20 and 40 in 2005; 50 in 2006; in 2007 and 2008, no changes from 2006; 90 in 2010; 43 stem clusters in 2011.
3. Compartment 11, Davy Crockett NF (introduced).	Houston	2004; 2011	200 in 2004; 75 plants in 2005; 10 in 2006; in 2007 and 2008, no changes from 2006; 7 in 2010; 10 stem clusters in 2011.
4. Compartment 20, Davy Crockett NF (introduced).	Houston	2000; 2011	200–250 in 2000 (also reported that 350 plants introduced); several hundred blossoms in 2001; 70 in summer and fall of 2002; 182 in 2002; 291 stems in 2003; 100 in 2005; 350 in 2006; in 2007 and 2008, no changes from 2006, but only 150 seed pods in 2007; 120 in 2010; 101 stem clusters 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; 2–3 in 1992; maximum of 27 in 1993; 38 in 1994; 41 in 1995; 16 in 1996 (only a partial survey); 15–20 on private land in 1997; 13 in 1998; 49 in 1999; 17 along ROW and 300 observed on private land in 2000; 15 and 300+ on private land in 2001; 20 along ROW and fewer than 100 observed on private land in 2002; 3 in 2003; 20 and 0 on private land in 2005; none in 2007; 35 along powerline in 2010; 128 stem clusters along ROW in 2011.
6. SH 204 ROW-Mud Creek	Cherokee	1992; 2011	1 in 1992 and 1993; 26 within 3 subpopulations in fall 1993; 1 in 1994–1996; 1 observed then an additional 75 in 1997 under bridge; 1 in 1998; 2 in 1999; 16 in 2000; 5 in 2001; none in 2002; 17 in 2003; none in 2004, 2005, 2008, 2009; 46 in 2010 in 4 subpopulations; 1 plant in one subpopulation in summer 2011; 20 stem clusters in 6 subpopulations 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, 2003, 2004, 2005, or 2011. Considered extripated.
8. Lovelady	Houston	2011	50–70 in 1991; 7 in 1992; 58 in 1993; several hundred blossoms in 2001; 400 along ROW in 2002; 900 blossoms or seedpods in 2007; observed in 2008, but no estimates; 20 in 2010; 539 stem clusters in 2011.
9. Mill Creek Gardens (introduced)	Nacogdoches	1995; 2011	96 in 1995; hundreds in October 2011.
10. Harrison Site	Harrison	Not observed after 1980	Herbarium specimen was recently confirmed again 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; 1978	No estimates. Searches occurred in 1992 and 1993, but no plants were observed.

Populations along SH ROWs include SH 94 in Trinity County, collected in 1955 (Blake 1958, p. 277); SH 204 in Cherokee County, first observed in 1992; and SH 230 in Houston County, first observed in 1978. The TPWD performed annual SH ROW monitoring along SH 94 from 1993 thru 2001 (Poole, 2001, p. 1); along SH 204 from 1993 thru 2003 (Poole 2001, p. 1; TXNDD 2012a, pp. 20–28); and along SH 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 Neches River 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 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 in 2004 (The Texas Land Conservancy 2011), an organization previously known as the Natural Areas Preservation Association (NAPA). The Neches River rose-mallow plants in this site, referred to as Lovelady, are part of a population that included the Neches River rose-mallow plants in the SH 230 ROW. The Neches River 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 stem clusters 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 Neches River 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 ROW, 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 Neches River 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 NF, Houston County, Texas, contains four extant sites, three introduced and one natural, of the Neches River rose-mallow. 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 was introduced with 450 plants (Davis 2000, pers. comm.; McCormick 2002, p. 1; Service 2000, p. 3); compartment 20 with 200–250 plants (Davis 2000, pers. comm.; McCormick 2002, p. 2; Service 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 (Service 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 NF appear to have declined dramatically.

The four remaining Neches River rose-mallow sites have had sporadic monitoring or have not been visited in recent years. In 1995, Stephen F. Austin State University Mast Arboretum planted 96 Neches River 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 Mast Arboretum. Neches River rose-mallow plants at this site were observed in 1997, 1998, 2001, 2009, and 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 Neches River rose-mallow (Creech 2011c, pers. comm.). Another site in Harrison County, Texas, was last verified by a specimen collected in 1980. The identification of this specimen was identified as Neches River rose-mallow and later considered *Hibiscus laevis* (Melinchuk 2012, p. 2). Not until 2011, was it confirmed that the specimen collected was the Neches River rose-mallow (Birnbaum 2011, pers. comm.; TXNDD 2012a, pp. 12–13). Although, the Harrison County site has not been visited since 1980, and drought and severe storms might have impacted this site but without a lack of evidence suggesting the species' extirpation from either threat, we presume that Neches River rose-mallow is extant at this site. 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 Neches River rose-mallow on the Camp Olympia site is unknown. 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 2001; plants were seen, but no plant counts were done.

Conservation

We relied on Pavlik's Minimum Viable Population analysis tool (1996, pp. 127–155) and species' experts to determine the conservation goals of the species. Based on the best known and available scientific information on the species' life-history and reproductive characteristics, we concluded that the conservation goals for the Neches River rose-mallow include 10 viable populations, each containing at least 1,400 individual plants. The species is limited to the Neches, Sabine, and Angelina River basins and the Mud and Tantabogue Creek basins with 11 extant sites throughout this range. However, many of these sites were introduced and are now compromised by threats from feral hog damage, hydrological changes, nonnative and native species encroachment into habitat, construction projects, and herbicide overspray. Future management actions that ameliorate these threats could allow for the species to expand within its known range. The extant populations are generally small. The only site that has come close to reaching the conservation goals is on compartment 55 of the U.S. Forest Service (USFS); however, it still only comprises 53 percent of the needed plants at this site (750 plants were seen in 2010).

Summary of Comments and Recommendations

We requested written comments from the public on the proposed listing for the Texas golden gladecress and Neches River rose-mallow during two comment periods. The first comment period, associated with the publication of the proposed rule (77 FR 55968), opened on September 11, 2012, and closed on November 13, 2012. Newspaper notices inviting general public comment were published in the Houston County Courier, Nacogdoches Daily Sentinel, and Marshall News Messenger. We also requested comments on the proposed listing during a comment period that opened April 16, 2013, and closed on May 16, 2013 (78 FR 22506). We received requests for a public hearing, which was held on May 1, 2013, in Nacogdoches, Texas. Newspaper notices inviting public comment for this second comment period were published in the San Augustine Tribune and Cherokeean Herald in addition to the three papers listed above. We also contacted appropriate Federal, State, and local agencies; scientific experts and organizations; and other interested parties and invited them to comment on the proposed rule during these comment periods.

We received approximately 63 public comments. All substantive information provided during both comment periods has either been incorporated directly into this final determination or is addressed below. Comments addressed below are grouped into general issues specifically relating to the listing of Texas golden gladecress and Neches River rose-mallow.

Peer Review

In accordance with our peer review policy published on July 1, 1994 (59 FR 34270), we solicited expert opinions from six knowledgeable individuals with scientific expertise that included familiarity with the biology and ecology of the Texas golden gladecress and Neches River rose-mallow; the geographic region in which these species occur and characteristics of their habitats, including the unique geology; and land uses common to the region that may bear on the threats to both species. We received responses from four of the peer reviewers.

We reviewed all comments we received from the peer reviewers for substantive issues and new information regarding listing of the Texas golden gladecress and Neches River rose-mallow. The peer reviewers generally agreed with portions of our assessment, including the threats analysis, and most of our conclusions, although they pointed out areas where additional research would refine our understanding of the two species' habitat requirements and range. The peer reviewers provided additional information, clarifications, and suggestions for future research that would inform future surveys to refine the geographic range and that would help with management and recovery efforts. Peer reviewer comments are addressed in the following summary and incorporated into the final rule as appropriate.

Peer Reviewer Comments

(1) *Comment:* One peer reviewer asked for clarification regarding the

numbers of Texas golden gladecress populations in State highway ROWs. One location in the proposed rule referred three extant sites within State highway ROW; however, another location refers to only two extant populations within State ROWs.

Our Response: We recognize that the language in the proposed rule may be misleading or easily misconstrued because it implies that the three confirmed Texas golden gladecress populations are all located in ROWs. We have changed the language in the referenced paragraph to reflect the fact that only two of the extant populations, Geneva and Caney Creek Glade Site 1, occur in ROWs, which are both managed by TXDOT. The third extant population at Chapel Hill is located on a small tract adjacent to a county road and is not considered to extend into any type of road ROW.

(2) *Comment:* One peer reviewer stated his opinion that that there is no conservation land, fee simple or under easement, for either of these species. He alluded to the land on which these species' habitats occur being some of the cheapest in east Texas and suggested that it would be more cost effective to purchase fee title or conservation easements of small tracts to conserve these species because creation of a series of small protected sites would work well for an endemic species. He indicated that the habitat areas in question have very little commercial value, with the Weches glades having no value for forestry or agriculture. He acknowledged that the value of the Weches Formation for glauconite mining exceeds values for other uses and indicated his opinion that it would be appropriate to estimate the commercial value of the glauconite mined on a site and match this value.

Our Response: We are in agreement with the first part of this comment about the lack of conservation lands for the Texas golden gladecress; however, this is not true for the Neches River rose-mallow. The Texas Land Conservancy has fee title ownership of the land on which the Neches River rose-mallow's Lovelady population in Houston County is located. The Texas Land Conservancy bought this land specifically to conserve the Neches River rose-mallow and manages the site accordingly. The United States Forest Service (USFS) also has Neches River rose-mallow in several compartments, is aware of the species, and manages those compartments to avoid impacts.

Further, the Act requires us to determine if the Texas golden gladecress and Neches River rose-mallow warrant listing solely on the basis of the best scientific and commercial data available as evaluated through our assessment of the five listing factors set forth in the Act. We previously determined that the Texas golden gladecress and Neches River rose-mallow warranted listing under the Act, making them candidate species. However, the listing of these species was precluded by the necessity to commit limited funds and staff to complete higher priority listing actions for other species. The Texas golden gladecress and Neches River rose-mallow have been included in our annual candidate notices of review for multiple years. In our annual review of these species, scientific literature and data have, and continue to, indicate that these species are impacted by ongoing threats. Any future conservation actions, such as purchasing land from willing landowners, or land management efforts to ameliorate threats, will be evaluated as part of the recovery planning process.

(3) *Comment:* Two peer reviewers discussed the geography of the Weches Formation and wondered how it may influence the range of the Texas golden gladecress. One reviewer indicated that it is a common misconception that the Weches Formation centers on Nacogdoches and San Augustine Counties. He pointed out that the Weches Formation also extends over 100 miles (161 km) to the north into Smith, Wood, Upshur, Marion, and Cass Counties in Texas, and even across into Miller County, Arkansas. A second reviewer described the Weches formation as consisting of Eocene age deposits lying mostly in an east-west band. This reviewer further pointed out a northeast to southwest trend in Cherokee County, Texas, proceeding northeastward toward Tyler, Texas. Referencing the U.S. Department of Agriculture's soils surveys of Cherokee, Nacogdoches, Houston, San Augustine, and Sabine Counties, the reviewer indicated that most acreage of Weches Outcrop may occur in Cherokee County. The former reviewer indicated that he was not aware of any systematic surveys of these widely dispersed outcrops for the presence of the endemic glade plants. He recommended that some attention and resources be directed at exploring the other Weches outcrops that stretch north to Cass County and suggested that any ruling by the Service or subsequent recovery plan for Texas golden gladecress include provisions for surveying these areas.

Our Response: The Service recognizes the extent of the Weches Formation reaches the above referenced counties. However, the Service has not found or received any data indicating that the species is present in these other counties. The Service is required to use the best scientific and commercial data available at the time of listing. We relied on all available information regarding the known occurrences of the Texas golden gladecress at the time of listing; none of the known occurrences was reported from outside Sabine and San Augustine Counties (with the exception of the introduced population in Nacogdoches County). Further analysis of geological correlations with the Texas golden gladecress is an issue to be addressed in recovery planning. Furthermore, as a federally listed endangered species, the Texas golden gladecress will be afforded the protections of the Act wherever found.

(4) *Comment:* One peer reviewer pointed out that our assessment of the Weches Formation did not take into account the work of geologists. He suggested referencing the body of work on the chemistry and mineralogy of the Weches by Ernest Ledger and students that document a wide variation in the attributes of the Weches across its range from San Augustine and Nacogdoches Counties, north over 100 miles (161 km) to Cass County. In his opinion, we need to know about the variability of the Weches Formation in terms of available calcium and long-term pH change to identify more potential sites for the Texas golden gladecress. This reviewer indicated that Ledger's chemical analyses of Weches constituent minerals shows hard data on the low-level presence of nutrients in some locations. Some of these may be suitable for mining as soil additives in the future when current sources like phosphate rock deposits are mined-out. Analyses of the chemical composition of the rock should be considered when selecting potential conservation sites. He suggested that a critical look at Ledger's work might show that unusual features of the Weches Formation that promote the occurrence of Texas golden gladecress and associated glade plants are limited to the southern end of the Weches Formation. Similarly, this peer reviewer referred to the known variations in the Weches Formation and suggests that we need a better understanding of the geology and soils conditions underlying Texas golden gladecress in order to plan for future surveys for the species.

Our Response: We recognize that variability of Weches outcrops does exist across the Weches Formation throughout the numerous counties listed above. We agree that a better characterization of the geology and soils underlying known Texas golden gladecress populations could provide useful information. However, there are

likely other factors that characterize individual outcrop sites that may also be important (for additional information, see ''Invasive Species'' under *A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range* of this rule). Further, the Service must use the best available scientific and commercial data available at the time of listing. Determining the chemical components of the geological formations beneath known glade sites is not a feasible accomplishment within the timeframe we have to publish our final determination. This research would be addressed in recovery planning. For purposes of the proposed rule and this final rule to list the Texas golden gladecress, we used the more general Weches Formation outcrops descriptions, and we more specifically relied on the geologic and soils information available from one known Texas golden gladecress population site, as well as from one white bladderpod site. Please see the ''Habitat'' section for the Texas golden gladecress in this final rule for more information.

The commenter did not provide specific references for Ledger's research. However, we attempted to locate research conducted by Ledger on this topic. We were able to locate some of Ledger's research, and we incorporated this into this final rule under the ''Habitat'' section for the Texas golden gladecress. However, this information did not modify our conclusions of our analysis of threats or determination that the species meets the definition of an endangered species under the Act.

(5) *Comment:* One peer reviewer commented that the essential habitat component of Weches outcrops underlying Texas golden gladecress populations is the combination of thin soil over a calcium-rich parent material. In the Weches Formation, the calcium is derived from a myriad of fossilized, calcium-dominated oyster shells and other marine life.

Our Response: The peer reviewer's verbiage was added to the Texas golden gladecress's ''Habitat'' description in this final rule to further illustrate the derivation of calcium from marine organisms that is true of the east Texas Weches Formation and which may be different from habitat of other *Leavenworthia* species.

(6) *Comment:* One peer reviewer indicated that the developed soils that occur near the Weches outcrops are included in the Bub, Trawick, Nacogdoches, or Chireno soil series. He described the Chireno soil series as unique because it is the only ''blackland soil'' in east Texas. Chireno soils are classified as ''mollisols'' or blackland soils and are developed under prolonged grassland habitat. This reviewer used the U.S. Department of Agriculture's soil surveys for Sabine, San Augustine, Nacogdoches, and Houston Counties to estimate roughly 3,000 acres (1,214 ha) of this soil type occurring in a four-county area. He indicated that these soils may underlie prairies (glades) and that Native Americans regularly burned these areas either for protection from wildfires or enemies, or to entice game animals.

Our Response: Although the reviewer does not specifically suggest that we add Chireno soils to the other soils known to support Texas golden gladecress habitat, this is how we have interpreted his comment. Based on the development of these blackland soils being dependent on long-term prairie cover, and the fact that other literature describes the Pineywoods glades as being within prairies, or as part of a combination of prairies and glades, information may indicate the potential for Weches outcrops within this soil series to support the herbaceous glades of which Texas golden gladecress may be a component. Mollisols, of which the Chireno series is one, are soils of grassland ecosystems, characterized by a thick, dark surface horizon that was developed under prolonged grassland habitat (Grunwald 2013, pp. 1–2). We based the soil parameters for Texas golden gladecress habitat on the soil descriptions in the TXNDD's element of occurrence records, the thesis by Robert George (George 1987, entire), and the U.S. Department of Agriculture's soil survey layers underlying all known Texas golden gladecress populations. The known Texas golden gladecress occurrences are all found on shallow, gravelly soils or almost bare bedrock overlying Trawick, Bub, or Nacogdoches soils, situations that would not support dense stands of prairie grasses, at least in the portion of the outcrop where the Texas golden gladecress is growing. Further investigation of the Chireno series for the presence of Texas golden gladecress would be addressed during the recovery process.

(7) *Comment:* One peer reviewer provided us with confirmation that the glade habitat at the Texas golden gladecress population site referred to as Caney Creek Glade 7 was still intact as of spring 1996, when this reviewer visited the site. However, on a second visit in 2000, encroachment by weedy and woody species was prevalent at this site.

Our Response: This comment affirms our 2012 evaluation of this site, as derived from analysis of satellite imagery. As indicated in our proposed rule and this final rule, the population being referenced may still be present as of 2012, but from satellite imagery the site appeared to be overgrown with woody vegetation. Based on the habitat at Caney Creek Glade Site 7 remaining intact (not excavated or built over), with the exception of woody overgrowth, we assume that Texas golden gladecress plants still occupy this site.

(8) *Comment:* One peer reviewer relayed personal observations that accumulation of pine leaf litter and eventual degradation of the material supports the germination of pine seed. This reviewer indicated that this likely happens because the leaf litter debris provides a small but steady increase of soil depth on the rocky, thin soil common in the Weches glades.

Our Response: This comment supports the data in our proposed rule and this final rule to list the Texas golden gladecress, which state that planting of pine trees in close proximity to small glades may produce leaf litter that can accumulate within a glade, sometimes covering its surface and smothering smaller glade plants. As noted by the reviewer, the accumulation of pine leaf litter and the byproducts of its decomposition would create and enhance layers of organic material and create conditions favorable to natural pine seedling establishment. This would alter the nature of the glades by eventually deepening soils within the glade, thereby allowing other plants, including woody plants that previously did not occur in the short, herbaceous plant community, to take over these areas that formerly had too shallow and poor soil to support shrubs and trees. This situation would also enhance invasion by other plants, including Macartney rose, that would benefit from additional soil. Not only would the glade vegetation undergo succession to shrubs and trees, but the glades would also be altered by the shading and would hold moisture in the soil. All of these conditions would impede the continued existence of the Texas golden gladecress by altering the competitive advantage that this plant has in the glade environment.

(9) *Comment:* One peer reviewer suggested evaluating a specific, potential Texas golden gladecress site based on the presence of the Texas golden gladecress's known associated species. The site is located on the SH 21 ROW, near the Sabine, Davy Crockett NF compartment 76, adjacent to a glauconite quarry.

Our Response: From information provided to us early in the proposed rule's preparation stage, we were aware

that flora and fauna surveys were done on USFS lands in Sabine County in association with the debris cleanup effort post-Hurricanes Rita and Ike. These surveys, in conjunction with results of botanical surveys conducted before this time, failed to document the Texas golden gladecress on any of these USFS lands, although we do not know if lands outside of the USFS were included in any of the surveys. However, strategies for continued evaluation of potential but unconfirmed new sites will be addressed during the recovery planning process.

(10) *Comment:* One peer reviewer suggested that mention be made of the possibility for illuminating the evolutionary history of these species by genetic studies and that this would be useful in determining management strategies.

Our Response: This is an issue that may be addressed during recovery planning.

(11) *Comment:* A peer reviewer provided additional literature to consider in our analysis on the hybridization of the Neches River rose-mallow. One was by Klips (1995) and the other by Mendoza (2004). These studies provide genetic insight of the relatedness between Neches River rose-mallow and two co-occurring species, *Hibiscus moscheutos* and *H. laevis.* Both researchers agree with the Service's opinion that the Neches River rose-mallow is a distinct species. These studies review the relatedness between the Neches River rose-mallow and other species; however, they do not investigate hybridization. Another peer reviewer noted the potential hybridization of the Neches River rose-mallow on compartment 20 in the Davy Crockett NF, in October 2012. Plants appeared to be *H. dasycalyx,* but the calyx was lacking the hairy surface typical of the species. The reviewer thought that the species was a potential cross with *H. laevis.*

Our Response: The Service has reviewed this new information and incorporated it into the threats section under ''Hybridization'' in this final rule. These studies pertain to the relatedness between the Neches River rose-mallow and other species. They do not investigate hybridization of these species. Although the genus *Hibiscus* readily hybridizes within the nursery trade, hybridization between Neches River rose-mallow and another *Hibiscus* under natural conditions has not been verified. Drought conditions can alter the plants morphological or physical characteristics including leaf size, structure, and overall plant height (Fair 2009, p. 1). Further investigation into the occurrence of hybridization and its impacts on the population are necessary. The University of Texas–Tyler is researching the hybridization issue for Neches River rose-mallow and its impacts on the population; however, the project is only in its infancy, and no results have been determined. We do not consider hybridization a threat to the Neches River rose-mallow at this time.

(12) *Comment:* One peer reviewer reported that in October 2012, she and a USFS botanist observed sedimentation along ROW work on both sides of SH 94. They anticipated that resurfacing and re-crowning work of the highway will likely increase runoff to this site. The reviewer noted that, during road improvement, TXDOT installs temporary culverts to assure water flow and exchange during construction. Another reviewer questioned whether county and municipal governments, who buy glauconite for road projects, are required to demonstrate that endangered species like white bladderpod are not being negatively impacted by their road-building activities. He further asked whether the counties are receiving State or Federal funds to assist with road building.

Our Response: The Service is aware of the bridge replacement along SH 94, but as of 2011, the construction and associated impacts of this project had not progressed into Neches River rose-mallow habitats (Adams 2011c, pers. comm.). Since the start of the SH 94 road expansion project, TXDOT has employed the use of temporary culverts and orange construction fencing around Neches River rose-mallow sites and has restricted workers from these fenced-off areas. Fenced-off areas encompassed far more area than that habitat known to be occupied by the Neches River rose-mallow (Adams 2013b, pers. comm.). In wetlands where sedimentation might continue despite the use of the above management activities, silt curtains (or silt fence) placed in conjunction with orange construction fencing have been installed (Adams 2013b, pers. comm.). Currently, all avoidance measures are voluntary.

However, on the effective date of this final rule (see **DATES**), the Neches River rose-mallow will become a federally threatened species under the Act. Section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out (that is, projects with a Federal nexus) are not likely to jeopardize the continued existence of the species or destroy or adversely modify its critical habitat, if any is designated. If a Federal action may affect a listed species or its designated critical habitat, the responsible Federal agency must enter into consultation with the Service (see Available Conservation Measures in this final rule for more discussion of this process). If this project, or any other project, has a Federal nexus and the project may affect a federally listed species then the Federal action agency will need to consult with the Service. We are publishing a final rule on the designation of critical habitat the Texas golden gladecress and the Neches River rose-mallow under the Act elsewhere in today's **Federal Register**.

(13) *Comment:* One peer reviewer made several comments on invasive species and provided the Service with new information on the biology of Chinese tallow. The reviewer's recent observations in 2012, along with a USFS botanist, found Chinese tallow and *Melia azedarach* (Chinaberry) within compartment 16, Davy Crockett NF. Chinese tallow has invaded all known Neches River rose-mallow sites, yet is more prominent in SH 94 and compartment 16, Davy Crockett NF sites. The reviewer provided a literature citation, Gan *et al.* 2009. Additionally, the reviewer mentioned that coastal bermudagrass (*Cynodon dactylon*) is one of the most serious, nonnative, invasive species threats to the Neches River rose-mallow.

Our Response: As described in the proposed rule, we agree with the peer reviewer that nonnative species are a threat to the Neches River rose-mallow. We incorporated the additional information and biological data on tallow provided in Gan *et al.* 2009 into the Summary of Factors Affecting the Species section of this final rule. This additional information did not modify our listing determination.

At the time the proposed rule was published, we were only aware of one location at Boggy Slough in Houston County where coastal bermudagrass was observed. However, new information was provided to the Service during a public comment period. We are now aware of three additional sites where encroachment from coastal bermudagrass was observed. These sites included: The Texas Land Conservancy, where it is common; SH 204 ROW, where it is abundant (Poole 2013a, pers. comm.); and the original site at the SH 94—Boggy Slough, where it is locally common in the interior of the unit (Allen 2011a, pers. comm.). At the planted site on Boggy Slough, Neches River rose-mallow was observed as recently as August 2012. Although the coastal bermudagrass has the potential to spread and grow quickly, and has been known to form monocultures along

highway ROWs, the Neches River rose-mallow and coastal bermudagrass do not necessarily grow naturally in the same habitat. Coastal bermudagrass is not typically found within wetland areas. Further, the Neches River rose-mallow is a taller growing species, a feature that prevents itself from being shaded out by coastal bermudagrass. Based on the above information, the Service does not consider coastal bermudagrass a threat at this time. The TPWD concurs with the Service that coastal bermudagrass is not considered a threat at this time (Poole 2013a, pers. comm.).

The nonnative species Chinaberry has not been previously noted at any of the sites, including the site mentioned by the commenter, compartment 16 on the Davy Crockett NF. The Service investigated this comment further, and Chinaberry was not mentioned in the TXNDD database information. Based on this information the Service does not consider Chinaberry a threat at this time.

(14) *Comment:* A peer reviewer indicated that due to drought in 2011, the numbers of plants were a lot fewer than years previous in SH 94 ROW and compartment 55, Davy Crockett NF. On October 3, 2012, observers went to specific locations in these compartments where plants were known to occur, and none could be found. In 2013, rainfall has been about average to date, but the reviewer concluded that effects were evident from previous drought.

Our Response: We agree that drought has caused impacts to said populations and likely other populations. Drought conditions have reduced the number of plants and have stunted overall Neches River rose-mallow plant growth (TXNDD 2012a, p. 8). We do not have knowledge of how drought affects the Neches River rose-mallow on a larger scale or how it impacts flowering or seed production. However, it is possible that during drought conditions, floral characteristics that are normally easily recognizable could be reduced and make identification of Neches River rose-mallow more difficult (Poole 2012b, pers. comm.). Since the Neches River rose-mallow is a wetland species, we understand that drought conditions could continue to threaten the habitat as well as the reproductive capability since it is likely that seed dispersal is water-mediated. With the likelihood that seasonal or successive year-round drought conditions will likely continue, ancillary threats from trampling and herbivory may be exacerbated. Drought is discussed in the Summary of Factors Affecting the Species in this final rule.

(15) *Comment:* One peer reviewer noted that in spite of the fact that Sabine and San Augustine Counties have not seen major increases in human population, there has been improvement of services, such as communication lines, water lines, domestic gas lines, and power lines. These actions occur primarily in ROWs, and some occur in areas that are situated in potential Texas golden gladecress habitat.

Our Response: We acknowledge that the installation of new service lines (e.g., communication, water, domestic gas, and power lines) could potentially occur in more rural areas, and these activities typically occur in road ROWs, such as where the Texas golden gladecress occurs. There are two known Texas golden gladecress sites that extend into road ROWs. When this rule is effective (see **DATES**), section 7 consultation requirements and section 9 prohibitions under the Act will apply to the Texas golden gladecress and Neches River rose-mallow. See our response to Comment 12 and Available Conservation Measures for more discussion of this process.

(16) *Comment:* One peer reviewer pointed out an example of the flaws of teaming these two species together can be seen in the statement in the proposed rule that says, ''Prolonged or frequent droughts can exacerbate habitat degradation for both species.'' He indicated that a river-bottom dwelling species like the Neches River rose-mallow might be negatively impacted when drought allows other species to encroach. However, drought could positively impact Texas golden gladecress as it might exclude woody closure of glades. This reviewer noted his personal observation of the drought of 2011 dramatically pushing back the edges of glades in the Weches and in tiny saline prairies.

Our Response: We agree that the droughty conditions of hot, dry summers are a part of the reason why Texas golden gladecress can remain competitive on the glades. However, prolonged drought, especially when it occurs in successive years, has resulted in Texas golden gladecress not appearing above ground in some years, and therefore not flowering or producing seed in those years. We do not know how many years of poor seed production, or no seed production at all, will affect the survival of the population. Negative impacts of drought on the Neches River rose-mallow are discussed in our response to Comment 14 as well in the Summary of Factors Affecting the Species section of this final rule.

(17) *Comment:* A peer reviewer commented on the occurrence and use of nonnative and potentially invasive pasture grasses such as coastal bermudagrass, *Paspalum notatum* (bahiagrass), and *Lolium perenne* (perennial ryegrass), which are commonly used to re-vegetate many road ROWs. These grasses are common on most ROWs and aggressively grow in open, sunlit areas.

Our Response: The Service recognizes the occurrence and use of nonnative and potentially invasive pasture grasses along ROWs, and that ROWs typically become monoculture stands of these invasive species, thereby out-competing natives. The Service has verified that both coastal bermudagrass and bahiagrass are included in mixtures used to re-seed ROWs (Adams 2013c, pers. comm.). There are two Texas golden gladecress and three Neches River rose-mallow known populations growing along ROWs, which could be planted with nonnatives. We are not aware of any Texas golden gladecress sites where the Texas golden gladecress itself is being impacted by these grasses. Coastal bermudagrass has been observed on four Neches River rose-mallow sites (see our response to Comment 13 for additional details). We investigated these nonnative species as potential threats and incorporated this information into our analysis in the Summary of Factors Affecting the Species section for the Texas golden gladecress and Neches River rose-mallow in this final rule. There is the potential for such nonnative, invasive species to impact the Neches River rose-mallow, as well as the Texas golden gladecress, in the future if these grasses out-compete native plants for soil nutrients, space, and light. However, these invasive species are not currently a threat, and there are no data indicating that these species will be a threat in the near future.

(18) *Comment:* One peer reviewer provided new observations about damage to habitat due to feral hog activity. In October 2012, feral hogs had broken and flattened plants in compartment 16, Davy Crockett NF. Large groups of feral hogs were seen in two Neches River rose-mallow sites (compartment 55 and compartment 16, both in the Davy Crockett NF). Neches River rose-mallow habitat is only surficially dry and can be easily disturbed by hogs, as made evident in compartment 20, Davy Crockett NF.

Our Response: The Service has included this information in our analysis of feral hog impacts on the Neches River rose-mallow in the Summary of Factors Affecting the

Species section in this final rule. Based on this information, the Service recognizes that feral hogs impact the species and that feral hogs will likely continue to impact the species in the near future. However, at this time, the severity of impacts to the species is low. The level of impacts from feral hogs does not change the determination to list the species as threatened versus endangered.

(19) *Comment:* One peer reviewer commented on the impacts that beavers have had on one Neches River rose-mallow site: Compartment 16, Davy Crockett NF. In general, water levels fluctuated due to beaver activity. It was observed that larger trees along the water's edge were damaged by beavers, although it appears that water levels had receded to the same level prior to the beaver activity.

Our Response: The Service is aware of beaver presence at compartment 16 of the Davy Crockett NF. We acknowledge that beaver activity (i.e., dams) could have impacted this Neches River rose-mallow site. However, with seasonally fluctuating water levels and no estimates on plant abundance before and after beaver activity, it is unclear how or if beaver activity was a factor in the size of the Neches River rose-mallow population. We are uncertain if there was a correlation between the damage done to this site and the changes in water flow and the site hydrology, and whether this had a positive or negative impact on the species. No other sites have been impacted by beaver activity. We do not consider the effects of beaver damming to be a threat to the Neches River rose-mallow.

(20) *Comment:* One peer reviewer agreed with the use of Weches glauconite as road base material being a threat. He indicated his belief that it should be possible to locate Weches mines where conditions are not suitable for the glade community and reiterated that the Weches is a highly variable rock formation. This peer reviewer provided new information about other uses for Weches glauconite, including animal feed additives, that were not addressed in the proposed rule. This reviewer expressed his opinion that it is also possible that in a few decades the shortage of mineral phosphate rock might make some of the deposits viable for agriculture use. He referred to information from Dr. Ernest Ledger (geologist) regarding instances where rare earth elements are being mined in the Weches or Reklaw Formations.

Our Response: In analyzing threats to a species, the Service uses the best scientific and commercial data available to analyze the current threats and threats anticipated to occur in the near future. The Service has identified quarrying Weches glauconite as a current and future threat to the Texas golden gladecress. We know that several Texas golden gladecress populations have been lost in areas where glauconite quarries were developed (see the Summary of Factors Affecting the Species sections of the proposed rule and this final rule). We did not specifically identify animal feed additive as a use for the Weches glauconite in our proposed rule, but we have incorporated this information into the Summary of Factors Affecting the Species section of this final rule. The impact to the species from quarrying is the clearing and excavation of vegetation and soil during development. The specific uses of the Weches glauconite are not relevant to the impacts from quarrying. However, new uses or an increase in current uses of Weches glauconite may increase the demand of this resource and therefore increase the amount of quarrying activities (that is, ground disturbance). However, the Service does not have information that either of these are occurring.

Section 7 of the Act requires Federal action agencies to consult with the Service to ensure their action do not jeopardize the continued existence of the species. However, there are limited or no Federal nexuses for glauconite quarry projects. Entities implementing projects that could impact the Texas golden gladecress could play a significant role in the conservation of the species by voluntarily working with the Service, the State, or conservation groups to construct their projects in such a way as to avoid or minimize impacts to the species. Site selection of quarries outside of endemic plant communities containing Texas golden gladecress could be a measure to avoid or minimize impacts to the species.

Additional research of the habitat requirements of the Texas golden gladecress, particularly the surface soils and subsurface composition of the bedrock, may help in determining whether there are particular outcrops that should be protected for Texas golden gladecress versus ones that will never support the species and would therefore not be problematic if selected for a quarry. This is an issue that may be addressed during recovery planning.

(21) *Comment:* One peer reviewer suggested using genetic evidence to evaluate how past climate changes, particularly drought, as well as dispersal mechanisms and barriers to dispersal, may have affected the distribution and endemism of the Texas golden gladecress and the Neches River rose-mallow. He indicated his opinion that a better understanding of these factors would have bearing on future management considerations.

Our Response: It is possible that the past droughts have affected the distribution of Neches River rose-mallow and Texas golden gladecress in east Texas. For Neches River rose-mallow, geographic barriers may have arisen due to past drought events, potentially limiting genetic exchange between populations. Humans may have contributed to further endemism of the species by altering habitat, which functionally created barriers to dispersal and resulted in more isolation of populations. However, we can only postulate that these are the reasons for the endemism of the Neches River rose-mallow to certain river systems, and more specifically to surficially dry habitats as compared to other east Texas *Hibiscus* species. Additional research is needed to assess the validity of this hypothesis.

With regard to the Texas golden gladecress, the Weches outcrops generally occur in small, isolated or segmented strips (George 1987, p. 4; George and Nixon 1990, p. 118), making the habitat, in essence, small islands separated from one another by dissimilar habitat. The current patchiness and separation of the Texas golden gladecress population sites may be, at least in part, due to past droughts, but may also be a result of the habitat being fragmented by land conversions or lost to succession by woody species. Because we lack information on seed dispersal of Texas golden gladecress, we do not know how the species spread historically or how it came to be distributed where it is. Therefore, we do not know if the isolation of the populations is due to vicariance (populations on outcrops that are geographically separated by surrounding forest) or due to a lack of dispersal to new habitats or between population sites. Genetic evidence may help to clarify the relatedness or lack thereof between the remaining extant populations, but that may be undertaken as part of the recovery process.

(22) *Comment:* One peer reviewer commented that the presence of a currently listed endangered species, white bladderpod, confers some protection for other Weches glade plants at sites where it occurs.

Our Response: There are two Texas golden gladecress sites where white bladderpod is also found: Chapel Hill and Caney Creek Glade Site 1. Additionally, both species were known to co-occur at historical Caney Creek

Glade Site 6, but they were eliminated by construction of a quarry. The entirety of the Chapel Hill site is privately owned, with all Texas golden gladecress plants growing strictly on private land. This situation is also true for most of the Texas golden gladecress plants at the Caney Creek Glade Site 1, although a limited number of individuals extend into the adjacent TXDOT-managed ROW. Although there are not formal legal protections for listed plants on private land, if a project takes place on that privately owned property that is carried out, permitted, or funded by a Federal agency, a Federal nexus is established for that project, and that Federal action agency is responsible for section 7 consultation with the Service to avoid jeopardizing the species or adversely modifying any designated critical habitat. For the plants in the ROW at Caney Creek Glade Site 1, TXDOT will provide protections for the species per State regulations or through consultation with the Service.

Comments From States

Section 4(i) of the Act states, ''the Secretary shall submit to the State agency a written justification for his failure to adopt regulations consistent with the agency's comments or petition.'' Comments received from the State agencies and government officials regarding the proposal to list the Texas golden gladecress and Neches River rose-mallow are addressed below.

(23) *Comment:* These species have not been fully studied. There are significant concerns with the quality of data and analysis the Service used for its determination. The proposal is based largely on inconclusive reports and vast speculation about operations thought to affect habitats, existing regulatory mechanisms, conservation efforts, species populations and potential threats that fail to provide any sound scientific foundation on which to justify the listing of these species.

Our Response: It is often the case that biological information may be lacking for rare species; however, the Act requires the Service to make determinations based on the best scientific and commercial data available after conducting a review of the status of the species and after taking into account those efforts, if any, being made to protect such species. We are also required to make our listing determinations based on the five threat factors, singly or in combination, as set forth in section 4(a)(1) of the Act.

We sought comments from independent peer reviewers to ensure that our designation is based on scientifically sound data, assumptions, and analysis. Peer reviewers were generally in agreement with the conclusions from our threats analysis that habitat modification and destruction due to human activities, as well as woody encroachment into Weches glades, likely adversely affects the Texas golden gladecress. The reviewers enhanced our understanding of some threats by providing personal observations of habitat conditions at some population sites of both species. A peer reviewer brought the ongoing installation of utility service improvements with potential to impact Texas golden gladecress in portions of its range to our attention. Peer reviewers also agreed that drought negatively affects the Neches River rose-mallow, and they provided new, detailed information on the types of invasive plants that most seem to constitute a threat to the species, as well as the extent of the invasion by these plants into Neches River rose-mallow population sites. In addition, they furnished information about the presence of feral hogs at specific Neches River rose-mallow population locations, as well as observations of sedimentation from a highway construction project into one Neches River rose-mallow site. One peer reviewer indicated his agreement that the Neches River rose-mallow lacks protective mechanisms other than U.S. Army Corps of Engineers (USACE) permits. One peer reviewer expressed his opinion that we needed more pertinent geological information on the outcrops across a larger geographic area than just Nacogdoches, San Augustine, and Sabine Counties. He also suggested chemical analysis of the outcrops known to support the Texas golden gladecress so as to better understand their unique qualities in order to use that information to seek out additional sites to survey for heretofore undiscovered populations or to carry out recovery actions.

We also solicited information from the general public, nongovernmental conservation organizations, State and Federal agencies that are familiar with the species and their habitats in east Texas, academic institutions, and groups and individuals that might have information that would contribute to an update of our knowledge of the Texas golden gladecress and the Neches River rose-mallow, as well as the activities and natural processes that might be contributing to the decline of either species. We used information garnered from this solicitation in addition to information in the files of the Service, TPWD, TXNDD's elements of occurrence records for both species, published journal articles, newspaper and magazine articles, status reports contracted by the Service and TPWD, reports from site visits, and telephone and electronic mail conversations with knowledgeable individuals. We also used satellite and aerial imagery to ascertain changes in land cover and land use at historical population sites and to determine whether changes in land cover and land use at historical populations sites and to determine whether the presence of primary constituent elements for each species were still in place. Additionally, we used the results of population monitoring from site visits to look at abundance, and if enough information was available, to get an idea of trends in the populations. In October 2011, we also made field trips to known sites where we were granted access, to verify land uses and contribute to the veracity of our threats analysis. In March 2012, we helped to organize and carry out a workshop and field tour of Texas golden gladecress sites for purposes of assisting landowners and agricultural agencies to become familiar with the species and its habitat. We also revisited accessible Texas golden gladecress sites at that time. In August 2012, we attended a Neches River rose-mallow workshop and field tour conducted by TPWD and revisited Neches River rose-mallow population sites. We used the best scientific and commercial information available in assessing population status, recognizing the limitations of some of the information.

(24) *Comment:* There is no conclusive indication that glauconite quarrying, oil and gas activities, invasive species, or pine tree plantings threaten Texas golden gladecress.

Our Response: As stated in the proposed rule and this final rule, three historical populations of Texas golden gladecress were documented from sites where glauconite quarries are now located. The sole introduced Texas golden gladecress population, in Nacogdoches County, was extirpated by construction of a pipeline as recently as 2011. The Weches glades are documented to be overgrown with invasive, native and nonnative plants. The potential for negative effects from pine trees, planted in such close proximity to glades that shading and leaf litter accumulations adversely affect the glades, was pointed out to us by several respondents during the comment periods on the proposed rule, as well as one of our peer reviewers based on their personal observations (see the Summary of Factors Affecting the Species section of this final rule).

(25) *Comment:* There is no conclusive indication that the invasion by other species, development and construction projects, herbicide use, or herbivory pose a risk of loss or degradation to the Neches River rose-mallow.

Our Response: A thorough analysis of the impacts of nonnative and native species encroachment, TXDOT roadway construction and maintenance projects, herbicide use, and herbivory were discussed in the proposed rule and in this final rule. All populations of the Neches River rose-mallow have been encroached upon by Chinese tallow. This invasive species is fast-growing and, once established in a habitat, is highly destructive, choking out native species. Development and construction projects will likely continue to be a threat to the species. Herbicides are a threat that could impact 7 of 11 (64 percent) Neches River rose-mallow populations. We do not consider herbivory to be a threat to the Neches River rose-mallow at this time. See the Summary of Factors Affecting the Species section of this final rule for our complete evaluation.

(26) *Comment:* The best available information stated that the Texas golden gladecress and the Neches River rose-mallow are resilient species.

Our Response: Based on our review of the best available scientific and commercial data, we concluded that the Texas golden gladecress exhibits low to moderate resiliency. Although the species has persisted at several sites in the face of bulldozing, drought, and invasion by woody species, likely due to its persistent seed bank, and has also stayed in existence in small sites with small numbers of individuals, perhaps due to self-fertilization, it has shown no resiliency to impacts such as excavations (e.g., quarrying) and pipelines. For more information, see the Determination section of this rule. In the case for the Neches River rose-mallow, the best available scientific information indicates that, while reductions in the species' range have not occurred, there have been significant impacts from habitat modification and loss that have caused reductions in most, if not all, of the known Neches River rose-mallow populations. The Neches River rose-mallow is adapted to highly variable rates of water flow, including seasonal high and low flows, and occasional floods and droughts. However, as the habitat is so water-dependent, threats that could adversely modify its habitat, including invasion from nonnative and native woody vegetation, hydrological changes, herbicide, trampling, and drought, can have huge impacts. The Neches River rose-mallow likely requires high precipitation and flowing water or flood events to disperse seed (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3), and although the Neches River rose-mallow is adapted to persisting during dry portions of the year, a complete lack of water can diminish seed production, range expansion, and genetic exchange.

(27) *Comment:* The Texas golden gladecress is already adequately protected by co-existing with the federally listed white bladderpod and collaborations between the Service and several partners.

Our Response: White bladderpod is found at two of the remaining known Texs golden gladecress population sites (see our response to Comment 22). Both sites are privately owned with the exception of the Texas golden gladecress plants that extend onto the Sunrise Road ROW at Caney Creek Glade Site 1; therefore, absent a Federal nexus, no legal protections are afforded to either species under the Act. The Chapel Hill landowner does mow or bush-hog at least once per year to try to keep woody plants from overrunning this small tract, but this action is strictly voluntary on his part and not assured into the future.

(28) *Comment:* The mechanisms and plans provided by the Davy Crockett NF, the TXDOT, groundwater management areas and conservation districts, federally protected wetlands, and a number of private initiatives and agreements all serve to adequately protect the Neches River rose-mallow species.

Our Response: We agree that the Neches River rose-mallow does benefit from some protections on USFS and TXDOT lands. As of the effective date of this rule (see **DATES**), the Neches River rose-mallow is a federally listed threatened species. Further, we are publishing a final rule on designation of critical habitat for the Texas golden gladecress and the Neches River rose-mallow under the Act elsewhere in today's **Federal Register**. Therefore, if a Federal nexus exists for a project, projects within the species' range or within designated critical habitat units must avoid jeopardizing the species or adversely modifying its designated critical habitat.

(29) *Comment:* Local elected officials were not notified of the proposed designation during the public comment period. It is crucial that the Service contacts potentially impacted private landowners, local elected officials and leaders, and industry in these counties.

Our Response: We made substantial efforts to notify the public and interested parties, as described here. We announced the opening of the public comment period on the proposed rule in Nacogdoches, Houston, and Harrison Counties via newspaper public notices on September 19 and 20, 2012. Within 14 days post-publication of the proposed rule in the **Federal Register,** the Service mailed 164 letters to recipients that included both U.S. senators; the U.S. representative from east Texas; two State senators and three State representatives for the districts in question; and the county judges and all four commissioners from each of the following counties: Sabine, San Augustine, Nacogdoches, Houston, Cherokee, and Trinity. We also notified, via letter, State officials including the Texas Governor, State Comptroller, Texas General Land Office (TGLO) Commissioner, and Executive Directors of Texas Parks and Wildlife Department (TPWD) and Texas Department of Transportation (TXDOT). Letters were also sent to staff of interested or affected agencies (TPWD, Texas Council of Environmental Quality, TXDOT, Texas Railroad Commission, Texas General Land Office, Texas Forestry Service, Texas Department of Agriculture, U.S. Department of Agriculture's Natural Resources Conservation Service, USACE), universities, conservation organizations and other nongovernmental organizations, and representatives of the following industries: Glauconite quarries, oil and gas exploration and production, timber production, and forestry services. In addition, we sent letters to some landowners, including private individuals, USFS, and TXDOT.

More specifically with regard to landowners, in September 2011, approximately 1 year prior to publication of the proposed rule, we sent letters to 107 entities, including representatives of many of the agencies or organizations listed above, informing the recipients of our need to gather and analyze the best available information for our use in developing a proposed rule to list and designate critical habitat for both species. We then added any landowner contacts that were given to us to our notification list. For some sites, landownership was clarified in file records or through communications with representatives of other organizations. Furthermore, for the Texas golden gladecress, we partnered with TPWD in March 2012, to host a Weches Glades workshop and field tour in San Augustine, to which we invited four private landowners (two with Texas golden gladecress and two with white bladderpod populations on their property). As preparation for the field

tour, permission to access sites was obtained from these four landowners. The purpose of the workshop and field tour was to acquaint landowners, and agency representatives that work with private landowners, with the glade and outcrop habitats, rare plants, and the listing process and implications, particularly as it applies to plants. In addition to these landowners, 24 other individuals were invited to the workshop, including two San Augustine County commissioners; the Mayor of San Augustine; the Chairman of the local Soil and Water Conservation District; and individuals from the Natural Resources Conservation Service, Texas Forest Service, a private forestry services company, and a mining company. Of the 28 invitees, 17 attended the workshop and field tour.

As additional outreach to Neches River rose-mallow landowners, land managers, and agencies that work with them, TPWD organized a workshop and 2-day field trip in August 2012. The workshop also furnished an opportunity to explain the listing process and its applicability for plants. A pre-field trip workshop allowed information to be presented to 45 attendees that included the Texas Land Conservancy (owner of the Neches River rose-mallow Lovelady site) and TXDOT (owner of the ROW sites along SHs 204 and 94).

On April 16, 2013, the day of **Federal Register** publication of the document making available the draft economic analysis and reopening the comment period for the proposal to list the plants and designate critical habitat, we emailed letters to 157 people including representatives of agriculture, timber, oil and gas, and mining industries; local elected officials from the counties in question; agency staff that work with landowners; and those landowners for whom we had email addresses. Within 2 days of publication in the **Federal Register**, we also sent 208 letters by mail to State and local elected officials (including all county judges and commissioners); industry representatives; scholars; conservation organizations; State, Federal, and local agencies; and all individual landowners who had been identified through the past 2 years since our initial information solicitation in September 2011.

(30) *Comment:* Multiple State entities expressed concerns that these listings will hamper economic development. They indicated their belief that listing could impact agriculture and timber planting operations; oil and gas operations; and highway construction and maintenance projects in Nacogdoches, Sabine, and San Augustine Counties. They were concerned that projects with a Federal component could be delayed or cancelled in the listed counties. They also indicated concern that listing could impact ground water management, reservoir construction, road and bridge projects, and agriculture operations in Cherokee, Harrison, Houston, Nacogdoches, and Trinity Counties.

Our Response: Under section 4(b)(1)(A) of the Act, we must base a listing decision solely on the best scientific and commercial data available. The legislative history of this provision clearly states the intent of Congress to ensure that listing decisions are ''. . . based solely on biological criteria and to prevent non-biological criteria from affecting such decisions . . . ''. Therefore, we did not consider the economic impacts of listing these species. See our response to Comment 12.

With respect to effects of listing on highway construction and maintenance, TXDOT has formally consulted with the Service only once for the white bladderpod in the 26 years that the plant has been listed. This formal consultation took place in 2009, for a highway safety improvement project on approximately 10 miles (16.1 km) of SH 21. The consultation resulted in slight modifications to TXDOT's original plan for a 4-ft (1.2-m) widening of the shoulder, instead widening it to 3 ft (0.9 m) for a short distance around a white bladderpod population. The Service and TXDOT agreed to creation of a ''No Work Area'' around the white bladderpod during construction phases to protect the plant from foot and vehicle traffic and to prevent any staging of equipment or materials. Provisions were made for TXDOT to continue maintenance (mowing) within the No Work Area post-project during the plant's dormant season (July 1 to August 31). The TXDOT also agreed to enhance habitat by hydroaxing invading woody vegetation at three white bladderpod sites on private land as compensation for loss of one or more plants that could not be avoided. These are the types of recommendations that are anticipated in the few situations where Texas golden gladecress occurs in State-maintained ROWs. The TXDOT has indicated that they do not have major highway construction projects planned anywhere near the critical habitat within the next 20 years, so we do not anticipate delays of highway construction projects.

(31) *Comment:* Although Neches River rose-mallow is considered extirpated in the SH 230 ROW, in 2012, Laura Baker, a graduate student at Stephen F. Austin State University, reported seeing Neches River rose-mallows within the ROW somewhere near the former site (Baker 2012, pers. comm., in Melinchuk 2012, p. 3). This observation needs to be verified.

Our Response: We visited the site along SH 230 in Houston County in 2011, and did not find any Neches River rose-mallow plants. This site was considered extirpated due to herbicide overspray along the ROW. However, based on this comment, the population could still be present. Another commenter provided information regarding reintroduced populations near the cities of Douglass and Chireno, and at the Pineywoods Native Plant Center, all in Nacogdoches County. These populations need to be verified as Neches River rose-mallow and not a hybrid variety.

(32) *Comment:* The Neches River rose-mallow and the other two co-occurring *Hibiscus* species are wetland rather than aquatic plants. They do not grow in permanently standing water. They grow near permanent or ephemeral water bodies, and the sites are occasionally flooded. For most of their life cycle they grow on saturated soils that can become surficially dry. The proposed rule (77 FR 55973) states that the Neches River rose-mallow prefers deeper water; it would be more correct to say that the plants prefer areas near deeper water.

Our Response: In our proposed rule at 77 FR 55973, we state, ''Geographically, these three species [the halberdleaf, crimsoneyed, and Neches River rose-mallows] 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 [Neches River] rose-mallow, which is found in side channels and floodplains of major river drainages.''

Neches River rose-mallow is an endemic east Texas wetland species, occupying relatively open habitat. Soils are of the Inceptisol or Entisol orders (Diggs *et al.*2006, pp. 46, 79) and, although generally water-saturated, can often be surficially dry. Geographically, the Neches River rose-mallow and the two other co-occurring *Hibiscus* species can be found within similar habitats; however, the Neches River rose-mallow prefers areas near deeper water, whereas the halberdleaf and crimsoneyed rose-mallows are found along edges of major rivers and streams (Blanchard 1976, pp. 10–14; Poole 2011b, pers. comm.).

(33) *Comment:* The general habitat for the Neches River rose-mallow is more similar to seasonally flooded river floodplains (Diggs *et al.* 2006, pp. 103–

104) rather than the short-leaf or loblolly pine-hardwood forest, longleaf pine, or loblolly pine forest (77 FR 55973).

Our Response: As stated in the proposed rule, Gould (1975, p. 10) and Correll and Johnston (1979, p. 1030) described the generic vegetation community of the Neches River rose-mallow as the Pineywoods of east Texas. Diggs *et al.* (2006, pp. 2–3) also describes the generic geographic area as the Pineywoods; however, this was not mentioned in the proposed rule. More specifically, Neches River rose-mallow habitat within the Pineywoods is more accurately classified by Diggs *et al.* (2006, pp. 103–104) as ''seasonally flooded river floodplains.'' Natural bottomlands occupy the flat, broad portions of the floodplains of major rivers and are seasonally inundated with loamy to clayey seasonally flood and host flood-tolerant species of oak, sweetgum, elm, swamp tupelo, and red maple (Diggs *et al.* 2006, p. 103). Stands of shortleaf, longleaf, and loblolly pine are not occupied by the Neches River rose-mallow.

(34) *Comment:* The proposed rule states that flowing water is required for seed dispersal downstream (77 FR 55974, 55988). However, research suggests this process has not entirely been investigated. Warnock (1995) notes that seed dispersal of Neches River rose-mallow is probably by water, Scott (1997, p. 5) stated that seed dispersal appears to be entirely water dependent, and Reeves (2008) discusses the dispersal of *Hibiscus moscheutos* (including *lasiocarpos*). The commenter states that although water-mediated seed dispersal of the Neches River rose-mallow is highly likely, it is not known that flowing water is required for seed dispersal downstream.

Our Response: We agree that based on the best scientific and commercial data available, Neches River rose-mallow seeds are likely to be dispersed by flowing water. This change is reflected in the ''Habitat'' section for the Neches River rose-mallow of this final rule, yet this comment did not change our listing determination for the Neches River rose-mallow.

(35) *Comment:* Of the four introduced populations of Neches River rose-mallow, all but the experimental site (which has been manipulated) have experienced population declines (50 percent in Davy Crockett NF compartment 20, 90 percent in Davy Crockett NF compartment 16, and 95 percent in Davy Crockett NF compartment 11). Rapidly declining populations such as those in Davy Crockett NF compartments 16 and 11 do not appear viable.

Our Response: The Act requires us to determine if the Texas golden gladecress and Neches River rose-mallow warrant listing based on our assessment of the five listing factors described in the Act using the best scientific and commercial data available at the time we conduct a review of the species. As part of our assessment, we evaluate whether a threat(s) is causing declines in numbers of individual plants in all populations or in specific population sites. However, a population's viability in and of itself, if not influenced by specific threats, is not a factor considered in our evaluation.

(36) *Comment:* One commenter noted that several of the population estimates throughout the proposed rule were not accurate or consistent. Information pertaining to sites 2, 3, 6, 7, and 8 in Table 4 of the proposed rule needs to be changed. Site 2 states 78 plants were counted in 2003, but this should read stems. Site 3 states that 200–250 Neches River rose-mallow plants were introduced on compartment 20 of the Davy Crockett NF in 2000; however, the critical habitat section (Critical Habitat Unit 7) states that 350–400 plants were introduced in 2000. The actual number introduced is important in evaluating the success of the reintroduction. Site 8 states several hundred plants were counted in 2001, but this should read several hundred flowers. Site 7, the SH 204 ROW site, has had as many as 75 individuals, not a maximum number of seven plants.

Our Response: The language in Table 4 pertaining to site 2 (compartment 16 of the Davy Crockett NF) has been updated. Site 2 (compartment 16) and Site 4 (compartment 20) were planted in 2000 (Nemec 2000, p. 3), totaling 700 plants in both units, with about 450 plants in Site 2 and about 200–250 plants in Site 4. Site 6 (SH 204) has been observed with about 75 plants in 1997, its maximum count to date, and this change is reflected in this final rule.

(37) *Comment:* One commenter noted the steep decline in the reintroduced site in compartment 16 of the Davy Crockett NF where the population has decreased by 90 percent (from 450 to 43 plants). Whether the loss of the beaver dam resulted in this drastic decrease needs further study.

Our Response: See our response to Comment 19.

(38) *Comment:* In the proposed rule under the heading ''Trampling by Feral Hogs and Cattle'' (77 FR 55987), it states that because Neches River rose-mallow habitat is permanently or temporarily flooded, feral hogs have limited access to the plants. Neches River rose-mallows do not occur in permanently standing water, although they may grow adjacent to such sites. Their habitat is only flooded infrequently. For most of the year, it is surficially dry and easily disturbed by feral hogs. The commenter also noted feral hog damage of Neches River rose-mallow (breaking and flattening) at the introduction site in compartment 20 on the Davy Crockett NF (TXNDD 2012a).

Our Response: National Wetland Inventory (NWI) maps were used to verify habitat at each Neches River rose-mallow site. Compartment 20 was described on the NWI map as permanently or temporarily flooded habitat. The Service recognizes that Neches River rose-mallow prefers areas located near deeper water, generally with temporary not permanent standing water. The long-term impact on the Neches River rose-mallow from feral hog damage is unknown. Feral hog presence has been limited to five Neches River rose-mallow sites with minimal damage to habitat. The Service considers feral hogs a present threat and one that will likely continue into the near future. However, at this time, the severity of impacts to the species is low. This threat does not change the determination to list the species as threatened versus endangered. See also our response to Comment 18.

(39) *Comment:* The listing proposal states that no genetic studies have been conducted on the Neches River rose-mallow; however, there have been two such studies by Klips in 1995 and Mendoza in 2004. Neither study looked at genetic drift, inbreeding, or the possible threat from hybridization. It seems premature to conclude that small population size and hybridization are not potential threats.

Our Response: The Service has reviewed Klips (1995, entire) and Mendoza (2004, entire) and incorporated this information into our analysis in the Summary of Factors Affecting the Species section of this final rule. While these studies pertain to genetic analysis, they do not look at genetic drift, inbreeding, or the possible threat from hybridization, as the commenter acknowledges. Based on the best scientific and commercial data available, we do not consider hybridization or small population size a threat to the species at this time. See our response to Comment 11 for additional information regarding this comment.

(40) *Comment:* Listing of the two plants will have adverse impacts on the State transportation system other than in instances where they occur in or immediately adjacent to State-owned

ROW. Listing will hamper economic development and delay projects that require section 7 consultations.

Our Response: See our response to Comment 30 above.

(41) *Comment:* There are existing mechanisms that adequately protect both species.

Our response: See our response to Comments 22, 27, and 28.

Federal Agency Comments

(42) *Comment:* The Natural Resources Conservation Service indicated their willingness to assist landowners and land managers in identifying those elements that may have a negative or positive impact on the species.

Our Response: We appreciate the Natural Resources Conservation Services' (NCRS') willingness to help landowners with actions to conserve these species. We foresee that NRCS' assistance to landowners and to the Service will be invaluable in delivering conservation programs like the Service's Partners for Fish and Wildlife Program that can help willing landowners plan and implement projects to restore habitat for both of these plant species.

Public Comments

(43) *Comment:* One commenter provided information regarding reintroduced populations near the cities of Douglass and Chireno, and at the Pineywoods Native Plant Center, all in Nacogdoches County. These populations have not been verified by the Service or a species expert. These populations need to be verified as Neches River rose-mallow and not a hybrid variety.

Our Response: These populations have not been verified by the Service or species experts. Until such verification, the Service cannot use this information in our analysis.

(44) *Comment:* Several commenters expressed their beliefs that these species have not been fully studied. They indicated that there are significant concerns with the quality of data and analysis the Service used for its determination. They believe that the proposal is based largely on inconclusive reports and vast speculation about operations thought to affect habitats, existing regulatory mechanisms, conservation efforts, species populations, and potential threats that fail to provide any sound scientific foundation on which to justify the listing of these species. Other commenters assert that the Service does not have the scientific justification to list these species.

Our Response: See our response to Comment 23.

(45) *Comment:* As outlined in the 2003 St. Augustine Glades Conservation Area Plan, TNC, along with other resource professionals, identified the conservation concerns and challenges for sustaining populations of the Texas golden gladecress.

Our Response: We were aware of this document and considered this in our preparation of this determination.

(46) *Comment:* A commenter recommended that the benefits provided by conservation efforts currently in place in an area be fully considered.

Our Response: Section 4(b)(1)(A) of the Act requires us to take into account those efforts being made by a State or foreign nation, or any political subdivision of a State or foreign nation, to protect such species. We consider relevant Federal, State, and tribal laws and regulations when developing our analysis. Regulatory mechanisms may preclude the need for listing if we determine such mechanisms adequately address the threats to the species such that listing is no longer warranted. However, existing regulatory mechanisms are inadequate to protect these species, and the ongoing conservation efforts are not sufficient to remove the threats to these species. Please see ''Other Conservation Efforts'' under ''*A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range''* for the Texas golden gladecress and Neches River rose-mallow in this final rule.

(47) *Comment:* Multiple commenters believe that interested parties should be given sufficient opportunity to review and comment on any proposal, including review of scientific data from an independent specialist's economic analysis of the current proposal, before the Service makes a final decision in this rulemaking. Similarly, any data provided to Service during future public hearings should also be made available to the public for review and comment.

Our Response: This information was provided to the public for review and comment. Please see our response to comment 29 above for a full description.

(48) *Comment:* One commenter recommended that any proposal to list a species should include easily accessible and transparent information about cited literature. Another commenter noted that Executive Order 13463 directs agencies to provide timely online access to the rulemaking docket on *http://www.regulations.gov,* including relevant scientific and technical findings, in a format that can be easily searched and downloaded (E.O. 13463, sec. 2(b)). The proposed rule failed to provide a meaningful opportunity to understand and comment on the Service's proposal.

Our Response: Executive Order 13463, signed by the President on April 18, 2008, amends Executive Orders 13389 (Creation of the Gulf Coast Recovery and Rebuilding Council) and 13390 (Establishment of a Coordinator of Federal Support for the Recovery and Rebuilding of the Gulf Coast Region). None of these three Executive Orders directs Federal agencies to provide timely online access to the rulemaking docket. We believe the commenter is referring to Executive Order 13563, ''Improving Regulation and Regulatory Review,'' and we believe that we have met the direction of that Executive Order. For our proposed rule to list the species and designate critical habitat, we provided the literature cited bibliography on *http://www.regulations.gov* when we published the proposed rule. The proposed rule also stated that additional tools and supporting information that we developed for that proposal were available at the Service's field office in Corpus Christi by appointment or that arrangements could be made to get that information by calling the field office. For this final determination, the literature cited bibliography and all tools and supporting information are available at:

- *http://www.regulations.gov* under Docket No. FWS–R2–ES–2012–0064,
- *http://www.fws.gov/southwest/es/ElectronicLibrary/ElectronicLibrary_Main.cfm,*
- *http://www.fws.gov/southwest/es/ClearLakeTexas,* and
- Texas Coastal Ecological Services Field Office in Corpus Christi (see **ADDRESSES**).

(49) *Comment:* The Service's failure to examine relevant evidence, explain its assumptions, consider contrary evidence in the studies on which it relies, identify uncertainties, share the studies it relied upon, and utilize basic scientific principles in its predictive analysis is arbitrary, capricious, and not in accordance with the law. There is no basis in the record to support listing the plants under the Act.

Our Response: As we are unable to identify from this comment the specific assumptions or contradictory evidence that the commenter is referring to, we cannot adequately provide a response to that part of this comment. We assessed the status of both species using the best scientific and commercial data available. We obtained this information by reviewing the candidate assessments that had been done for each species since they were first determined to be warranted for listing (in 1975 for the

Neches River rose-mallow, and in 1997 for the Texas golden gladecress), using all information in our files, soliciting new information prior to publication of the proposed rule, as well as during two comment periods, from a wide variety of knowledgeable entities and individuals, and using additional sources of information such as peer-reviewed journals and other publications. We incorporated all substantial information we received into this final rule, including any new information regarding the species' status, habitat conditions, and threats. We believe that we did identify and point out uncertainties and data gaps. We had to rely on the best scientific and commercial data available to us, as opposed to collecting new data to fill gaps. We believe that we have made a sound case for why the Texas golden gladecress warrants listing as endangered and the Neches River rose-mallow warrants listing as threatened under the Act. For further information, see our response to Comment 23.

(50) *Comment:* The threat to SH 204 ROW by ''water management strategies'' is speculative. There are no scientific data that demonstrate the level of hydrological change that would impact the Neches River rose-mallow; the Service is speculating this threat. Also, the proposed rule's discussion of the plant numbers for the Neches River rose-mallow and the impacts of the proposed Lake Columbia project on this species have not been subjected to rigorous scientific analysis or discussion. The Service does not report on information from two of its published reports; specifically plant count information was missing from 2007. Also, in these reports, plants were determined to be *Hibiscus* hybrids; however, this was not mentioned. There is no explanation of why the Service did not present this readily available data.

Our Response: Some degree of hydrological change has been seen at most of the Neches River rose-mallow sites; however, information on some of the private land sites is lacking. Many wetland species, including the Neches River 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 Neches River rose-mallow likely requires high precipitation and flowing water or flood events to disperse seed (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3), and although the Neches River rose-mallow is adapted to persisting in dry conditions during portions of the year, a complete lack of water can diminish seed production, range expansion, and genetic exchange. As Niches River rose-mallow habitat is so water-dependent, hydrological changes can have huge impacts.

In regards to the SH 204 ROW site, the best scientific and commercial data available suggest that the construction of the Lake Columbia reservoir project will divert water downstream, thereby likely dewatering the site. The agencies involved with the project are still working on solidifying the project details, and, therefore, we do not know how much water will remain at this site or if future water management practices or decisions will allow for seasonal flooding of water to this site. Please reference the ''Hydrological Changes'' section in this rule for more information on this project and hydrological impacts to this and other sites.

Summary of Changes From Proposed Rule

There are not any substantial changes from the proposed rule. We did receive new information regarding the presence of feral hogs at Neches River rose-mallow sites. Based on this new information, we determined that feral hogs are a current and continuing threat to the Neches River rose-mallow, but the severity of the threat is low. We also received new information about ongoing service line improvements, including communication, domestic gas, water, sewer, and electric lines, that were occurring within the Texas golden gladecress's range, sometimes in highway ROWs. We determined that, because these improvements may involve excavations of habitat and plants, they could constitute additional threats to the Texas golden gladecress. These newly identified threats do not alter our listing determinations.

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 Texas golden gladecress's habitat, include construction of well pads, buildings, roads, and poultry production facilities, and service line improvements. A historic and ongoing major threat to Texas golden gladecress's habitat is the invasion by nonnative and native shrubs, trees, and vines, and other weedy species into the formerly open-sun, herbaceous, glade vegetation communities. Planting of pine plantations can potentially have negative impacts on the Texas golden gladecress if the spacing of planted trees puts them in close proximity to occupied outcrops, resulting in shading and pine leaf litter accumulations in the glade habitat. 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 Texas golden 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, USFS, 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 and as an animal feed additive (Godwin 2012, pers. comm., p. 4). 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.). The best scientific and commercial information available does not allow us to make predictions about future demand for glauconite, and we are unable to project the level of future quarry development throughout the Texas golden gladecress's range. Selection of quarry sites can be based on different site qualities and the variation in the mineral composition of the Weches Formation across its geographic range. 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.).

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 (Caney Creek Glade 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. The Service has been denied access to these sites; thus we cannot determine if any habitat or plants remain on the periphery of the excavated quarries. The last recorded survey of plants at Caney Creek Glade Site 2 was on March 18, 1988, when the Texas golden 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. Based on the total loss of habitat (surface and subsurface) due to the excavation, over a large portion of the former population site, we assume that the population was extirpated here.

The last information on plant numbers and conditions at the Caney Creek Glade Sites 6 and 8 was collected on March 19 and April 24, 1987. At that time, Caney Creek Glade Site 6 was recognized as the largest known viable population of Texas golden gladecress. At this site, the Texas golden gladecress grew in a former pasture with thousands of fruiting plants in association with other native glade plants, including white bladderpod, in shallow bedrock pockets. The Caney Creek Glade 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 because 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 to develop a quarry, typically there is no Federal nexus, 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 Texas golden 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 Texas golden 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 (32-km) 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 Texas golden 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 Texas golden 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 mi^2 (23,310 km^2). 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 (Hall 2009, pp. 3–7; 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 is 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 (Murphy 2011b, pp. 2–3).

The Texas Railroad Commission's 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 Caney Creek Glade 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 Texas Railroad Commission regulates the oil and natural gas industry in the State of Texas. The Texas Railroad Commission 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 Texas Railroad Commission 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 Texas golden 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 2011, 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 Texas golden 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 coastal bermudagrass in this region (Rodewald 2011, pers. comm.). The Simpson Farms Texas golden gladecress 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 Texas golden 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 Texas golden 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 Texas golden 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 directly 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 Texas golden 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. However, service improvements for existing homes and businesses, including installation of service lines for communications, electric power, water, sewer, and domestic gas are ongoing and do have the potential to occur in Texas golden gladecress habitat (Walker 2012, pers. comm., p. 1). Because water, sewer, and gas lines entail excavations to lay pipe, these activities could have similar consequences to installing natural gas and oil pipelines if the lines pass through an occupied outcrop. Electric power structures in this area are

generally above-ground poles and lines that may be installed, or maintained, in highway ROWs. Although Texas golden gladecress habitat and plants may potentially be impacted by pole placement, the small project footprint, limited to the pole installation, may mean that the small Texas golden gladecress sites could be avoided by moving pole locations a few feet to either side of an outcrop. In those cases where new power lines are built outside of established ROWs, Texas golden gladecress populations might be damaged during clearing of habitat by vehicles and heavy equipment traversing a glade. However, there is also potential that clearing of woody vegetation out of invaded glades may reopen them to the point that the Texas golden gladecress could show a positive response.

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 Texas golden gladecress habitat in the same manner as would residential or other types of commercial construction. Aerial photography from November 2011 (Google Earth, 2011) shows 21 poultry farms within the Texas golden gladecress's 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 Texas golden 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, on the tops of ridges, or in low-lying areas (Ritter 2012, pers. comm.), such as those occupied by the Texas golden gladecress. This site-selection preference means that poultry producers would most likely avoid Texas golden 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 Texas golden gladecress habitat.

Roads

Two of the three extant Texas golden gladecress populations, Geneva and Caney Creek Glade Site 1, extend into ROWs managed by TXDOT. The third confirmed population at Chapel Hill is located on a small tract adjacent to a county road and is not considered to be in a road ROW. In the 1990s, a road project impacted the portion of the Caney Creek Glade Site 1 population that occurred in the SH ROW when Sunrise Road was widened and straightened (Singhurst 2012g, pers. comm.); however, not all plants were destroyed. Review of a 2011 list of TXDOT-planned projects did not show any future road improvements or expansions near known Texas golden gladecress population sites. Based on the best scientific and commercial information available, we conclude that new road construction or improvements to the existing roads does not pose a threat to the two Texas golden gladecress populations that occur within ROWs, or to the third population that does not.

Invasive Species

A major stressor to the habitat of Texas golden gladecress is the ongoing invasion of nonnative and native shrubs, trees, and vines 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. The historic Caney Creek Glade 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 Texas golden 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, p. 2) 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 Texas golden 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 1980s to be affected by an accelerated succession from open, herbaceous Weches outcrops to dense shrub thickets and closed canopy woodlands (Service) 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 (Service 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 Texas golden gladecress habitat (Service 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.
Melilotus 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 crus-galli	hawthorn.
Crataegus spathulata	hawthorn.
Prunus mexicana	Mexican plum.
Viburnum rufidulum (=prunifolium)	rusty blackhaw.
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-ft^2 (557-m^2) 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 Texas golden 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 Texas golden gladecress after its apparent absence for 10 years. This suggests that the Texas golden gladecress's seed bank may be able to remain viable over extended time periods even though the habitat is overgrown by woody species.

Fire suppression is considered a threat to the continued integrity of the native plant communities of the Weches glades because lack of fire contributes to woody and weedy native and nonnative plants being able to more quickly overtake the open glade areas. TNC's Area Conservation Plan for the San Augustine Glades indicated that fire suppression in the Coastal Plain Carbonate Glades (another reference for the Weches glades) constituted a high level of threat (The Nature Conservancy 2003, p. 9) and that the fire frequency was ''fair to poor''; the ideal frequency being burns occurring every 5 to 10 years. For future viability and biodiversity health in the glades, the plan said that fire processes should be restored or simulated, where feasible (The Nature Conservancy 2003, p. 8), and categorized development and implementation of fire management and invasive species plans with partner landowners as a top priority conservation strategy (The Nature Conservancy 2003, p. 13). TNC's plan also stated that seasonal burns could create habitat conditions allowing establishment and expansion of white bladderpod populations by triggering germination and reducing completion from woody invasives, and referred to ''limited data'' indicating that burns conducted July through October (non-bloom period) are the most beneficial for the bladderpod. This plan also indicted that this is probably true for the Texas golden gladecress.

Although information about the direct effects of prescribed burns on Texas golden gladecress is not available, Dr. Michael Warnock did conduct experimental burns at Caney Creek Glade Site 6 in the mid-1990s to determine the impacts on white bladderpod. His experimental burns did result in white bladderpod showing a positive reproductive response. However, Dr. Warnock did not list the Texas golden gladecress in his final report, and did not mention anything about its response to the experimental burn (Warnock 1992, entire). The TXNDD's element of occurrence records include descriptions of habitat conditions, including mention of winter burns, at a time when the Texas golden

gladecress was present (in fruit) at two historic Texas golden gladecress sites. At Caney Creek Glade Site 2, Texas golden gladecress was last observed in March 1988, when the site was described as being brush-hogged and burned that same year. In 1988, at the Caney Creek Glade Site 7, part of the Weches formation glade area below a shrubby slope was in part burned that winter (or early spring), and the Texas golden gladecress itself was described as being locally abundant in a very small area on a seepy, gravelly glade (TXNDD 2012b, pp).

Bermudagrass, ryegrass, and bahiagrass are nonnative grasses that have been documented as occurring at some white bladderpod and Texas golden gladecress sites. Nemec (1996, p. 4) described bermudagrass as among the most serious invaders of white bladderpod and Texas golden gladecress habitat. Carr (2005, p. 4) listed ryegrass (although he described it as *Lolium multiflorum* (English rye)) as a common grass component at the Chapel Hill Site in spring 2005. George (1987, pp. 26–36) found bermudagrass, bahiagrass, and perennial ryegrass at San Augustine County glade sites where he assessed the herbaceous vegetation community. Using ''importance values'' for plant species that were calculated by summing the relative density and the relative frequency of the species (with a value of 1 being highest or most dense and most frequent), he found bermudagrass, ryegrass, and bahiagrass to rank in importance as 38, 53, and 69 (respectively) of 80 species at site 1; while ryegrass, bermudagrass, and bahiagrass ranked as 13, 17, and 23 in importance (respectively) out of a total of 75 species at site 2. Interestingly, at site 3, which was the sole site with Texas golden gladecress present, only ryegrass was found; the other two species were absent. Some of the differences between the three sites (as described by George 1987, pp. 26–36) may have contributed to the presence of all the invasive grasses at sites 1 and 2, where they varied with respect to their frequency and density. Site 3 (where Texas golden gladecress occurred) was the rockiest and most fossiliferous of the three sites, with soil and a gravel-like substrate containing many small rocks. Sites 1 and 2 appeared to include more areas of deeper, more developed soil. Site 3 was the wettest in the spring and the driest in the summer and fall, due to rapid drying of the thin soil. George (1987, pp. 26–36) postulated that the thin, rocky soils of Site 3 were probably a limiting factor that helped to explain the generally lower densities of most of the plants at the site.

George (1987, pp. 26–36) also described a seasonality component to the vegetation growth on the Weches glades. This seasonality may help to keep the habitat conditions suitable for the Texas golden gladecress even if bermudagrass, bahiagrass, and ryegrass are present. He noted that the spring was dominated by a sequence of diverse annual forbs, and as the summer progressed, rainfall diminished, the soil dried out, and the flora became very sparse. The grasses exhibited large growth spurts in September and dominated all three sites; however, this time of grass dominance (summer and fall months) is the time of year when Texas golden gladecress is not present aboveground. Therefore, seasonality of growth should help to somewhat ameliorate competition between the grasses and the annuals on the outcrops.

With regard to ROWs, Texas golden gladecress does extend into highway ROWs at several sites. Coastal bermudagrass and bahiagrass are included in mixtures used to re-seed ROWs in the east Texas area (Adams 2013c, pers. comm). Bahiagrass is a deep-rooted perennial adapted to a wide range of soils. It spreads via stolons and rhizomes, in addition to being a prolific seed producer. Bahiagrass is most productive on sandy soils with a pH of 5.5 to 6.5 (Houck 2009, p. 1). These qualities would seem to contraindicate bahiagrass colonizing and persisting on the parts of the outcrop where Texas golden gladecress grows, since bahiagrass does not share an affinity for the thin, rocky, or nonexistent soils under the Texas golden gladecress.

Ryegrasses grow best on fertile, well-drained soils; however, they can also grow on soils where conditions are too wet at certain times of the year to support other grasses because ryegrass is a heavy water user (Hall 1992, p. 1). Soil pH for optimum ryegrass production is between 6.0 and 7.0 (Hall 1992, p. 3), so it may be able to tolerate the alkalinity of the Weches outcrops. Perennial ryegrass requires a dormancy period of cool temperatures before the photoperiod can induce flowering, and it normally produces seed heads during late spring (Hall 1992, p. 1). This timing of growth and reproduction may be offset enough to help to minimize competition if and when ryegrass does grow onto Texas golden gladecress habitat.

Bermudagrass is a vigorous, stoloniferous grass that can rapidly invade cultivated land in areas of high rainfall or irrigation (Duble 2013, p. 1). Bermudagrass has a fibrous, perennial root system with vigorous, deep rhizomes. Root production and dieback is reported to be especially high in the spring when shoot production begins. Soil temperatures above 65 degrees Fahrenheit (°F) (18.3 degrees Centigrade (°C)) are required for significant growth of rhizomes, roots, and stolons, with the optimum soil temperature for root growth around 80 °F (27 °C) (Duble 2013, p. 2). Bermudagrass has the capability of surviving extreme droughts and produces seed heads under stress conditions (Duble 2013, p. 3). This invasive grass can grow well on a wide variety of soils from heavy clays to deep sand, as long as fertility is not limiting. It can tolerate both acid and alkaline soil conditions and salinities. Bermudagrass does not tolerate poorly drained sites like compacted soils and heavy clays (Duble 2013, p. 6). Some qualities of bermudagrass, like its growth and spread via stolons and shoot production at nodes, along with its tolerance of varying pH conditions, might enhance its ability to invade the Weches outcrop habitats, and indeed it has been noted as a significant invader at some outcrop sites. However, its lack of tolerance for poor drainage might preclude it from the portions of the outcrop favored by the Texas golden gladecress. Also, its soil temperature requirements for growing periods may offset its season of growth and reproduction from that of the Texas golden gladecress.

Nonnative and native woody species, including woody shrubs, vines, and trees, continue to degrade Texas golden gladecress's habitat across the species' entire range. This threat is significant for the species because it is ubiquitous and has led to declines in, or disappearance of, Texas golden gladecress populations, along with altering the species' habitat. Based on our review of the scientific and commercial data available, we conclude that invasion of woody and weedy nonnative and native plants into Texas golden gladecress habitat is a threat across its range. We recognize the potential for bermudagrass, bahiagrass, and ryegrass to impact the habitat of the Texas golden gladecress, especially in those situations where these grasses are deliberately planted nearby to Texas golden gladecress populations. However, there are characteristics of each of the three that may help limit competition between these nonnative plants and the Texas golden gladecress, at least on those Texas golden gladecress sites that have sufficient outcrop rock ledge or rock face that separate the Texas golden gladecress

from the deeper soils needed by the grasses. Based on this information, we do not consider these specific species a threat at this time. In the future, if these grasses are shown to impact the Neches River rose-mallow or Texas golden gladecress, we will work with the appropriate agencies and industries to address these impacts.

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; Service 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 (Service 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 Texas golden gladecress habitat from woody plant invasion are detailed in the ''Invasive Species'' section.

There is no documentation of Texas golden gladecress plants being lost due to trampling. Potential does exist for this to happen, for example, at the Geneva Site, where Texas golden 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 to the species. Grazing also occurs within the fenced private portions of the other two remaining Texas golden gladecress population sites (Caney Creek Glade 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 best 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 Texas golden 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 (Service 1992, p. 7). At least one Texas golden gladecress population was described as being lost to this type of land use change during the 1980s (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 Resources Conservation Service 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 moister and cooler, leading to replacement of the sun-loving natives by invading cool-season vegetation and exotic species (Hartman 2005, pp. 2–4). The decomposition of pine leaf litter also facilitates the germination of pines as the soil deepens within the glade (Walker 2012, pers. comm., p. 1).

Current data do not suggest that the establishment of pine tree plantations is a threat to the species. However, if in close proximity to occupied glade openings, this may potentially cause problems for Texas golden gladecress. If this becomes an issue in the future, we will consider it in our recovery planning and implementation.

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 ROWs and in pastures. Herbicide use to maintain highway and county road ROWs has the potential to destroy the small subpopulations that exist in the TXDOT ROWs at the Geneva and Caney Creek Glade 1 sites. If timing of the herbicide application coincides with the growing and reproductive period of the year for the Texas golden gladecress, all individuals that are growing in the ROW might be extirpated if the herbicide contacts all Texas golden 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 Natural Resources Conservation Service 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 (The Nature Conservancy 2003, pp. 30–31), it is one of several herbicides identified as potentially harmful to the Texas golden gladecress and white bladderpod if used near their habitats. Management recommendations include 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 between July 1 and 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 Texas golden gladecress population sites, it is reasonable to assume that some areas of glade habitat are included in these treatment programs. Thus, although control of Macartney rose would likely benefit the Texas golden gladecress in the long term, application of a pre-emergent herbicide has the potential to eliminate the Texas golden 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 constitute a threat to Texas golden gladecress's emerging seedlings.

Climate Change

Our analyses under the 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. 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 (Intergovernmental Panel on Climate Change 2007a, p. 78). The term ''climate change'' thus refers to a change in the mean or variability of one or more measures of climate (for example, 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 (Intergovernmental Panel on Climate Change 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 Intergovernmental Panel on Climate Change 2007a, p. 30 and Solomon *et al.* 2007, pp. 35–54, 82–85. Results of scientific analyses presented by the Intergovernmental Panel on Climate Change 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 Intergovernmental Panel on Climate Change 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 (Intergovernmental Panel on Climate Change 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 (for example, 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 (Intergovernmental Panel on Climate Change 2007a, pp. 44–45; Meehl *et al.* 2007, pp. 760–764, 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 Intergovernmental Panel on Climate Change 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 (for example, habitat fragmentation) (Intergovernmental Panel on Climate Change 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 (Intergovernmental Panel on Climate Change 2007a, p. 89; 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 °F (5 °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 1950s, and in the last 15 years there have been widespread droughts: in 1996, 1999–2000, 2005–2006, 2007, and 2010–2011 (Texas Water Resources Institute 2011, pp. 10–12). Projections are for winter precipitation to decrease by 5 to 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 cm) 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 Caney Creek Glade Site 1 during the 1999–2000 droughts (Service 2010b, p. 5; Singhurst 2011a, pers. comm.). It is unknown how the Texas golden gladecress will respond to continued years of drought, especially when combined with other threats. Godwin (2012, pers. comm., p. 4) noted that droughts have had a major effect on the distribution of biota in east Texas and hypothesized that drought has contributed to isolation and endemism in the glade flora.

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 improve habitat conditions for invasive plant species and other plants (Service 2010b, p. 5), although, conversely, extreme drought years may contribute to keeping woody species from overtaking glades by making the shallow soil even more inhospitable to larger plants. Godwin (2012, pers. comm., p. 1) personally observed the drought of 2011 ''pushing back'' the edges of Weches glades and tiny saline prairies. 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 Texas golden 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 nonnative plants, the Texas golden gladecress will likely be negatively affected. Although the Texas golden 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 data available 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.

The best scientific and commercial data available do not provide reliable 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, its habitat, or responses of invasive species in these habitats.

Other Conservation Efforts

Habitat conditions conducive to the Texas golden gladecress's persistence are being maintained at the Chapel Hill population site by the landowner. Texas golden gladecress was an incidental

beneficiary of a brush removal project done for white bladderpod at this site in 1995, when the private landowner, working in cooperation with the Service, cleared shrubby overgrowth from his small tract of land. As a result of this glade being reopened, the Texas golden gladecress reappeared after a 10-year absence (Nemec 1996, p. 5). This success demonstrated that removal of woody and weedy invaders may help the Texas golden gladecress seedbed to germinate and the plant to emerge. Because this site experienced rapid reinvasion of shrubs, repeated maintenance was required to keep the site open, and the landowner has voluntarily continued to mow or bushhog at least once per year (Singhurst 2012f, pers. comm.). As a result, the Texas golden gladecress and bladderpod were still seen to occupy this site as recently as February 2012 (Singhurst 2012f, pers. comm.).

Within the past several years, the Service's Partners for Fish and Wildlife Program has funded a habitat restoration project involving brush clearing and planting of white bladderpod in a glade at a privately owned tract in San Augustine County. It was also hoped that Texas golden gladecress would benefit from this project, but the species has not been detected at the site to date.

A past conservation effort proved that there is some potential to reintroduce or create new populations of Texas golden gladecress. The species was successfully introduced via seed into apparently appropriate habitat in Nacogdoches County at a site located approximately 30 mi (48 km) west of its historic range in the late 1980s, where it continued to grow until 2011, when a pipeline excavation eliminated the population. The success of this introduction effort was a positive indication of possibilities to augment existing population sites or introduce Texas golden gladecress into other currently unoccupied but suitable habitat sites to form new populations.

In addition to habitat projects, the Service funded several projects with TNC, including one that provided for 3 years of status surveys for Texas golden gladecress and white bladderpod. These surveys, completed in 2006, were the sole source of population numbers for these species for several years. TNC also attempted to identify appropriate glade habitats in which Texas golden gladecress and white bladderpod might be found using GIS data (aerial, geology, and hydrology sources) (Turner 2000 pers. comm.), but follow-up site visits showed little Weches habitat and no new Texas golden gladecress populations at what appeared to be suitable sites (Turner 2003, p. 4, in Service 2010a). In 2001, TNC collected Texas golden gladecress seeds from four sites for cultivation, research, and long-term storage, and as seed sources for reintroduction work. The seeds were given to Mercer Arboretum, where they have been in long-term storage, as well as being used for some early germination and cultivation work. 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 1980s, 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 threat that has the most significant impacts to Texas golden gladecres populations is 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-1990s and 2011. The threats from quarry development are likely to continue, as glauconite is currently in demand for road bed and well pad construction, as well as for use in fertilizer and as an animal feed additive. For the past several years, energy exploration and production, especially natural gas, has been active due to development of the natural-gas-bearing Haynesville Shale, which underlies the entire range of Texas golden gladecress. For the four remaining populations, these activities pose ongoing threats because we cannot predict whether new pipelines, well pads, roads, or quarries are planned for the areas where the populations occur. The populations of Texas golden gladecress are found mainly on privately owned land where no level of protection for the plants is guaranteed. Portions of two extant populations extend into SH ROWs where TXDOT has the ability to provide some protections but only for those few plants that are on the ROW. Much of the species' potential habitat throughout its range occurs on private lands that have not been surveyed; therefore, the current level of threats across these lands cannot be assessed. The excavation activities associated with surface quarrying of glauconite and oil and gas development are threats that have significant impacts to the known extant populations and associated habitats of the gladecress, both now and in the future.

We have also determined that the damage to Texas golden gladecress plants and outcrop habitat that is associated with excavations may occur when pipelines for water, sewer lines, gas connections to homes, and communication lines are installed. New power lines that are built outside of established ROWs also have potential to damage Texas golden gladecress populations and habitat if land-clearing activity and heavy equipment directly cross occupied outcrops. Although we acknowledge that these activities constitute potential threats to the species and its habitat, we do not know where service improvements are planned within the range of the species or the number of these types of projects that are planned for the future.

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 Texas golden gladecress if applied to or persisting in the soil during the species' period of growth, from late fall through early summer.

A recent, ongoing trend in local land use is the conversion of open pasture to pine plantations. 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 Texas golden gladecress's habitat. However, long-term drought has negatively affected and will likely continue to negatively affect the reproduction and germination of Texas golden gladecress seeds.

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

Limited collection of Texas golden 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. TNC collected seed at four sites in 2001, and contributed these seed

collections to Mercer Arboretum, a participating institution in the Center for Plant Conservation, in 2002 (Tiller 2013, pers. comm., p. 1). Mercer maintained some in long-term storage and planted 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 constitutes 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 currently a threat to the species, nor do we expect it to become a threat in the future.

C. Disease or Predation

Our review of the best available scientific and commercial information regarding disease in Texas golden gladecress does not indicate that disease or predation are issues for this species. There is no information regarding predation by wildlife on the species. Grazing is ongoing across the range of the Texas golden gladecress and occurs on portions of all extant population sites; however, there is no information to document that cattle eat Texas golden 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 currently threats to the species, nor do we expect disease or predation to become a threat in 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 Texas golden gladecress.

The greatest threats to the Texas golden 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; installation of service lines; and potentially herbicide applications for purposes of controlling the invasive Macartney rose.

Existing State and Federal regulations that might help conserve rare species on SH 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 Texas golden gladecress. Of the two Texas golden gladecress populations that occur in ROWs, the federally listed white bladderpod is only found at one site (Caney Creek Glade Site 1). Although the Texas golden gladecress plants at the Caney Creek Glade Site 1 do extend into the TXDOT-maintained ROW, the majority of the plants are on the adjacent private land, so any protections offered by the State would apply to very few of the plants. Likewise, no existing regulations protect the species on privately owned land, where most of the remnant Texas golden gladecress is found.

Currently, Texas golden gladecress is not protected by State or Federal laws. All of the populations occur on private property even though portions of those populations extend onto SH ROWs; the ROW portions of these populations are miniscule. As such, the existing regulatory mechanisms are inadequate 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 Texas golden gladecress's seed dispersal patterns or distances, we do know that the Texas golden gladecress's habitat is exceedingly fragmented, with fewer and smaller known populations than the bladderpod, and farther distances between populations. This makes the prospects for recolonization after a potential loss of a Texas golden 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 Texas golden 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 Texas golden gladecress increases each population's vulnerability to the threats that have significant impacts described under 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 Texas golden 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 Texas golden 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 risk of extinction, 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, we do not know whether these remaining populations are peripheral to what may have been a historically larger range. Although we might infer inbreeding is occurring in gladecress based on the species' isolated occurrences and ability to self-fertilize, the best scientific and commercial data available do not describe 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 increase 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 under Factor A, constitutes a threat to the species and greatly exacerbates other the threats we identify above for this species.

Conservation Efforts To Reduce Other Natural or Manmade Factors Affecting Its Continued Existence

We have several examples of voluntary conservation efforts that are currently underway, or which took place in the past, that directly, or indirectly, assist the Texas golden gladecress by addressing the impacts of habitat loss and degradation, or low population and individual plant numbers. See description under the Factor A analysis, above.

Cumulative Effects From Factors A Through E

As described above under Factor E, Texas golden gladecress's small population size and the small number of extant populations increase each population's vulnerability to the significant threats described under Factor A. Small numbers of plants, confined to very small areas, can be extirpated by actions such as installation of pipelines; excavation of mines; or construction of well pads, roads, or other types of construction. The remaining Texas golden gladecress populations are so small that they can fall completely within the footprint of one well pad, or even within the width of a pipeline excavation. This has been the case for four of the eight Texas golden gladecress populations ever documented; three of these were extirpated due to quarry excavation between the late 1980s and the mid-1990s. The continued threat of extirpation of populations to excavation projects continues, as evidenced by the loss of the fourth population (the introduced population) to a pipeline installation as recently as 2011.

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. The high incidence of Macartney rose invasion within the Texas golden gladecress's range could increase the species' likelihood of exposure to herbicides associated with Macartney rose-control projects.

The overgrowth of many glade habitats by woody shrubs, particularly Macartney rose and Chinese privet, within the range of Texas golden gladecress also puts these few small populations at an increased risk of genetic isolation if the plant is forced into dormancy by hostile conditions on the glade. Sustained drought could also 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 Texas golden gladecress population.

The combined effects of drought, impacts from oil and gas development or other excavations, herbicide treatment, shading, and competition place the remaining three populations at a high extinction risk, and this is exacerbated by their small population size and very restricted geographic distribution.

Determination

Standard for Review

Section 4 of the Act, 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(b)(1)(A), the Secretary is to make endangered or threatened determinations required by subsection 4(a)(1) solely on the basis of the best scientific and commercial data available to her after conducting a review of the status of the species and after taking into account conservation efforts by States or foreign nations. The standards for determining whether a species is endangered or threatened are provided in section 3 of the Act. An endangered species is any species that is ''in danger of extinction throughout all or a significant portion of its range.'' A threatened species is any species that is ''likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.'' Per section 4(a)(1) of the Act, in reviewing the status of the species to determine if it meets the definition of endangered or threatened, we determine whether any species is an endangered species or a threatened species because

of 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 Status Determination

Based on our review of the best available scientific and commercial data, we conclude that the Texas golden gladecress is currently in danger of extinction throughout all of its range and, therefore, meets the definition of an endangered species. This finding, explained below, is based on our conclusions that the severity of threats is high and occurs throughout the range of the species. The Texas golden gladecress has demonstrated some ability to survive certain events (dozing and drought) likely due to persistent seed bank and some ability to tolerate small population sizes likely due to self-fertilization. However, it shows little to no ability to survive or tolerate other impacts (quarry mining and pipelines). Further, although somewhat able to persist in the face of past naturally occurring stochastic events, the species is currently highly vulnerable due to the limited distribution of populations across its range and to the specific habitat requirements needed to support the species. We find that the Texas golden gladecress is at an elevated risk of extinction now, and there is no information to suggest that the species' status will improve without significant conservation intervention. We, therefore, find that the Texas golden gladecress meets the definition of an endangered species under the Act.

On the basis of our biological review documented in this final rule to list the Texas golden gladecress, we find the species is vulnerable to population extirpations due to its specialized habitat requirements; restricted geographic distribution; moisture regime requirements; small, isolated populations; and few remaining populations (Factors A and E). The species is endemic to Weches glade habitat, which is scattered or patchy across the landscape. Its historic range does not extend farther 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 (5-km-wide) band around SH 21. 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 (Caney Creek Glade Site 1), central (Chapel Hill), and southern (Geneva) populations. All three extant populations are small in terms of areal extent and number of individual plants. The remaining three sites cover less than 1.2 ac (0.5 ha). The loss of any of the known populations further reduces the ability of the species as a whole to withstand additional threats.

The remaining small, isolated Texas golden gladecress populations are particularly susceptible to extirpation from habitat loss and degradation (Factor A). The main sources of habitat loss and degradation include construction of glauconite mines, construction of pipelines, and invasive woody plants. Glauconite mines and pipelines remove the habitat and the overlying Texas golden gladecress plants, which eliminates the entire glade or alters hydrology of glades nearby; allow the invasion of the open, sunny glade habitats by native and nonnative woody and weedy species; and can prompt the planting of pine trees in close proximity to occupied glades, which reduces sunlight and increases leaf litter. Drought decreases seed production. Successive years of drought could lead to further declines in the numbers of plants, or perhaps total loss of Texas golden gladecress populations, if no growth or reproduction occurs over this extended time period, a circumstance that could be exacerbated by climate change.

In addition to the individual sources of habitat loss and degradation under Factor A, and small, isolated populations under Factor E, the cumulative effects of the multiple stressors are acting on populations such that the effects on the Texas golden gladecress, as well as the immediacy of these threats, are significant throughout the species' entire current range. The small and limited number of remaining populations act in concert with the threats under Factor A and E. These factors pose imminent threats to the species because they are ongoing. The current conditions of small and isolated populations reduce the ability of any given Texas golden gladecress population to endure such adverse events, and natural recolonization following local extirpations is considered unlikely in most cases.

We evaluated whether the Texas golden gladecress is in danger of extinction now (i.e., an endangered species) or is likely to become in danger of extinction in the foreseeable future (i.e., a threatened species). The foreseeable future refers to the extent to which the Secretary of the Interior can reasonably rely on predictions about the future in making determinations about the future conservation status of the species. A key statutory difference between an endangered species and a threatened species is the timing of when a species may be in danger of extinction either now (endangered species) or in the foreseeable future (threatened species).

Because of the fact-specific nature of listing determinations, there is no single metric for determining if a species is ''in danger of extinction'' now. In the case of the Texas golden gladecress, the best available information indicates that, while a major range reduction (that is the overall geographic extent of the species' occurrences) has not happened, habitat destruction has resulted in significant loss of populations and reductions in total numbers of individuals. These losses are ongoing, as at least one population was lost due to a pipeline installation within the last 3 years and three populations were lost between 1994 and 2011 due to quarry mining. Because the types of human activities that have contributed to the losses of Texas golden gladecress populations are continuing to occur across the species' range, we anticipate that future losses of the remaining populations are likely to occur. Additionally, degradation of the species' habitat across its entire range is continuing as woody and weedy plants overrun glade sites. Further, an increase in the number and duration of drought events is projected to continue. Without substantial conservation efforts, this trend of population loss is expected to continue and result in an elevated risk of extinction of the species. The narrow endemism of the species, with its small geographic range, increases the risk for the species that stochastic events (e.g., drought) will affect all known extant populations, putting the Texas golden gladecress at a high risk of extinction.

Under the Act and our implementing regulations, a species may warrant listing if it is endangered or threatened throughout all or a significant portion of its range. The threats to the survival of this species occur throughout its range and are not restricted to any particular significant portion of its range. Accordingly, our assessments and determinations apply to this species throughout its entire range.

In conclusion, as described above, the Texas golden gladecress has experienced significant reductions in population numbers (based on habitat loss and degradation). The Texas golden gladecress is especially vulnerable to impacts due to its life history and

ecology. The species is also subject to significant current and ongoing threats. After a review of the best available scientific information as it relates to the status of the species and the five listing factors, we find the Texas golden gladecress is in danger of extinction now. Therefore, on the basis of the best available scientific and commercial information, we are listing the Texas golden gladecress as an endangered species, in accordance with section 3(6) of the Act. We find that a threatened species status is not appropriate for the Texas golden gladecress because the threats to the species are occurring now and are expected to continue into the future such that overall risk of extinction is high at this time.

Neches River Rose-mallow

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

Neches River rose-mallow is a nonwoody, flowering perennial found within seasonally or regularly inundated sloughs, oxbows, terraces, sand bars, and bottomlands. The Neches River rose-mallow is endemic to relatively open habitat with hydric alluvial soils (water-saturated soils). Sites are found within the Neches, Sabine, and Angelina River basins and the Mud and Tantabogue Creek basins of five counties within east Texas.

Nonnative Species

Nonnative plant species are a constant threat to native flora throughout the Gulf coast prairies of Texas and Louisiana (McCormick 2005, p. 23). A primary threat to the Neches River rose-mallow is the ongoing encroachment of nonnative and native woody species into its generally open, intermittent or perennial wetlands. We considered the potential threat from three nonnative species, Chinese tallow, coastal bermudagrass, and bahiagrass (Miller 2011, pers. comm.). Based on the best scientific and commercial data available, the Chinese tallow is an ongoing threat to the Neches River rose-mallow, but coastal bermudagrass and bahiagrass are not threats at this time.

Chinese tallow was introduced to the United States in the 1700s from China (McCormick 2005, pp. 7, 8). With the ability to reproduce quickly, reach reproductive maturity in as little as 3 years, and remain reproductively mature for at least 60 years (United States Geological Survey (USGS), 2000, p. 2) to 100 years (Gan *et al.* 2009, p. 1346), Chinese tallow can produce 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, and both flooding and drought-stricken habitats (USGS 2000, p. 1). These features allow Chinese tallow to dominate certain habitats. Butterfield *et al.* (2004, p. 338) also found that Chinese tallow grew faster than native species found within the Neches River rose-mallow habitat, such as loblolly pine, water tupelo (*Nyssa aquatica*), blackgum (*N. sylvatica*), and sweetgum, which occur in both perennially and intermittently wet habitats. Without management, the Chinese tallow has the ability to shade out, out-grow, and limit water and nutrient absorption to Neches River rose-mallow and its native vegetative associated species.

While there are methods to control Chinese tallow, these methods are labor intensive, expensive, and limited in their effectiveness. 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 Neches River 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 Revised Land and Resource Management Plan for National Forests and Grasslands in Texas (specific to the streamside Management Area 4 where the Neches rose-mallow occurs) 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 feet (30.5 m) of the Neches River rose-mallow (United States Department of Agriculture 1996, p. 154). Despite the available management actions, Chinese tallow remains at all USFS sites. Current mowing activities along ROWs may abate some growth of Chinese tallow, but management actions on these sites should also be evaluated for their effectiveness. Chemical methods are not being used to control Chinese tallow.

The invasion from nonnative Chinese tallow tree has historically been a threat to the Neches River rose-mallow and continues to be a threat. Chinese tallow occurs at all Neches River rose-mallow sites (Miller 2011, pers. comm.) at varying densities and was found to be most prevalent at SH 94 and compartment 16, Davy Crockett NF, respectively (Walker 2012, p. 2). Without active or effective management, Chinese tallow can reproduce quickly, out-shading Neches River rose-mallow and other native woody vegetation and limiting its water and nutrient absorption. Only select sites are being actively managed for Chinese tallow, but the species has not been successfully eradicated at any of the sites. This threat has led to declines at all Neches River rose-mallow sites. Therefore, based on the best scientific and commercial data available on this invasive, we conclude that invasion from Chinese tallow is a threat across the species' range.

Coastal bermudagrass is not typically found within the wetland habitats that the Neches River rose-mallow prefers, but three sites have persisting stands of coastal bermudagrass: The Texas Land Conservancy site, SH 204 ROW (Walker 2012, pers. comm.), and SH 94 or Boggy Slough (Allen 2011a, pers. comm.). Site visits to east Texas that included these three sites in August 2012, did not exhibit reduced numbers of Neches River rose-mallow due to coastal bermudagrass. Bahiagrass has not been found at any Neches River rose-mallow sites.

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), much like the conditions of Neches River rose-mallow habitat. In drier 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); however once established, coastal bermudagrass tends to produce dense monocultures where native species cannot persist. A lack of management, including mowing, could allow coastal bermudagrass to monopolize Neches River rose-mallow habitats such that the bermudagrass would out-compete the rose-mallow for water and nutrients and could out-shade the Neches River rose-mallow. Along ROWs, coastal bermudagrass and bahiagrass are often included in mixtures to re-seed ROWs in east Texas (Adams 2013c, pers. comm.). The wetter, low-lying areas of the ROW where Neches River rose-mallow exists are not generally planted with coastal bermudagrass. TXDOT also mows along

ROWs, potentially diminishing any possible encroachment as coastal bermudagrass and bahiagrass have not been observed to cause declines in any Neches River rose-mallow population.

The threat from coastal bermudagrass and bahiagrass can have potential impacts to native plants. However, only three sites have coastal bermudagrass, and bahiagrass is not present at any of the sites. It does not appear that Neches River rose-mallow has been negatively impacted by either species as of yet or will likely be impacted in the near future. Therefore, based on the best scientific and commercial data available on coastal bermudagrass and bahiagrass, and the lack of any observed impacts to the Neches River rose-mallow, we conclude that they are not threats to the Neches River rose-mallow across its range.

Native Species

Historical and current encroachment from native species has been observed in Neches River rose-mallow habitat. Two species, sweetgum and green ash (*Fraxinus pennsylvanica*), are native, deciduous trees of east Texas that have been found at all Neches River rose-mallow sites (Miller 2011, pers. comm.). Four Neches River rose-mallow populations monitored in 2011 were overgrown with sweetgum and green ash (Miller 2011, pers. comm.; TXNDD 2012a, pp. 1–11, 20–28). About 36 percent (4 of the 11) of the Neches River rose-mallow's populations are impacted by competition and shading from native sweetgum and green ash trees.

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 partial to open canopies that the Neches River rose-mallow needs. In the absence of other competing species, sweetgum and green ash can attain large sizes (50–100 feet (15–30 m)) (Dickerson 2002, p. 1) and can reduce the open canopy (Kirkman 1995, pp. 12, 15), thereby shading out Neches River rose-mallow.

Historically, natural fires generally occurred every 1 to 3 years in east Texas (Landers *et al.* 1990, p. 136; Landers 1991, p. 73) and controlled both native and nonnative species. Naturally occurring wildfires or prescribed fires can be used as management tools to limit the abundance of these native tree species. Two of the four sites were on ROWs, and prescribed burning is not a widely accepted method of ROW maintenance. On the other two sites, prescribed burning had not been implemented. The TXDOT mows these ROW sites, but mowing does not appear to be an effective management tool because these sites have both historic and current observations of native species encroachment.

Four of the 11 sites are impacted by native species, the current management techniques are not adequate for control of native species, and effective techniques need to be investigated. Therefore, based on the best scientific and commercial data available, the effects of native encroachment by these species pose an ongoing threat to the Neches River rose-mallow.

Hydrological Changes

Habitat where Neches River rose-mallow is found includes both intermittent and perennial wetlands along oxbows, sloughs, terraces, sand bars, and other low-lying areas in habitats with minimal standing water. Wetlands are ecological communities with hydric (flooded or saturated) soils. Many wetland species, including the Neches River 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 Neches River rose-mallow likely requires high precipitation and flowing water or flood events to disperse seed (Warnock 1995, p. 20; Scott 1997, p. 8; Reeves 2008, p. 3), and although the Neches River rose-mallow is adapted to persisting in dry conditions during portions of the year, a complete lack of water can diminish seed production, range expansion, and genetic exchange. As Neches River rose-mallow habitat is so water-dependent, hydrological changes can have huge impacts. Some degree of hydrological change has been seen at most of the Neches River rose-mallow sites; however, information on some of the private land sites is lacking.

At the Boggy Slough site, which is connected to the SH 94 site, natural shifts of river and creek beds have left meandering scars and remnant oxbows. However, several levees upstream and the creation of a duck hunting pond on this site have changed the natural landscape and flow patterns, thereby converting seasonally inundated wetlands to permanently flooded wetlands (Miller 2011, pers. comm.). Beaver activity, such as selective cutting and damage to certain tree species, was evident at the Boggy Slough site, but the Neches River rose-mallow did not show impacts.

On another private land site, The Texas Land Conservancy site (referred to as the Lovelady site in Table 4, above), Neches River rose-mallow plants were once observed lining the perimeter of a flatwoods pond. However, after 2003, when a stock pond was constructed (TXNDD 2012a, p. 18) in what was likely part of an overflow channel from Tantabogue Creek, the natural surface hydrology was altered by retaining overflow, preventing it from draining south to the site containing Neches River rose-mallow plants. The Texas Land Conservancy was considered a robust population; however, in 2011, the Service and TPWD botanists only observed 539 Neches River rose-mallow stems, most of which were in relatively poor condition (Miller 2011, pers. comm.).

All four Davy Crockett NF sites (compartments 55, 16, 11, and 20) 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.). Compartment 16 had altered hydrological changes. In 2000, when the Neches River rose-mallow was introduced into a wetland on this compartment, 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). Plant numbers decreased from 450 to 43 plants. It is unclear if this decrease in plants was due directly to the loss of the beaver dam; this needs further research. The pine-oak forest on adjacent private land west of compartment 55 helps regulate the amount, timing, and possibly the rate of water flow into the compartment. Therefore, any alteration of the pine forest, through tree removal projects or other habitat-altering activities, could alter key hydrological characteristics of this compartment. However, the likelihood of tree removal projects or habitat alteration activities on adjacent lands is unknown but likely minimal.

Water development and construction projects could also result in the complete loss or inundation of water at sites, threatening the Neches River rose-mallow. 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), 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 (1,105 mcm) of water would be diverted from the downstream flow of Mud Creek (USACE 2010, p. 1–1).

According to the most current project plans available in the draft environmental impact statement (EIS), a habitat evaluation procedures analysis (a broad habitat-based approach to assess environmental impacts of proposed water and land resource development projects) stated that it was possible for the Neches River rose-mallow to be in the permit area, if habitat exists; however, the analysis did not document any Neches River rose-mallow in the permitted project area (Walker 2011, pers. comm.; USACE 2010, p. 4–154). The ''Permitted Project Area'' includes the footprint of the normal conservation pool of the reservoir below a certain elevation and the limits of construction in the vicinity of the dam, or a total of approximately 10,655 acres. The ''Downstream Impacts Area'' was also analyzed in the EIS. This area included the existing Mud Creek 100-year floodplain for a distance of approximately 16 miles from below the dam site to the confluence with the Angelina River (USACE 2010, p. 1–4). The extant Neches River rose-mallow population found at the intersection of SH 204 ROW and Mud Creek is within the downstream portion of the project that was analyzed. The SH 204 ROW site is a perennial wetland where plants generally remain inundated year round; therefore, a change in the water level at this site could make it unsuitable for Neches River rose-mallow or could restrict potential seed dispersal mechanisms. Drought conditions could also exacerbate the potential threats from this project, and the reduced downstream water flows could completely extirpate the SH 204 ROW site (USACE 2010, p. 4–154; Heger 2012, pers. comm.).

Using the best scientific and commercial data available, we anticipate that the construction of the Lake Columbia reservoir project will divert water downstream, thereby likely dewatering the SH 204 ROW site. The agencies involved with the project are still working on solidifying the project details, and, therefore, we do not know how much water will remain at this site or if future water management practices or decisions will allow for seasonal flooding of water to this site.

Optimal habitat conditions for Neches River rose-mallow include intermittent or perennial wetlands that can be variable throughout the year, often becoming surficially dry during the summer and wet during the winter, perhaps being exposed to water year-round. However, hydrological changes that result in the complete loss or inundation of water at the site threaten the Neches River rose-mallow. Neches River rose-mallow, despite its name, is not found in deeper waters, unlike other *Hibiscus* species, and the Neches River rose-mallow is thought to need water at some point of its life cycle for seed dispersal. A complete loss of water at any or all of the sites could restrict the exchange of genetic material between and among sites, thereby compromising the species' genetic integrity.

Although the severity of impacts from beaver dams to the Neches River rose-mallow could be high, the level of exposure to this stressor is low. Consequently, we do not consider beaver dams a threat at this time. However, the severity of altered hydrology as a whole is high and the exposure of this threat is present throughout the species' range. Consequently, we have determined that altered hydrology is a threat now and will continue to be a threat in the near-future.

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

Right-of-way populations are vulnerable to bridge and road expansion, new road construction, and upgrade projects. These activities could impact the sites' hydrology, soil stability, wetland and riparian vegetation, and water quality. Hydrological changes, erosion, and changes in the associated native vegetation due to ROW and road upgrades and construction projects are threats to the species (as described in detail in the ''Nonnative Species,'' ''Native Species,'' and ''Hydrological Changes'' sections, above). We do not have information on how sedimentation and changes in water quality could impact Neches River rose-mallow; however, increased siltation within the water column is the major pollutant of wetlands in the United States (Baker 1992; USEPA 1995).

In 2005, a proposed bridge replacement on SH 230 ROW would have altered approximately 4.91 ac (2 ha) of Neches River rose-mallow habitat south of the ROW and 0.07 ac (0.03 ha) north of the ROW (Adams 2005, p. 1), but the TXDOT implemented avoidance measures. Bridge replacement and road expansion projects are continuing along SH 94 ROW, but as of 2011, had not progressed into Neches River rose-mallow habitats (Adams 2011c, pers. comm.). For this project, TXDOT is using temporary culverts and silt fencing to reduce sedimentation, and the Neches River rose-mallow site has been fenced off to prevent access. Regardless of these minimization techniques, sedimentation was evident along SH 94 ROW (Walker 2012, p. 2).

Potential road projects are mainly restricted to ROW easements and may potentially impact three of the 11 extant populations. Roadwork along SH 230 is occurring, and based on communication with the TXDOT, there will likely be only one project in road ROWs within the Neches River rose-mallow sites. These activities are currently being implemented or will be in the near future. As a result, the impacts to Neches River rose-mallow could be high, as an entire population could be removed as a result of these activities. Consequently, we conclude that SH ROW maintenance, bridge maintenance, and other structural projects are a threat to Neches River rose-mallow populations now and will continue to be a threat into the future.

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 Neches River rose-mallow population on private property south of SH 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 Neches River rose-mallow populations have shown evidence of habitat-clearing activities to prepare land for harvesting trees, including: Adjacent land south of the Davy Crockett NF compartment 55, Houston County; an extirpated site located south of the extant Lovelady site, Houston County; and the privately owned site at Champion, Trinity County.

Although silviculture impacts have occurred in the past, the likelihood that silviculture activities (including land-clearing activities and actual planting of trees) will occur in the near future is very low on the occupied units, including the three ROW sites and on the four USFS sites. In addition, the wetland habitat does not necessarily exclude silviculture from occurring on sites, but wetlands are not usually considered the best sites for pine planting. Therefore, we conclude that silviculture activities are currently not a threat to the Neches River rose-mallow.

Herbicide Use

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). There have been several instances where herbicide impacts to Neches River rose-mallow plants on ROWs and on privately owned lands have been documented. Neches River rose-mallow populations may also be potentially impacted by herbicides applied to pine plantations that drift into the Neches River rose-mallow habitat. Normal rainfall and flood events can unintentionally disperse herbicides downstream, impacting individual plants or whole populations, depending on the nature of the herbicide.

Three subpopulations in Trinity County along SH 230 experienced impacts from herbicide spraying. One subpopulation with approximately 50 plants, on private property south of SH 230, was extirpated by herbicide use (Service 2010b, p. 7). Herbicide drift at a second subpopulation along SH 230 (Gordon 2009, pp. 3–4) caused the ROW population to decline from 14 plants in 1999 (Poole 2001, p. 2) to zero plants in 2002 (Miller 2011, pers. comm.). Herbicide damage was evident at a third subpopulation along SH 230 ROW, and could have been the result of herbicide use by the private landowner south of SH 230 (what is now planted in pine), but this has not been confirmed. In 2012, a graduate student from Stephen F. Austin State University noted Neches River rose-mallow at this site, but this needs to be confirmed.

The TXDOT used herbicides to remove woody vegetation from ROWs in the past (Miller 2005, pers. comm., in Service 2006, p. 7; Adams 2011c, pers. comm.), but mechanical clearing methods have largely replaced the use of herbicides in these ROW areas. Impacts from herbicide applications to Neches River rose-mallow have not been documented at any of the four USFS compartments. The USFS Revised Land and Resource Management Plan for National Forests and Grasslands in Texas restricts the use of nonaquatic herbicides unless hand-applied (United States Department of Agriculture 1996, p. 153).

Exposure to herbicides, in conjunction with silviculture activities, is a threat to the Neches River rose-mallow, as it has impacted seven of the 11 populations (64 percent). While the majority of Neches River rose-mallow populations are on State or Federal land, all are adjacent to private lands. Even though the State and the USFS do not actively use herbicides, private landowners do. Consequently, herbicide overspray from private land could impact all existing Neches River rose-mallow populations. The severity of herbicide use effects to the Neches River rose-mallow, in combination with silviculture practices, is high, as seven of the 11 populations have been impacted by these activities. These activities are current and ongoing threats. Consequently, exposure to herbicides is a current and near future threat to the Neches River rose-mallow.

Trampling and Herbivory by Feral Hogs 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 1930s (Isle and Hellgren 1995, p. 793). While these omnivores dig in the soil in search of roots, tubers, and invertebrates, they can inadvertently cause damage to other food resources and habitat. Feral hogs forage by turning over soil with their snouts, creating mounds and depressions (Arrington *et al.* 1999, p. 535). Hogs transition from foraging in oak stands during winter months, to foraging in swamp and marsh edges during the summer months 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 to 8 months (Wood and Barrett 1979, p. 242), and have large litter sizes. However, uprooting of Neches River rose-mallow has not been observed (Creech 2011a, pers. comm.; Miller 2011, pers. comm.).

There are both historic and current records of damage to Neches River rose-mallow habitat from feral hogs. Damage of habitat by feral hogs has historically been recorded at Mill Creek Gardens (Creech 2011a, pers. comm.; Miller 2011, pers. comm.) and on all four Davy Crockett NF sites. Until 2012, only tracks and damage to habitat have been the most noted type of destruction; however, current damage to Neches River rose-mallow plants was observed in compartments 16 and 20 of the Davy Crockett NF, where feral hogs had broken and flattened plants (Walker 2012, pers. comm.). Large groups of feral hogs were observed in Neches River rose-mallow sites within compartments 55 and 16 of the Davy Crockett NF (Walker 2012, pers. comm.). Habitat damage is rangewide, and although Neches River rose-mallow may not the primary target during foraging activity, plants have been damaged.

Although the Neches River rose-mallow grows adjacent to permanent standing water or may occur within infrequently flooded areas, this does not limit the access of feral hogs. Further, drought may enhance accessibility to Neches River rose-mallow sites, thus increasing their susceptibility to trampling by feral hogs. Unmanaged feral hog populations can lead to increased soil disturbance and impacts to the native vegetative community, which could create prime conditions for nonnative species to invade. Current feral hog damage has been documented at four of the 11 Neches River rose-mallow sites. Feral hogs are a present threat and will likely continue to be a threat in the near future. However, at this time the severity of impacts to the Neches River rose-mallow is low.

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 observed on The Texas Land Conservancy's Lovelady site in 2011. The Neches River rose-mallow at the Lovelady site suffered severe documented herbivory where stems had been eaten almost to the ground (TXNDD 2012a). The Texas Land Conservancy has attempted to exclude these livestock, and has proposed constructing an exclusion fence around the current location of the Neches River rose-mallow population; however, funding has not been secured (Dietz 2011, pers. comm.). The Neches River rose-mallow at Lovelady is concentrated along a low area leading into a stock pond (Miller 2011, pers. comm.). Only one of 11 sites (9 percent of the total known population) has shown damage from cattle herbivory. Trampling has not been observed at the Lovelady site or any other. Drought could exacerbate herbivory, as was seen in the severe drought of 2011, which could lead to an increase in trampling. The immediacy and severity of herbivory to the Neches River rose-mallow is high, but the exposure to herbivory is low. Therefore, we conclude that herbivory is not a

threat to to the Neches River rose-mallow.

Natural Gas Pipelines and Well Activity

The Haynesville or Bossier and Eagle Ford Shale formations in east Texas are currently being developed for oil and natural gas production. The Texas Railroad Commission 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 Neches River rose-mallow, including Houston, Trinity, Nacogdoches, and Cherokee Counties, may be subject to increased oil and natural gas exploration in the future (Texas Railroad Commission 2012). However, oil and gas exploration was not observed on or directly adjacent to any of the Neches River rose-mallow populations that the Service observed in 2011, and currently there are no proposals near extant Neches River rose-mallow populations. Therefore, we determine that oil and natural gas exploration activities are not currently a threat to the Neches River rose-mallow.

Climate Change

We discuss the topic of climate change in greater detail under ''*A. The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range*'' for the Texas golden gladecress (which, like the Neches River rose-mallow, 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 Neches River rose-mallow by altering flow regimes and by temporarily increasing the depth of its wetland habitat to a level at which the species cannot survive. A warmer climate with more precipitation extremes may also increase competition from native and nonnative invasive plant species (Service 2010b, p. 8). The timing of precipitation is also crucial for the Neches River rose-mallow, as seed dispersal is likely dependent on flowing water.

Neches River rose-mallow has shown evidence of damage from drought conditions. In October 2011, all Neches River rose-mallow populations and habitats showed evidence of damage from the previous 3 years of drought, including changes in leaf morphology, dead plants at specific sites, reduced seed production, and lower water levels in perennial wetlands. In addition, one site (The Texas Land Conservancy site) showed evidence of herbivory by livestock. The survival of Neches River rose-mallow populations during previous drought cycles may have been aided by its greater abundance and by greater habitat contiguity. Loss of habitat contiguity impedes the recolonization of sites from neighboring seed sources following a catastrophic loss, such as from drought. More frequent droughts will further exasperate these impacts to the Neches River rose-mallow.

With climate change projections of warmer and more frequent droughts, and more extreme precipitation events, impacts to the Neches River rose-mallow will continue. The severity of impacts to the Neches River rose-mallow is high, as all populations will be impacted. Further, this threat is current and will continue into the near future.

Other Conservation Efforts

Three populations of the Neches River rose-mallow exist along SH ROWs in Houston, Trinity, and Cherokee Counties. The 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. Because the Neches River rose-mallow was not a listed species, the MOU relates to protection of Neches River 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.

Five populations, including a portion of the SH 94 site, are located on private lands. Historically, two candidate conservation agreements were formed between the Service and Champion International (Champion) in 1998, and with Temple-Inland Forest Products (Temple-Inland) in 2002, to conserve the Neches River rose-mallow on both sites. The candidate conservation agreements have expired, and private landowners are not restricted by guidelines outlined those agreements. Champion's 5-year candidate conservation agreement 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 (Service 1998, p. 4). The Champion property was sold to Temple-Inland in 2001, and in 2004, the candidate conservation agreement expired (Service 2010b, p. 9). The Temple-Inland candidate conservation agreement covered an area that has a 20-ac (8.1-ha) wetland with Neches River rose-mallow (Boggy Slough site in Table 4); the plants declined due to drought and alteration of an onsite wetland. A smaller wetland with Neches River 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 (Service 2002, p. 3; Service 2010b, p. 9). The Temple-Inland candidate conservation agreement was valid from 2002–2004. Contact was made with the owners, and the Service and TPWD visited the site in October 2011. Plants appeared healthy, but nonnative and native species encroachment into Neches River rose-mallow habitat was observed (Miller 2011, pers. comm.).

Four known sites lie within the Davy Crockett NF, which is managed under the Revised Land and Resource Management Plan. The USFS considers the Neches River rose-mallow a sensitive species. Actions occurring on USFS property must not result in a net loss of species viability or create significant trends toward the need for Federal listing. However, USFS standards and guidelines in the plan are not mandatory and do not address all threats pertaining to the Neches River rose-mallow.

The Lovelady site is owned by The Texas Land Conservancy, once known as the Natural Area Preservation Association. Thirty acres (12 ha) of land were purchased in 2004, located north of SH 230 (The Texas Land Conservancy 2011). Purchase of this easement on

private land was specifically for the conservation of the Neches River rose-mallow; however, plants occur on private land, and they are not offered protection under the Act unless there is a Federal nexus. However, The Texas Land Conservancy had initiated a voluntary effort to construct a cattle-exclusion fence, but funds were lacking 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 (Stephen F. Austin State University 1999, p. 1), and was used as an experimental plot to test fertilizer and mulching effects on the Neches River rose-mallow (Scott 1997, pp. 6–7). This site is informally managed through mowing and burning regimes prescribed by Stephen F. Austin State University staff, but encroachment from native woody species has been observed in the past (Creech 2011c, pers. comm.). The Neches River rose-mallow was last observed in 1980 at the Harrison County site and the site has not been revisted since then due to a lack of accessibility. The Neches River rose-mallow was last observed at the Camp Olympia site in 1978. The site has been revisited in 1992 and 1993, but has not been observed (Warnock 1995, pp. 6, 8; TXNDD 2012a, pp. 58–60). Introductions onto Mill Creek Gardens and the Pineywoods Native Plant Center on the Stephen F. Austin State University campus have provided researchers the opportunities to study the species, including its affinity for hybridization. Seed has also been collected by the Mercer Arboretum in Ft. Collins, Colorado.

Summary of Factor A

Based on our evaluation of the best available scientific and commercial data, we conclude that the present loss and modification of the Neches River rose-mallow's habitat is a threat that has significant impacts to the species' continued survival. Threats include competition for light and nutrients by native and nonnative invasive plant species, altered hydrology, herbicide drift, and trampling by feral hogs. These threats may be exacerbated by future road and bridge construction and maintenance projects. We determine that livestock grazing is not a threat to the species. Although silvicultural practices have caused some prior impacts to the species, we do not anticipate that silviculture activities will continue to be a threat. The activities related to exploration and development of oil and natural gas wells are not currently a threat to the species. Effects of climate change may be exacerbated by effects from other threats. 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 Neches River rose-mallow. Therefore, we conclude that habitat loss, destruction, and modification is a threat to the Neches River rose-mallow rangewide both now and in the future.

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

The showy flowers produced by the genus *Hibiscus* make it of high horticultural interest (Service 2010b, 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 Neches River rose-mallow plants online (Creech 2011a, pers. comm.). Neches River 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 Neches River 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 Mercer Arboretum Rare and Endangered Gardens, where they have remained; seeds and plants have not been transplanted back into the wild populations (Tiller 2011, pers. comm.). Neches River 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 Neches River 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 scientific and commercial data available, we conclude that collection for recreational, scientific, or educational purposes is not a threat to the Neches River rose-mallow and is not likely to become one 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 typically to a lesser degree than white-tailed deer (Everitt *et al.* 1999, pp. 187–193). In 1993, evidence of herbivory was present at four of the 11 Neches River rose-mallow subpopulations at Lovelady (Warnock 1995, p. 18) and in 2010, at compartment 20 (Allen and Duty 2010, p. 3). In 2011, at five of the 11 populations, aboveground portions of the Neches River rose-mallow, mainly the tips, were grazed by cattle, with the most intense herbivory occurring at the Lovelady site; cattle on adjacent land were the likely culprit. Herbivore consumption of plants could decrease the reproductive success of the Neches River rose-mallow (Adler *et al.* 2001, p. 1). Only at 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, which increases and strengthens the girth rather than the height of the plant (Strauss and Agrawal 1999, p. 179; Bailey 2006, p. 415).

Insect damage and predation has been observed on Neches River rose-mallow plants in several populations; however, regrowth of foliage after herbivory incidents may indicate that the Neches River rose-mallow is adapted to herbivory (Strauss and Agrawal 1999, p. 179). Ninety percent of the first foliage of Neches River rose-mallow leaves at Lovelady had been consumed by insects (Service 2010b, p. 8) with insect predation also seen on compartment 11 plants in 2006 (Philipps 2009, p. 1). The scentless plant bug (*Niesthrea louisianica*) 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 Neches River rose-mallow plants on all Davy Crockett NF sites (Miller 2011, pers. comm.) and were likely caused by this plant bug. Larval forms of the Hibiscus sawfly (*Atomacera decepta*) can consume Neches River rose-mallow seed pods in herbaria, but have not been noted to affect wild populations (Wieland 1995, p. 1; Creech

2011a, pers. comm.). However, these bugs are not considered a significant pest because the damage to the plants is minor (Toth 2007, p. 6).

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 Neches River rose-mallow could increase. 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 Neches River rose-mallow.

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. Neches River 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 rangewide, 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, but it is not a threat 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 Neches River rose-mallow.

Davy Crockett NF lands are federally owned and managed by the USFS for the general public. Four populations of the Neches River rose-mallow occur on the Davy Crockett NF. The Davy Crockett NF classifies the Neches River 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 for National Forests and Grasslands in Texas (USDA 1996, entire). This management zone includes the bed, bank, and water resources of the rivers, perennial and intermittent streams and wetlands, and their adjacent areas (United States Department of Agriculture 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 (United States Department of Agriculture 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 (United States Department of Agriculture 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 ''Nonnative Species'' under the Factor A discussion), routine fires may play a role in reducing Chinese tallow. Actions that may affect Neches River rose-mallow habitat need to be assessed using these standards and guidelines because these are considered regulations that need to be followed (Philipps 2012, pers. comm.). The encroachment of nonnative and native vegetation in Neches River rose-mallow habitat is not addressed in the Revised Land and Resource Management Plan for National Forests and Grasslands in Texas; however, the application of prescribed fire in some areas may benefit the Neches River rose-mallow.

The Neches River rose-mallow is considered by the USFS 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 (USFS Manual 2670, 2005). The management objectives described in USFS Manual 2670 are to develop and implement management practices to ensure that species do not become endangered or threatened because of USFS actions, including: Maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on NF System lands; and develop and implement management objectives for populations or habitat of sensitive species or both. Application of USFS Manual 2670 standards are only guidelines, and are not mandatory. However, the USFS must 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 USFS 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. Specific threats to the Neches River rose-mallow are not addressed with this designation.

Existing regulatory mechanisms do not provide protection for plants on private lands. Neches River rose-mallow populations on Davy Crockett NF lands only receive some protection from habitat modification. In addition, not all threats are addressed, such as encroachment of nonnative and native species into Neches River rose-mallow habitat. The designation as a sensitive species for the Neches River rose-mallow does not address the threats

specific to the species. Only when the species is listed under the Act will the USFS be required to consult on projects that could impact the species or its habitat. Therefore, based on our review of the best scientific and commercial data available, we conclude that existing regulatory mechanisms provide some protection against threats, but these mechanisms do not address or ameliorate all of the threats.

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).

Klips (1995) looked at the genetic affinity of the Neches River rose-mallow compared with the two other congeners (similar) species, *Hibiscus moscheutos* and *H. laevis.* In his study, Klips concluded both *H. dasycalyx* and *H. laevis* are genetically more similar than *H. moscheutos.* Mendoza created the genetic fingerprints for all three congener species to help determine the level of hybridization within and among populations. Both studies observed wild plants that appeared to be hybrids; however, neither Klips nor Mendoza studied the occurrence of hybridization among the populations of the Neches River rose-mallow. There is no evidence that Neches River rose-mallow populations are experiencing genetic drift or inbreeding. We conclude that small population size is not a threat to the Neches River 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 Neches River rose-mallow sites contain individuals that may be products of crosses between the Neches River rose-mallow with *H. laevis* or *H. moscheutos.* In some locations, *H. laevis* or *H. moscheutos,* or both, grow in close proximity to the Neches River rose-mallow. These plants have leaves, flowers, and floral parts resembling both parent species (Service 2010b, p. 3; TXNDD 2012a, entire). Other species accounts, including our candidate notices of review and anecdotal accounts from USFS, TPWD, and other botanists, conclude that there is the potential that hybrids may exist at most, if not all, of the sites; however, genetic studies have not confirmed that this phenomenon is occurring. So far, these are only observations, and no genetic studies have taken place to verify if hybridization is occurring. The University of Texas-Tyler is researching the hybridization issue for Neches River rose-mallow and its impacts on the population; however, the project is only in its infancy, and no results have been determined. Therefore, we do not consider hybridization to be a threat to the Neches River rose-mallow.

Conservation Efforts To Reduce Other Natural or Manmade Factors Affecting Its Continued Existence

We have several examples of voluntary conservation efforts that are currently underway, or which took place in the past, that directly, or indirectly, assist the Neches River rose-mallow by addressing the impacts of habitat loss and degradation, or low population and individual plant numbers. See description under the Factor A analysis above.

Cumulative Effects From Factors A Through E

The threats that have the most severe impacts to the Neches River rose-mallow and its habitat involve the loss, destruction, modification, and curtailment of habitat. The rangewide and imminent threat from nonnative species encroachment (mainly Chinese tallow) and native woody species (sweetgum and green ash) will likely continue if regulatory mechanisms are not employed. Alteration of natural hydrological features of Neches River rose-mallow is an ongoing and potential threat, having rangewide impacts. Trampling and herbivory also impact the Neches River rose-mallow.

Threats discussed in this finding could work in concert with one another to cumulatively create situations that potentially impact Neches River rose-mallow beyond the scope of the combined threats that we have already analyzed. Specifically, threats may be exacerbated by the effects of ongoing and future climate change, especially the projected increases in temperature and decreases in precipitation that may increase the frequency and severity of droughts. Although the Neches River rose-mallow is adapted to being dry during portions of the year, a complete lack of water can diminish its ability to expand its known range and reduce its genetic exchange. Further, climate change could lead to an increase in nonnative species, because nonnative species can typically tolerate a wider range of habitat conditions outside of those that are suitable for the Neches River rose-mallow. Drought conditions can increase the susceptibility of sites to be impacted from trampling from feral hogs, such that observations of broken and flattened plants would increase. The reproductive capabilities of feral hogs and their ubiquitous foraging behavior allows them to adapt well to drought conditions. Herbivory from cattle, or white-tail deer, would also increase in concert with future effects of climate change. Hydrological alterations combined with drought conditions could cause or intensify herbivory. This phenomenon was only observed at The Texas Land Conservancy site in 2011 by cattle, where drought likely increased the grazing pressures not normally experienced by the Neches River rose-mallow within this site. A reduction in the height of Neches River rose-mallow stems could increase its vulnerability to browsing by cattle. The drought conditions of 2011 caused decreased heights in Neches River rose-mallow plants; this, combined with the lack of a cattle exclusion fence on an adjacent land to The Texas Land Conservancy, likely increased the risk of herbivory. When normal rainfall resumes and preferred forage sources become available, herbivory would likely decrease.

Summary of Factors

The primary factors threats to Neches River rose-mallow are nonnative species encroachment at all sites; invasion of sites by native woody species, causing shading and increased competition for resources; ongoing and potential changes to key hydrological features of the species' habitat; future construction and ROW projects; and aerial herbicide drift incidents. These factors pose imminent threats to the species because they are ongoing or are likely to occur in the near future. Since the Neches River rose-mallow is endemic to intermittent and perennial wetlands, drought can exacerbate all of the existing threats.

Determination

Based on our review of the best scientific and commercial data

available, we conclude that the Neches River rose-mallow is likely to become an endangered species within the foreseeable future and, therefore, meets the definition of a threatened species. This finding, explained below, is based on our conclusions that the Neches River rose-mallow's primary threats are imminent, thus causing the species to exhibit low viability as characterized as having only one site close to meeting its conservation goals. Significant factors that support this determination include the following:

- The significant and ongoing threat from nonnative species at all sites (Factor A);
- The encroachment of habitat from woody natives (Factor A);
- The potential extirpation of an occupied Neches River 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);
- The trampling from feral hogs (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).

We relied on Pavlik's Minimum Viable Population analysis tool (1996, pp. 127–155) and species experts to determine the conservation goals of the species. Based on the best known and available scientific information on the species' life-history and reproductive characteristics, we concluded that the conservation goals for the Neches River rose-mallow included 10 viable populations, each containing at least 1,400 individual plants. The species is limited to the Neches, Sabine, and Angelina River basins and the Mud and Tantabogue Creek basins with 11 extant sites throughout this range. However, many of these sites were introduced and are now compromised by threats from feral hog damage, hydrological changes, nonnative and native species encroachment into habitat, construction projects, and herbicide overspray. Future management actions that ameliorate these threats could allow for the species to expand within its known range. The extant populations are generally small. The only site that has come close to reaching the conservation goals are on compartment 55 of the USFS; however, it still only comprises 53 percent of the needed plants at this site (750 plants were seen in 2010).

The main sources of habitat loss, degradation, and modification include hydrologic changes (which alter habitat suitability, growth of plants, expansion into new areas, and potentially seed dispersal); encroachment of habitat from woody natives and invasive nonnatives (which out-shade and compete for nutrients and water absorption); road construction and maintenance projects; aerial drift of herbicides (which may go unregulated on private lands); trampling by feral hogs (known to flatten and break plants); and herbivory. These can have a cumulative impact that further depletes population numbers. Drought is likely to exacerbate these threats.

Most threats are distributed across the geographic range of the Neches River rose-mallow. These threats include: Encroachment by woody natives and invasive nonnatives, hydrological changes, and trampling. The threat from nonnatives is imminent and is occurring at all populations, resulting in competition for light and nutrients, but maintenance activities occur within some populations to minimize this threat. Although information on populations inhabiting private lands is a bit lacking, some degree of hydrological change has been seen at most sites and is therefore rangewide. This threat is likely to continue into the future as water resources become more scarce and important to the human population. Drought will likely exacerbate existing threats and impact all populations. Direct impacts to plants from trampling has been documented at 4 of the 11 Neches River rose-mallow sites, and several others have had documented observations of damaged habitat from feral hog tracks. However, some threats do not affect all Neches River rose-mallow populations. For instance, drift from herbicide spraying likely resulted in the extirpation of the Neches River 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, Neches River rose-mallow populations on NF lands are not threatened by this activity. 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 USFS lands have declined in recent years. Some threats are likely to occur in the near 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 Neches River 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).

We evaluated whether the Neches River rose-mallow is in danger of extinction now (i.e., an endangered species) or is likely to become in danger of becoming endangered (i.e., a threatened species) in the foreseeable future. The foreseeable future refers to the extent to which the Secretary can reasonably rely on predictions about the future in making determinations about the conservation status of the species. A key statutory difference between an endangered species and a threatened species is the timing of when a species may be in danger of extinction, now (endangered) or in the foreseeable future (threatened species).

In the case for the Neches River rose-mallow, the best available scientific information indicates that, while reductions in the species' range have not occurred, there have been significant impacts from habitat modification and loss that has caused reductions in most, if not all, of the known Neches River rose-mallow populations. However, there are sufficient numbers of populations available, some of which are being conserved for the Neches River rose-mallow. Four of the 11 existing Neches River rose-mallow populations, including the largest and most robust population, occur on USFS lands. However, the USFS Revised Land and Resource Management Plant does not address all the significant threats to the species. The Texas Land Conservancy private land site was purchased as a conservation easement for the Neches River rose-mallow. However, these protection measures are voluntary. We conclude that the Neches River rose-mallow is likely to become an endangered species within the foreseeable future, meeting the standard of a threatened species.

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 Neches River 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.

As threats extend throughout the species' entire range and are not geographically concentrated, it is unnecessary to determine whether the Neches River 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 are listing the Neches River rose-mallow as a threatened species throughout its range in accordance with sections 3(20) 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. Revisions of the plan may be done to address continuing or new threats to the species, as new substantive information becomes available. 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 Texas Coastal Ecological Services Field Office in Corpus Christi (see **ADDRESSES**, above).

Implementation of recovery actions generally requires the participation of a broad range of partners, including other Federal agencies, States, tribes, nongovernmental organizations, businesses, and private landowners. Examples of recovery actions include habitat restoration (e.g., restoration of native vegetation), research, captive propagation and reintroduction, and outreach and education. The recovery of many listed species cannot be accomplished solely on Federal lands because their 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.

Once these species are listed, funding for recovery actions will be available from a variety of sources, including Federal budgets, State programs, and cost share grants for non-Federal landowners, the academic community, and nongovernmental organizations. In addition, pursuant to section 6 of the Act, the State of Texas would be eligible for Federal funds to implement management actions that promote the protection and recovery of the Texas golden gladecress and the Neches River rose-mallow. Information on our grant programs that are available to aid species recovery can be found at: *http://www.fws.gov/grants.*

Please let us know if you are interested in participating in recovery efforts for the Texas golden gladecress and the Neches River rose-mallow. 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**).

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 listed species or result in destruction or adverse modification of 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 consultation with the Service.

For the Texas golden 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: (1) Provision of Federal financial and technical assistance through the U.S. Department of Agriculture; (2) permits issued by the Federal Energy Regulatory Commission for installation of interstate natural gas pipelines and associated infrastructure; (3) provision of Federal Highway Administration funds for road projects; (4) provision of Department of Housing and Urban Development funds for municipal and residential construction and infrastructure projects in towns along SH 21 within the range of the Texas golden gladecress; (5) funds for electric service improvements provided to electric cooperatives by the U.S. Department of Agriculture's Rural Utilities Service; (6) 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 (7) actions funded by the Federal Emergency Management Agency. 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 Neches River 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 (33 U.S.C. 1251 *et seq.*) 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 U.S. Department of Agriculture's USFS; 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 endangered or threatened (section 9(a)(2)(E) of the Act).

Chapter 88 of the Texas Parks and Wildlife Code lists plant species as State endangered or threatened, with the same status as the Federal designation, immediately upon completion of final Federal listing. The State prohibits commerce in endangered or threatened plants and the collection of listed plant species from public land (defined as State-owned and land belonging to local governments) without a permit issued by TPWD. The State also prohibits removal for purposes of commercial sale, possession for commercial sale, transport for commercial sale, or sale of all or part of a listed plant from private land without a permit issued under Texas Parks and Wildlife Code, section 88.0081. 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 listing on proposed and ongoing activities within the range of listed species. 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 Texas golden gladecress or the Neches River 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 Texas golden gladecress or Neches River rose-mallow plants from populations located on State-owned land (highway ROWs) or on land owned by local governments.

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

(4) Unauthorized removal, damage, or destruction of Texas golden gladecress or Neches River rose-mallow plants from populations located on federally owned lands.

Questions regarding whether specific activities would constitute a violation of section 9 of the Act should be directed to the Texas Coastal Ecological Services Field Office in Corpus Christi (see **FOR FURTHER INFORMATION CONTACT**). Requests for copies of the regulations concerning listed species 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, TX 78412–5837 (telephone 361–994–9005; facsimile 361–994–8262).

Upon listing the Texas golden gladecress and the Neches River rose-mallow under the Act, the State of Texas's Endangered Species Act (Texas Administrative Code Chapter 88:88.001–88.012) is automatically invoked. The State's Endangered Species Act would prohibit commerce in endangered or threatened plants and the collection of listed plant species from public land without a permit issued by TPWD and would restrict any take for commercial purposes from private land to individuals possessing a permit issued under section 88.0081. The State's law would also 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, some Federal protection afforded to these species by listing them (Texas golden gladecress as endangered, and Neches River rose-mallow as threatened) will be reinforced and supplemented by protection under State law.

Under section 4(d) of the Act, the Secretary of the Interior has discretion to issue such regulations as he deems necessary and advisable to provide for the conservation of threatened species. Our implementing regulations (50 CFR 17.71) for threatened plants generally incorporate the prohibitions of section 9 of the Act for endangered plants, except under certain circumstances, such as when a ''special rule'' promulgated under section 4(d) of the Act has been issued with respect to a particular threatened species. In such a case, the general prohibitions in 50 CFR 17.61 would not apply to that species, and instead, the special rule would define specific take prohibitions and exceptions, which we consider necessary and advisable to conserve the species, that would apply for that particular threatened species. With respect to a threatened plant, the Secretary of the Interior also has the discretion to prohibit by regulation any act prohibited by section 9(a)(2) of the Act. Exercising this discretion, which has been delegated to the Service by the Secretary, the Service has developed general prohibitions that are appropriate for most threatened plants in 50 CFR 17.71 and exceptions to those prohibitions in 50 CFR 17.72. We are not promulgating a special section 4(d)

rule, and as a result, all of the section 9 prohibitions, including the ''take'' prohibitions, will apply to the Neches River rose-mallow.

Required Determinations

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 in connection with listing a species as an endangered or threatened species under the Endangered Species Act. We published a notice outlining our reasons for this determination in the **Federal Register** on October 25, 1983 (48 FR 49244).

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 Texas Coastal Ecological Services Field Office in Corpus Christi (see **FOR FURTHER INFORMATION CONTACT**).

Authors

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

List of Subjects in 50 CFR Part 17

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

Regulation Promulgation

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

PART 17—[AMENDED]

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

Authority: 16 U.S.C. 1361–1407; 1531–1544; and 4201–4245, unless otherwise noted.

2. 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	814	17.96(a)	NA
*	*	*	*	*	*	*	
Leavenworthia texana ..	Texas golden gladecress.	U.S.A. (TX)	Brassicaceae ..	E	814	17.96(a)	NA
*	*	*	*	*	*	*	

* * * * *

Dated: August 29, 2013.

Rowan W. Gould,

Acting Director, U.S. Fish and Wildlife Service.

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