

Environmental Assessment
for
Designation of Critical Habitat
for
Roswell Springsnail, Koster's Springsnail,
Pecos Assimineia, and Noel's Amphipod

U.S. Department of the Interior
Fish and Wildlife Service
Region 2



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1.0 PURPOSE OF AND NEED FOR ACTION

The U.S. Department of the Interior (USDI), Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) to analyze potential effects to physical and biological resources and social and economic conditions that may result from designation of critical habitat for four invertebrate species. These four invertebrate species are Roswell springsnail (*Pyrgulopsis roswellensis*), Koster's springsnail (*Juturnia kosteri*), Pecos assiminea (*Assiminea pecos*), and Noel's amphipod (*Gammarus desperatus*)¹. All four of these species are proposed for listing as endangered under the Endangered Species Act of 1973 (ESA), as amended.

This EA will be used by the Service to decide whether or not critical habitat will be designated as proposed, if the proposed action requires refinement, or if further analyses are needed through preparation of an environmental impact statement. If the proposed action is selected as described or with minimal changes and no further environmental analyses are needed, a Finding of No Significant Impact will be prepared. This EA has been prepared pursuant to the requirements of the National Environmental Policy Act of 1969 (NEPA) as implemented by the Council on Environmental Quality regulations (40 CFR §1500, *et seq.*)² and Department of the Interior NEPA procedures.

¹ Roswell springsnail, Koster's springsnail, and Pecos assiminea are snail species (mollusks), while Noel's amphipod is a crustacean species. The four invertebrate species are described in more detail in section 1.4.2.

² CFR is the Code of Federal Regulations, which can be accessed via the Internet at <http://www.gpoaccess.gov/cfr/index.html>

1.1 Introduction

While species extinction can and does occur naturally, the current rate of extinctions is estimated to be many times greater than the natural "background" rate, due to the effects of human actions (*e.g.*, Wilson, 1992; Ward, 2004). Recognition that human activities "untempered by adequate concern and conservation" were causing species extinctions was the primary reason for enacting the Endangered Species Act of 1973 (*cf.* ESA §2[a][1]). In developing the law, Congress found that the biological diversity and natural heritage of the United States had "esthetic, ecological, educational, historical, recreational, and scientific value to the Nation and its people" (*cf.* ESA §2[a][3]). The ESA is now the main federal law for protecting and recovering species that are in danger of extinction, thereby conserving the biological diversity and natural heritage of the United States.

The Service published a proposed rule on 12 February 2002 to list Roswell springsnail, Koster's springsnail, Pecos assiminea, and Noel's amphipod (hereafter collectively referred to as "the four invertebrate species") as endangered under the ESA (67 FR 6459)³. The primary reasons for proposed listing were "local and regional groundwater depletion, surface and groundwater contamination, oil and gas extraction

³ This is a reference to the Federal Register, which is "the official daily publication for rules, proposed rules, and notices of Federal agencies and organizations, as well as executive orders and other presidential documents." Federal Register volumes from 1994 to present can be accessed via the Internet at <http://www.gpoaccess.gov/fr/index.html>

activities within the supporting aquifer and watershed, and direct loss of their habitat (*e.g.*, through burning or removing marsh vegetation, cementing, or filling habitat) ” (67 FR 6459).

This EA analyzes the potential effects of designating critical habitat for the four invertebrate species. Critical habitat is defined in the ESA as areas that are essential for the conservation⁴ of the species (see section 1.4.1 below for an in-depth discussion of critical habitat). The Service is required to designate critical habitat, to the maximum extent prudent, at the time species are listed as threatened or endangered (ESA §4[a][3]; 50 CFR §424.12). Designation of critical habitat is not considered to be prudent when: 1) the species is threatened by taking or other human activity, and identification of critical habitat can be expected to increase the degree of threat to the species; or 2) designation of critical habitat would not be beneficial to the species (40 CFR §424.12[a][1]).

The Service has determined that threats to the four invertebrate species would not increase with critical habitat designation and that designation of critical habitat would have substantial beneficial effects in their conservation (67 FR 6459: 6466)⁵. Collection is not known to threaten any of the four invertebrate species. Information on their

occurrence and distribution is already available to the public. The areas proposed for critical habitat designation are managed for the benefit of wildlife and unauthorized collection of any of the four species is unlikely to occur to any measurable extent. Therefore, the degree of threats to the four species would not increase with designation of critical habitat (67 FR 6459: 6466).

Conservation of the four invertebrate species may benefit from critical habitat designation (67 FR 6459: 6466). Federal actions that may affect designated critical habitat would be reviewed to ensure that areas essential for the conservation of the four invertebrate species retain necessary habitat characteristics. Designation of critical habitat may also help focus conservation activities for the four invertebrate species, alert the public and land-management agencies to the importance of specific areas for their conservation, and identify areas that may require special management.

The entire distribution of the four invertebrate species consists of a few small, isolated aquatic habitats in the Pecos River drainage in southeastern New Mexico and west Texas. Recent population extinctions caused by habitat loss and degradation have been documented for all four invertebrate species (Cole, 1981; Taylor, 1987; Cole, 1988*a*; Taylor, 1987; Lang, 1998). Currently, Roswell springsnail, Koster's springsnail, and Noel's amphipod are known to occur only at Bitter Lake National Wildlife Refuge. Pecos *assimineae* occurs at three isolated locations in the United States: two springs in Texas and at Bitter Lake National Wildlife Refuge.

This EA analyzes alternatives for designation of critical habitat for the four invertebrate species. The EA is organized in six chapters. Chapter 1

⁴ Conservation is defined in the ESA as the use of "all methods and procedures which are necessary to bring any endangered or threatened species to the point at which the measures provided pursuant to this Act are no longer necessary."

⁵ Citations in this Environmental Assessment often point to the specific page number of the reference. For example, (67 FR 6459: 6466) refers to page number 6466 of the proposed rule published in the Federal Register. Full citations are provided at the end of the Environmental Assessment in the section titled *References*.

contains introductory information on critical habitat and the four invertebrate species, and describes the purpose of and need for the action. Chapter 2 describes the alternatives for critical habitat designation, including the No Action alternative, and provides a summary comparison of the effects of the alternatives. Chapter 3 presents the existing conditions and discloses the effects of the alternatives for critical habitat designation on relevant resource areas. Chapter 4 is the analysis of significance of the proposed action. Chapter 5 is the list of preparers of the EA, and Chapter 6 is a list of references cited in the EA.

1.2 Purpose of the Action

The critical habitat provisions of the ESA are intended to provide protection of habitat that is essential to the conservation of listed species, which includes that necessary for recovery of the species. A primary purpose of the ESA is to "provide a means whereby the ecosystems upon which endangered species and threatened species may be conserved" (ESA §2[b]).

The purpose of this action is to designate critical habitat for the four invertebrate species, which are proposed for listing as endangered under the ESA. Critical habitat designation identifies geographic areas that are essential for conservation of the four invertebrate species. It also describes the physical and biological features that constitute critical habitat (*i.e.*, primary constituent elements).

1.3 Need for the Action

Habitat protection and management is essential for conservation of the four invertebrate species. Threats to habitat of the four invertebrates were a primary reason for proposing to list the four species as endangered (67 FR 6459: 6464). The critical habitat provisions of the ESA were intended to address habitat requirements for conservation of listed species.

1.4 Background

1.4.1 Critical Habitat

1.4.1.1 Provisions of the ESA Section 4(a)(3) of the ESA states that critical habitat shall be designated to the maximum extent prudent and determinable and that such designation may be revised periodically, as appropriate. Section 4(b)(2) of the ESA requires that critical habitat designation be based on the best scientific information available and that economic and other impacts must be considered.

Areas may be excluded from critical habitat designation if it is determined that the benefits of excluding them outweigh the benefits of their inclusion, unless failure to include the areas in critical habitat would result in extinction of the species.

Critical habitat is defined in section 3(5)(A) of the ESA as:

"(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical and biological features (I)

essential to the conservation of the species and (II) which may require special management considerations or protection;

and

(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species."

Section 3(5)(C) also states that critical habitat "shall not include the entire geographical area which can be occupied by the threatened or endangered species" except when the Secretary of the Interior determines that the areas are essential for the conservation of the species.

Section 7(a)(2) of the ESA requires federal agencies to consult with the Service to "insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined ... to be critical." Each agency is required to use the best scientific and commercial data available. This consultation process is typically referred to as section 7 consultation. Section 7 of the ESA does not apply to state, local, or private land unless there is a federal nexus (*i.e.*, federal funding, authorization, permitting).

Designation of critical habitat can help focus conservation activities by identifying areas that are essential to the conservation of the species, regardless of whether they are currently occupied by the listed species. Designation of critical habitat also serves to alert the public and land

management agencies to the importance of an area for conservation of a listed species. As described above, critical habitat receives protection from destruction or adverse modification through required consultation under section 7 of the ESA. Aside from outcomes of consultation with the Service under section 7, the ESA does not automatically impose any restrictions on lands designated as critical habitat.

1.4.1.2 The Section 7 Consultation Process

The section 7 consultation process (Figure 1) begins with a determination of effects on listed species and designated critical habitat by the federal action agency. If the federal action agency determines that there will be no effect on listed species or designated critical habitat, the proposed action is not altered or impacted by ESA considerations. If the federal action agency determines that listed species or designated critical habitat may be affected, then consultation with the Service is initiated.

Once it is determined that the proposed federal action may affect a listed species or critical habitat, the federal action agency and the Service typically enter into informal section 7 consultation. Informal consultation is an optional process for identifying affected species and critical habitat, determining potential effects, and exploring ways to modify the action to remove or reduce adverse effects to listed species or critical habitat (50 CFR §402.13). The informal section 7 consultation process concludes in one of two ways: 1) the Service concurs in writing that the proposed action is not likely to adversely affect listed species or critical habitat; or 2) adverse impacts are likely to occur and formal consultation is initiated.

Formal consultation is initiated when it is determined that the proposed federal action is

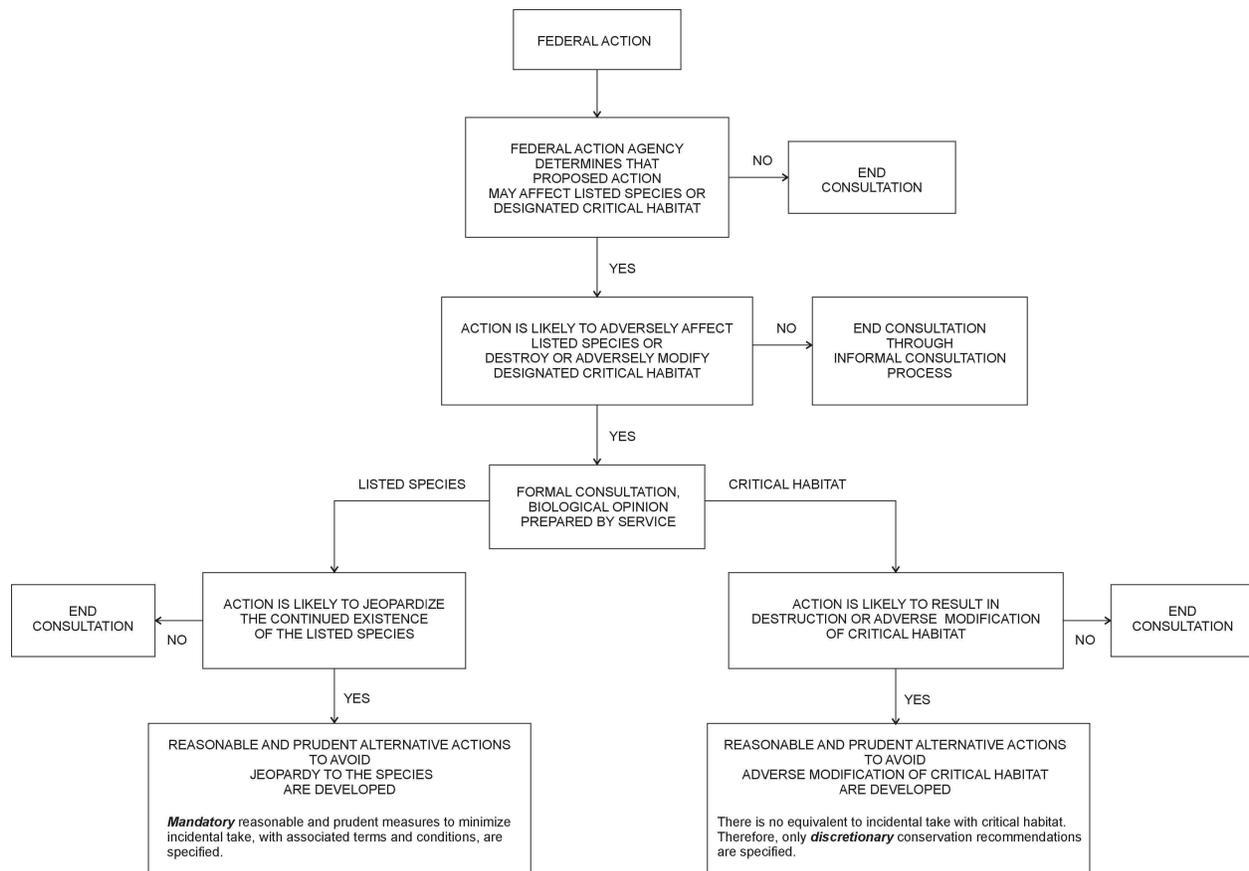
likely to adversely affect a listed species or critical habitat (50 CFR §402.14). Formal consultation concludes with a biological opinion issued by the Service on whether the proposed federal action is likely to jeopardize the continued existence of a listed species or result in destruction or adverse modification of critical habitat (50 CFR §402.14[h]). Independent analyses are made under both the jeopardy and the adverse modification standards.

A “non-jeopardy” or “no adverse modification” opinion concludes consultation and the proposed action may proceed under the ESA. The Service may prepare an incidental take statement with reasonable and prudent measures to minimize take, and associated, mandatory terms and conditions that describe the methods for accomplishing the reasonable and prudent measures. Discretionary conservation recommendations may also be included in a biological opinion based on effects to species. Conservation recommendations, whether they relate to the jeopardy or adverse modification standard, are discretionary actions recommended by the Service. These recommendations may address minimizing adverse effects on listed species or critical habitat, identify studies or monitoring, or suggest how action agencies can assist species under their own authorities and section 7(a)(1) of the ESA. There are no ESA section 9 prohibitions for critical habitat. Therefore, a biological opinion that concludes no destruction or adverse modification of critical habitat may contain conservation recommendations but would not include an incidental take statement, reasonable and prudent measures, or terms and conditions.

In a biological opinion that results in a jeopardy or adverse modification conclusion, the Service develops mandatory reasonable and prudent

alternatives to the proposed action. Reasonable and prudent alternatives are actions that the federal agency can take to avoid jeopardizing the continued existence of the species or adversely modifying critical habitat. The Service may develop reasonable and prudent alternatives that vary from slight project modifications to extensive redesign or relocation of the project, depending on the situations involved. Reasonable and prudent alternatives must be consistent with the intended purpose of the proposed action and they also must be consistent with the scope of the federal agency's legal authority. Furthermore, the reasonable and prudent alternatives must be economically and technically feasible. A biological opinion that results in a jeopardy finding, based on effects to the species, may also include an incidental take statement, reasonable and prudent measures, terms and conditions, and conservation recommendations. A biological opinion that results in an adverse modification finding may include reasonable and prudent alternatives and conservation recommendations, but no incidental take statement or associated reasonable and prudent measures and terms and conditions.

Figure 1. Simplified diagram of the ESA section 7 consultation process showing the parallel track for listed species and designated critical habitat. The informal section 7 consultation process leading to a determination of no adverse effect to listed species or designated critical habitat is not portrayed in detail.



1.4.1.3 Proposed Primary Constituent Elements

In accordance with section 3(5)(A)(I) of the ESA and regulations at 50 CFR §424.12, the Service is required to consider those physical and biological features, called primary constituent elements, that are essential to conservation of the species. Proposed primary constituent elements essential to the conservation of the four invertebrate species include those habitat components providing for foraging, sheltering, reproduction, and recruitment (67 FR 6459: 46466). Proposed primary constituent elements of critical habitat for Roswell springsnail, Koster's springsnail, and Noel's amphipod are:

- permanent, flowing, unpolluted fresh to moderately saline water;
- slow to moderate water velocities of water over substrates (a surface on which a plant or animal grows or is attached) ranging from deep organic silts to limestone cobble and gypsum substrates;
- presence of algae, submergent vegetation, and detritus in the substrata; and
- water temperatures in the approximate range of 10°C to 20°C (50°F to 68°F) with natural diurnal and seasonal variation slightly above and below that range.

Proposed primary constituent elements for Pecos assiminea include the four listed above and:

- moist soil at stream or spring run margins with vegetation growing in or adapted to an aquatic or very wet environment, such as salt grass or sedges.

1.4.2 Background Information on the Four Invertebrate Species

1.4.2.1 Description All four invertebrate species have only recently been described to science. Noel's amphipod was described as a new species in 1981 (Cole, 1981), whereas Roswell springsnail, Koster's springsnail, and Pecos assiminea were all described as new species in 1987 (Taylor, 1987).

The three snail species (Roswell springsnail, Koster's springsnail, and Pecos assiminea) are small (Figure 2 A through D). Roswell springsnail is light tan colored. Shell length ranges from 0.10 to 0.15 inches and shells have four to five moderately convex whorls (Hershler, 1994: 63). Koster's springsnail is also tan colored and shell length ranges from 0.10 to 0.18 inches. Shell width ranges from 0.06 to 0.10 inches and shells have up to 5¾ regularly convex whorls. Females are typically larger than males (Taylor, 1987: 45-46). Pecos assiminea has a chestnut-brown colored, translucent shell that ranges in length from 0.05 to 0.08 inches. The shell has up to 4½ strongly convex whorls (Taylor, 1987:8).

Noel's amphipod is a small freshwater crustacean. Amphipods are also commonly known as "scuds" or "sideswimmers" (Thorp and Covich, 2001: 788). Noel's amphipod is greenish-brown colored, with bands of red on the sides of the body (Figure 2 E and F). Noel's amphipod ranges in length from 0.37 to 0.58 inches for males and 0.34 to 0.50 inches for females (Cole, 1981:31; Cole, 1988a: 3-4).

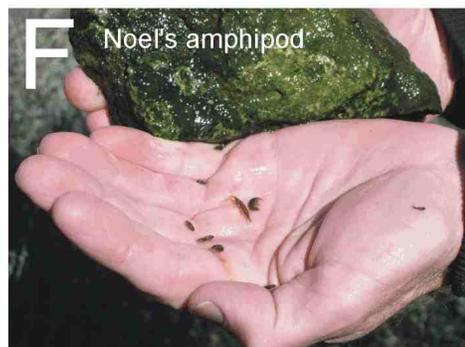
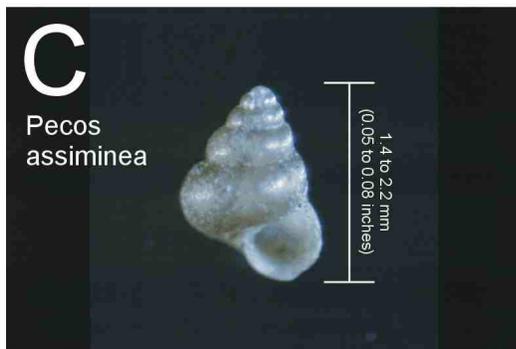


Figure 2. Roswell springsnail (A), Koster's springsnail (B), Pecos assiminea (C and D), and Noel's amphipod (E and F).

Photos A, B, C, and E courtesy of Brian K. Lang, New Mexico Department of Game and Fish; photo D courtesy of Karen Yori, Blue Earth Ecological Consultants, Inc.; photo F courtesy of John Pittenger, Blue Earth Ecological Consultants, Inc.).

Roswell springsnail is in the family Hydrobiidae. This springsnail was initially considered by Taylor to be in the genus *Fontelicella* (Taylor, 1987: 15). However, Hershler and Thompson (1987: 25) subsequently allocated the genus *Fontelicella* to *Pyrgulopsis*. Hershler reassigned *Fontelicella roswellensis* to *Pyrgulopsis rowellensis* in 2002 (Hershler, 1994: 63). Koster's springsnail is also in the family Hydrobiidae. Although initially considered by Taylor (1987: 45) to be in the genus *Tryonia*, the species was reassigned first to the genus *Durangonella* (Hershler, 2001: 15) and then to the new genus *Juturnia* in 2002 (Hershler *et al.*, 2002: 175). Pecos assiminea is in the family Assimineidae, and is unique in that it is the most inland species of the primarily marine genus *Assiminea*.

Noel's amphipod is in the family Gammaridae. Noel's amphipod is one of three described and four undescribed *Gammarus* species collectively known as the *Gammarus-pecos* complex (Cole, 1985). The *Gammarus-pecos* complex occurs in the Pecos River basin from Roswell, Chaves County, New Mexico south to Fort Stockton, Pecos County, Texas.

1.4.2.2 Distribution All four species are restricted to small, isolated, spring-fed aquatic and wetland habitats in the Pecos River drainage. Fossil specimens of Roswell springsnail have been collected from Berrendo Creek and the Pecos River northeast of Roswell (Taylor, 1987: 16). Four populations of Roswell springsnail were known when the species was described in 1987. All of these occurred in Chaves County, and three of them were within Bitter Lake National Wildlife Refuge. The latter were located at a seep draining into a ditch along the west side of Unit 6, a seepage area on the west side of Unit 7 (the type locality), and Sago Spring. The fourth population was known from North Spring on the Roswell

Country Club grounds from collections made from 1968 to 1981 (Taylor, 1987: 16).

Current distribution of Roswell springsnail appears to be restricted to Bitter Lake National Wildlife Refuge. A survey of the Roswell Country Club conducted in 2004 indicated that Roswell springsnail is no longer present there (M. Myers, Service, pers. comm., 18 April 2005). Roswell springsnail persists in Bitter Creek, Sago Spring, Sinkhole No. 32, and along the western boundary of Unit 6 (Melhop, 1992; Melhop, 1993; Lang, 2002: A16). The type locality on the western boundary of Unit 7 was reported as being dry in 1992 (Melhop, 1992: 5), and Lang (1998: B69) confirmed that the species was no longer found there.

Fossil shells of Koster's springsnail, presumably of Pleistocene age, have been collected from North Spring River, South Spring River, Berrendo Creek, and the Pecos River near Roswell (Taylor, 1987: 47). Five populations of Koster's springsnail, all from New Mexico, were known when the species was described in 1987. Four of these populations were on Bitter Lake National Wildlife Refuge at the following locations: throughout Bitter Creek; in a 0.25-mile reach of an unnamed creek along the west side of Unit 3; in a seep draining into a ditch along the west side of Unit 6; and at Sago Spring, the type locality. The fifth population was known from North Spring on the Roswell Country Club from collections made from 1968 to 1981 (Taylor, 1987: 47).

The current distribution of Koster's springsnail appears to be restricted to Bitter Lake National Wildlife Refuge. A survey conducted in 2004 indicated that Koster's springsnail no longer occurs at the Roswell Country Club site (M. Myers, Service, pers. comm., 18 April 2005). Therefore, the status of the population there is

unknown. Koster's springsnail persists in Lake St. Francis, Dragonfly Spring, Bitter Creek, Sago Spring, Sinkhole No. 32, the southwestern corner of Unit 15, the northwestern border of Hunter Marsh, and in isolated locations along the western boundaries of Units 5, 6, and 7 (Melhop, 1992; Lang, 2002: A16). Koster's springsnail has not been found in recent times along the western boundary of Unit 3 (Lang, 2002: A16).

When Pecos *assimineae* was described in 1987, extant populations were found at three isolated localities: Bitter Lake National Wildlife Refuge in Chaves County, New Mexico; Diamond Y Draw in Pecos County, Texas; and in the Bolsón de Cuatro Ciénegas, Coahuila, Mexico (Taylor, 1987: 9). However, recent genetic analysis suggest that the Cuatro Ciénegas population is not conspecific with *P. assiminea* (R. Hershler, *in litt.*). Taylor (1987: 8-9) reported extirpation of two populations in Chaves County: one at North Spring on the Roswell Country Club and the other at the type locality on Bitter Lake National Wildlife Refuge. Taylor (1987: 9) reported fossil Pecos *assimineae* from along the Pecos River near Grandfalls, Texas and the Rio Monclova, Coahuila, Mexico.

Pecos *assimineae* persists at Diamond Y Spring in Pecos County, Texas (Lang, 2002: A5). A previously- unknown population was discovered at East Sandia Spring in Reeves County, Texas on private lands under stewardship of The Nature Conservancy (Lang, 2000: A3). The species also persists at Bitter Lake National Wildlife Refuge. Populations on Bitter Lake National Wildlife Refuge currently are found in the upper reaches of Bitter Creek near Dragonfly Spring, the lower end of Bitter Creek near Bitter Lake, the lower reaches of the Sago Spring wetland complex near Sinkhole No. 32, very localized on the western perimeter of Unit 7, and at a spring in the extreme southwestern corner of Unit 15 (Lang, 2002: A5).

Noel's amphipod was historically known from Lander Springbrook, a tributary of the South Spring River near Roswell, where it was collected by Martha S. Noel in 1950 (Noel, 1954: 124) and North Spring on the Roswell Country Club from collections made in August 1967 and August 1978 (Cole, 1981: 27). Noel's amphipod was also collected from a sinkhole and from Bitter Creek (*i.e.*, "Lost River") on Bitter Lake National Wildlife Refuge in 1988 (Cole, 1988*b*: 2).

The Lander Springbrook population of Noel's amphipod went extinct by about 1960 with drying of the spring (Cole, 1981: 27; Cole, 1988*a*: 1). The North Spring population of Noel's amphipod appears to have been extirpated as a result of habitat modification that occurred prior to May 1988 (Cole, 1981: 27; Cole, 1988*a*: 2). Noel's amphipod currently persists on Bitter Lake National Wildlife Refuge at the Sago Spring wetland complex (including Sinkhole No. 32), Bitter Creek, and along the western boundary of Unit 6 (Lang, 1999: A1; Lang, 2002: A2). Noel's amphipod appears to be declining at Dragonfly Spring at the headwaters of Bitter Creek following the Sandhill Fire that burned through the area in March 2000 (Lang, 2002: A2).

1.4.2.3 Reproduction and Life History

Roswell springsnail and Koster's springsnail are dioecious⁶. Fertilization is internal in both species. Roswell springsnail is oviparous (*i.e.*, it lays eggs; New Mexico Department of Game and Fish, 1988: B-300), while Koster's springsnail is ovoviviparous, meaning that it produces free-living young (New Mexico Department of Game and Fish, 1988: B-306). Fertilized eggs hatch and

⁶ Dioecious means that individuals possess either male or female reproductive systems, as opposed to monoecious, which means that both male and female reproductive systems are present in the same individual.

develop in the anterior mantle (or pallial oviduct) of female Koster's springsnail (Thorp and Covich, 201: 299-300). Both Roswell springsnail and Koster's springsnail are annual species (Thorp and Covich, 2001: 304), having a life cycle of about one year (Noel, 1954: 127; Taylor, 1985: 16; New Mexico Department of Game and Fish, 1988). Peak densities of Roswell springsnail occur in winter (Noel, 1954: 127).

Like the two springsnails, Pecos *assimineia* is also a prosobranch snail and is dioecious (Taylor, 1987: 8). Pecos *assimineia* is oviparous, laying its eggs in gelatinous masses (New Mexico Department of Game and Fish, 1988: B-295). Sada (2001) found that reproduction occurred several times during the year in a similar species, *Assimineia infima*, in Death Valley, California. Parthenogenesis (*i.e.*, sexual reproduction where egg development occurs without fertilization), documented in other prosobranch snails that occupy isolated habitats (Vail, 1978), is not known to occur in Roswell springsnail, Koster's springsnail, or Pecos *assimineia*.

Amphipods are typically annual species and produce a single brood of young during their life cycle (Smith, 2001: 573; Thorp and Covich, 2001: 794). Noel's amphipod appears to mate in spring, with peak numbers occurring in late fall and early winter (Noel, 1954: 125). Females carry fertilized eggs in a marsupium, or pouch. Eggs develop over a period of one to three weeks (Smith, 2001: 573). After hatching, young are retained in the marsupium for another one to eight days before being released. Brood size may range from several to more than 50 eggs (Smith, 2001: 573; Thorp and Covich, 2001: 795).

1.4.2.4 Habitat Both Koster's springsnail and Roswell springsnail are in the Family Hydrobiidae. All eight described hydrobiids of New Mexico (Taylor, 1987) are state endemics

that typically occur in small, geographically isolated habitats consisting of eurythermal (*i.e.*, fluctuating temperature) springs and spring-fed wetland systems restricted to the southern half of the state (Lang, 1998: B77). Habitat of Koster's springsnail consists of soft substrates of springs and seeps (Taylor, 1987: 47). In Bitter Creek, Lang (1998: 13) found the species to be most abundant in areas with deep organic substrate. Roswell springsnail, on the other hand, was found to be most abundant on hard, gypsum substrate in Sago Spring outflow channels and pools (Lang, 1998: 13).

Both springsnails are found throughout Bitter Creek, which varies in water temperature from the headwaters at Dragonfly Spring to the downstream reaches near the mouth of Bitter Lake. The upstream reaches of Bitter Creek are characterized by a relatively stable temperature regime with a narrow range of fluctuation (Lang, 1998: 15). Water temperature at Dragonfly Spring varied only about 8.3°F from 56.5°F to 64.8°F from October 1996 through June 1998 (Lang, 1998: 16). Water temperature was much more variable during the same period in the lower reach of Bitter Creek, ranging from 32°F to 87.8°F. Water temperature regimes are similar in the Sago Spring complex as in Bitter Creek (Lang, 1998: 15). Water temperature varied about 6.3°F, from 62.6°F to 68.9°F at the headspring of Sago Spring and about 10.9°F from 60.3°F to 71.2°F in the outflow at Sago Spring (Lang, 1998: 20-21). Salinity in Bitter Creek ranged from about 4.5 parts per thousand (ppt) to near 6 ppt. Dissolved oxygen in Bitter Creek ranged from about 1.0 parts per million (ppm) to over 20 ppm from 1995 to 1998, with lowest levels occurring in summer evening hours and highest levels during daytime hours in spring. Variation in pH was from about 6.67 to 8.20 (Lang, 1998: 22-24).

Taylor (1987: 9) described the habitat of Pecos assiminea as “moist earth beside seepages or spring-brooks; never beside standing water” and that they occurred “beneath salt grass or sedges, less often on exposed surfaces.” Lang (2002: A5) reported that Pecos assiminea was closely associated with wetland habitats characterized by soils saturated at the surface and vegetation dominated by American three-square (*Scirpus americanus*), common reed (*Phragmites australis*), and spike rush (*Eleocharis* spp.) with inland saltgrass (*Distichlis spicata*) and rushes (*Juncus* spp.) also occurring as common species in the wetland plant community. The snail typically occurs near the surface of the soil beneath litter and vegetation in these habitats. Pecos assiminea occupies wetland habitats along the margin of Bitter Creek, particularly near the mouth at Bitter Lake, at the type locality near Unit 7, and at Sinkhole No. 32 at the lower end of the Sago Spring complex, where the species is most abundant. Although Pecos assiminea is most common in non-inundated wetland habitat, it may also rarely occur in aquatic habitats of Bitter Creek and Sago Spring (Lang, 1998: 13). The snail was found at a density of about 5.95/ft² in water depths ranging from 0.06 inches to 8.27 inches in these aquatic habitats (Lang, 1998: 13). The species does not appear to persist in conditions of fluctuating water level or standing water in wetlands that is subject to winter freezing (Lang, 2000: A2).

Gammarid amphipods typically are found in shallow, cool, well-oxygenated waters of small streams, ponds, ditches, sloughs and springs (Holsinger, 1976: 3; Smith, 2001: 574). Amphipods in general require high dissolved oxygen concentrations and relatively high calcium concentration (Smith, 2001: 574). Acidity is a limiting factor for amphipods, with a pH of 6.0 generally constituting a lower threshold and 8.0 an upper threshold (Smith, 2001: 574). They are

found beneath stones and in aquatic vegetation during daylight hours (Cole, 1988a: 5; Smith, 2001: 572-574). Noel's amphipod was found mainly on rubble and rubble-sand substrate at Lander Springbrook and less frequently on silt substrate or vegetation (Noel, 1954: 124). Habitats on Bitter Lake National Wildlife Refuge range from dense beds of emergent aquatic macrophytes to clear, flowing spring brooks with submerged aquatic vegetation, vegetated banks and margins, and clean substrates. Standing water and silt accumulation appear to constitute unsuitable habitat for the species (Lang, 2000: A1). Lang (2002: A2) reported that the addition of stones to spring brook habitat, which increased stream gradient and current velocity, improved habitat for Noel's amphipod along the western boundary of Unit 6. Salinity in habitats occupied by *Gammarus-pecos* amphipods is low to moderate, ranging from 0.12 to 5.85 ppt (Cole, 1988a: 5). Cole (1981: 27) reported chemical composition of the water at North Spring to be similar to that described at Lander Springbrook (Noel, 1954: 123): impure gypsum substrate, sulfate- and chloride-rich waters, and calcium as the primary cation.

1.5 Permits Required for Implementation

No permits are required for critical habitat designation. Designation of critical habitat occurs through a rule-making process under the Administrative Procedures Act and the ESA.

1.6 Related Laws, Authorizations, and Plans

Related provisions of the ESA require federal agencies to consult with the Service when there are potential effects to endangered or threatened species, independent of critical habitat. The four invertebrate species co-occur with other federal-listed species including Pecos gambusia (*Gambusia nobilis*), Leon Springs pupfish (*Cyprinodon bovinus*), Comanche Springs pupfish (*Cyprinodon elegans*), and Pecos sunflower (*Helianthus paradoxus*), for which recovery plans have been developed. Critical habitat was designated for Leon Springs pupfish in 1980 (45 FR 54678), which encompasses the Diamond Y Springs Complex critical habitat unit proposed as part of Alternative I.

The Nature Conservancy manages lands they own consistent with their mission statement, which is to "preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive." Site-specific management plans have not yet been developed for the Diamond Y Spring or East Sandia Spring preserves (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

The National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge Improvement Act of 1997, provides statutory authority for management of national wildlife refuges. The National Wildlife Refuge System Administration Act established that the mission of the National Wildlife Refuge System is wildlife conservation, which includes restoration and maintenance of biological integrity, diversity, and environmental health. Management of the Bitter Lake National Wildlife Refuge is conducted in accordance with

the U.S. Fish and Wildlife Service Manual (parts 601-603). A comprehensive conservation plan for Bitter Lake National Wildlife Refuge was completed in 1998 (Service, 1998a).

A conservation plan for the four invertebrate species was developed by the New Mexico Department of Game and Fish (2005). The plan contains recommendations for habitat management, as the New Mexico Wildlife Conservation Act does not include any regulatory authority other than precluding direct take of state-listed endangered species (State of New Mexico, 2002: 9).

1.7 Issues

The following issues associated with designation of critical habitat were identified in written and recorded oral comments received during the public comment period on the February 2002 proposed rule to list the list the four invertebrate species with critical habitat (67 FR 6459).

- Critical habitat designation may contribute to conservation of the four invertebrate species.
- Critical habitat designation may lead to restrictions on ground water pumping in the Pecos basin.
- Critical habitat designation may result in restrictions on oil and gas development in locations where surface or ground water is connected to habitats occupied by the four invertebrate species.
- Critical habitat designation may lead to restrictions on use of herbicides to control or manage salt cedar (*Tamarix chinensis*) in the project area.

2.0 ALTERNATIVES, INCLUDING THE NO ACTION ALTERNATIVE

2.1 Development of Alternatives

Identification of areas essential for the conservation of the four invertebrate species is the cornerstone of critical habitat designation. The Service made an assessment of areas needed for the conservation of the four invertebrate species based on the best scientific and commercial information available concerning the present and historic range of the four species, their habitat and biology, and threats (67 FR 6459: 6466-6467). This assessment and issues identified during comment on the proposed rule served as the basis for developing critical habitat designation alternatives.

2.2 No Action Alternative

The No Action alternative is defined as no designation of critical habitat for the four invertebrate species. Analysis of the No Action alternative is required by NEPA, and it serves as a baseline for analyzing effects of action alternatives. However, it is not clear that the Service could, under the law, adopt the No Action alternative.

2.3 Alternative I

Alternative I is the critical habitat designation described in the 12 February 2002 proposed rule (67 FR 6459). This alternative includes four critical habitat units encompassing 1,523 acres (Figure 3). Most of the critical habitat in this alternative (74 percent or 1,127 acres) is located

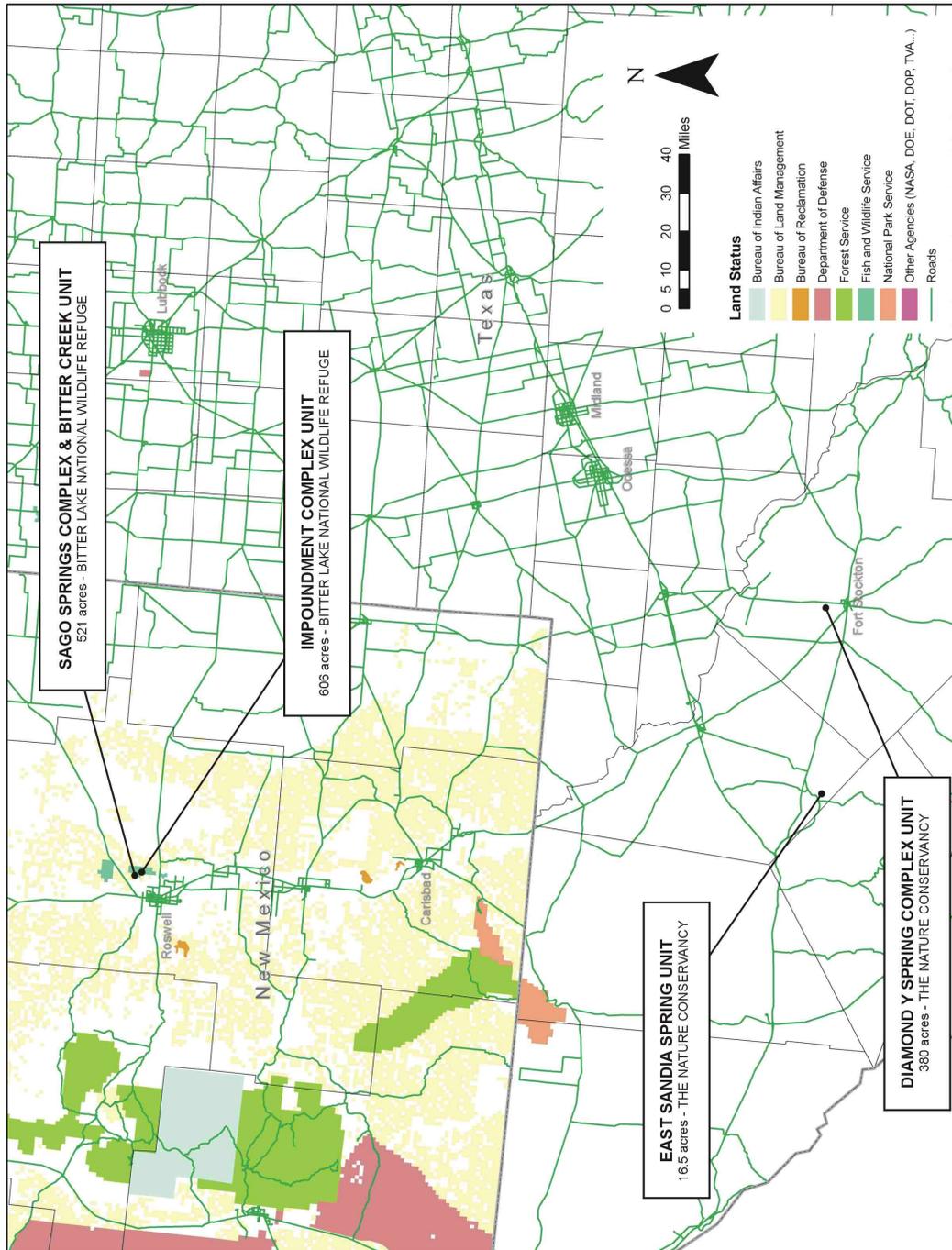
in Bitter Lake National Wildlife Refuge in Chaves County, New Mexico (Figure 4). The remaining 26 percent (396.5 acres) is located on private lands owned by The Nature Conservancy in Pecos and Reeves counties, Texas (Figures 5 and 6).

2.3.1 Sago Springs and Bitter Creek Complex Unit, Bitter Lake National Wildlife Refuge, Chaves County, New Mexico This unit is the core population center for all four invertebrate species (Figure 4). It includes all springs, seeps, sinkholes, and outflows surrounding Bitter Creek and the Sago Springs complex. This unit encompasses 521 acres of federal land.

2.3.2 Impoundment Complex Unit, Bitter Lake National Wildlife Refuge, Chaves County, New Mexico This unit includes portions of impoundments 3, 5, 6, 7, 15, and Hunter Marsh (Figure 4). It constitutes a secondary population center for all four invertebrate species, particularly Koster's springsnail. This unit includes all springs, seeps, sinkholes, and outflows surrounding the impoundments. This unit encompasses 606 acres of federal land.

2.3.3 Diamond Y Springs Complex Unit, Pecos County, Texas This spring habitat supports a large population of Pecos assimineae. The Diamond Y Springs Complex unit includes the Diamond Y Spring and about 4.2 miles of spring outflow that ends about 0.5 miles downstream from the State Highway 18 bridge crossing (Figure 5). Also included is about 0.5 miles of Leon Creek upstream from the confluence with Diamond Y Draw.

Figure 3. Locations of the four proposed critical habitat units in Alternative I.



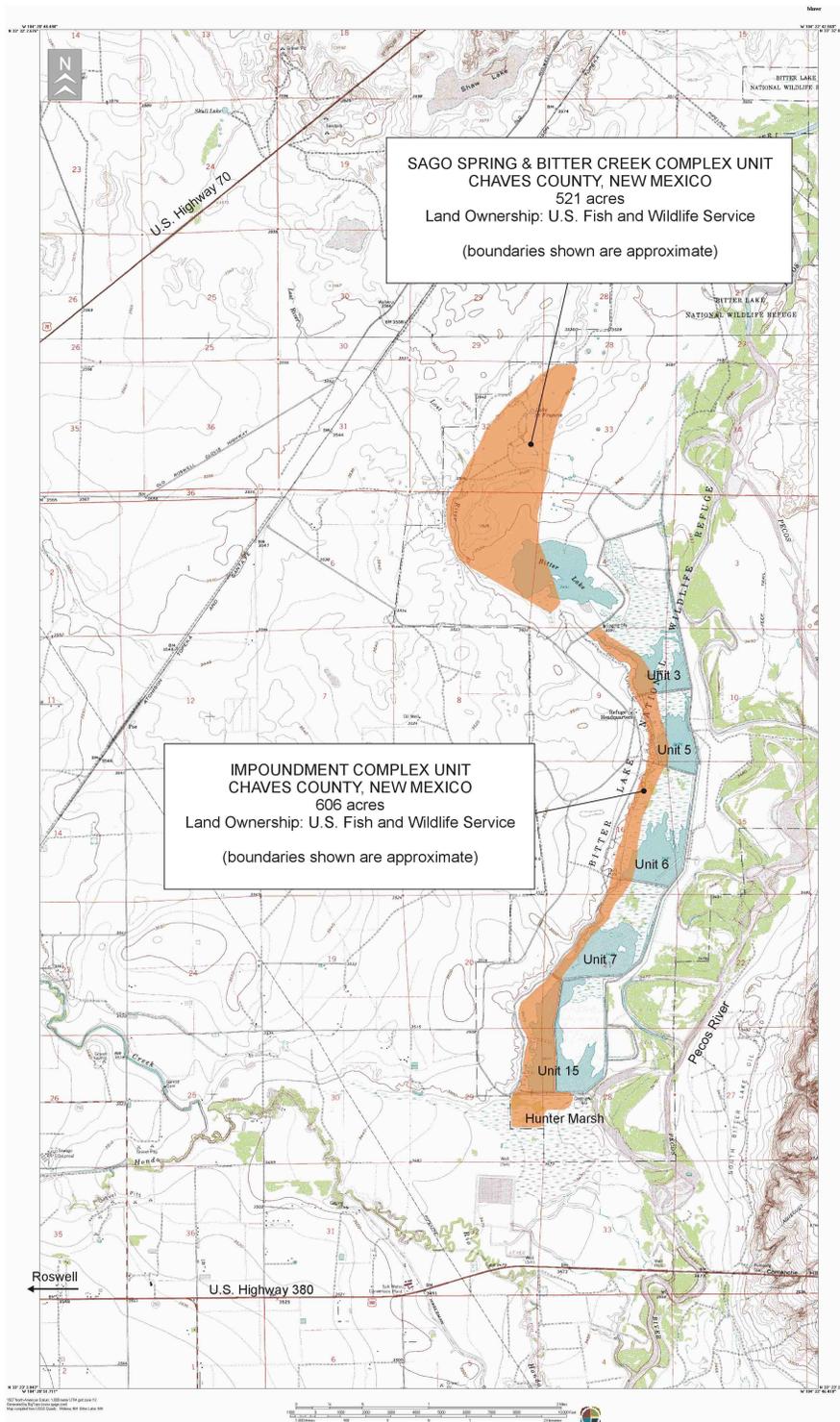


Figure 4. The Sago Springs and Bitter Creek Complex and Impoundment Complex units of proposed critical habitat.

Figure 5. The Diamond Y Springs Complex Unit of proposed critical habitat.

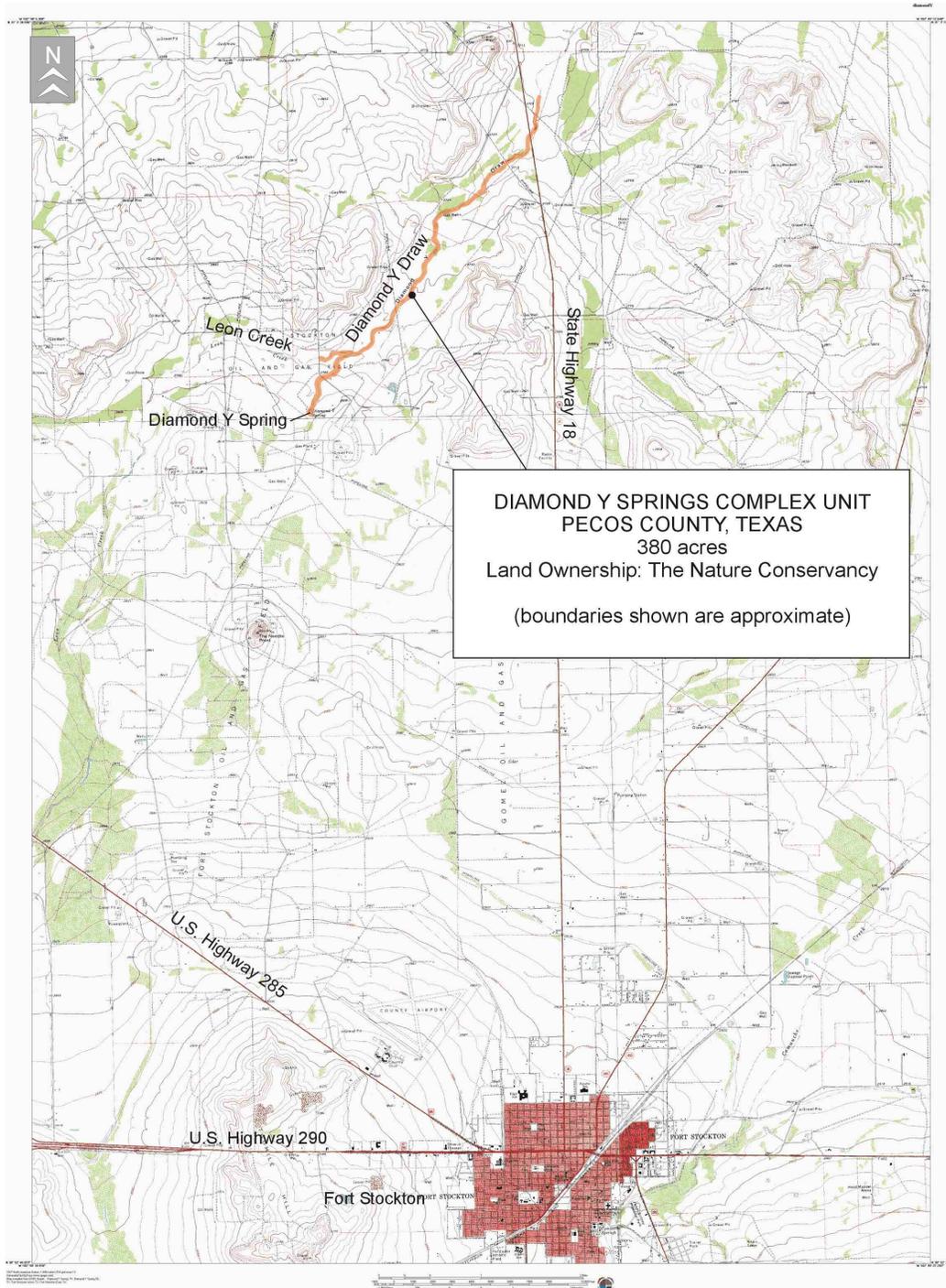
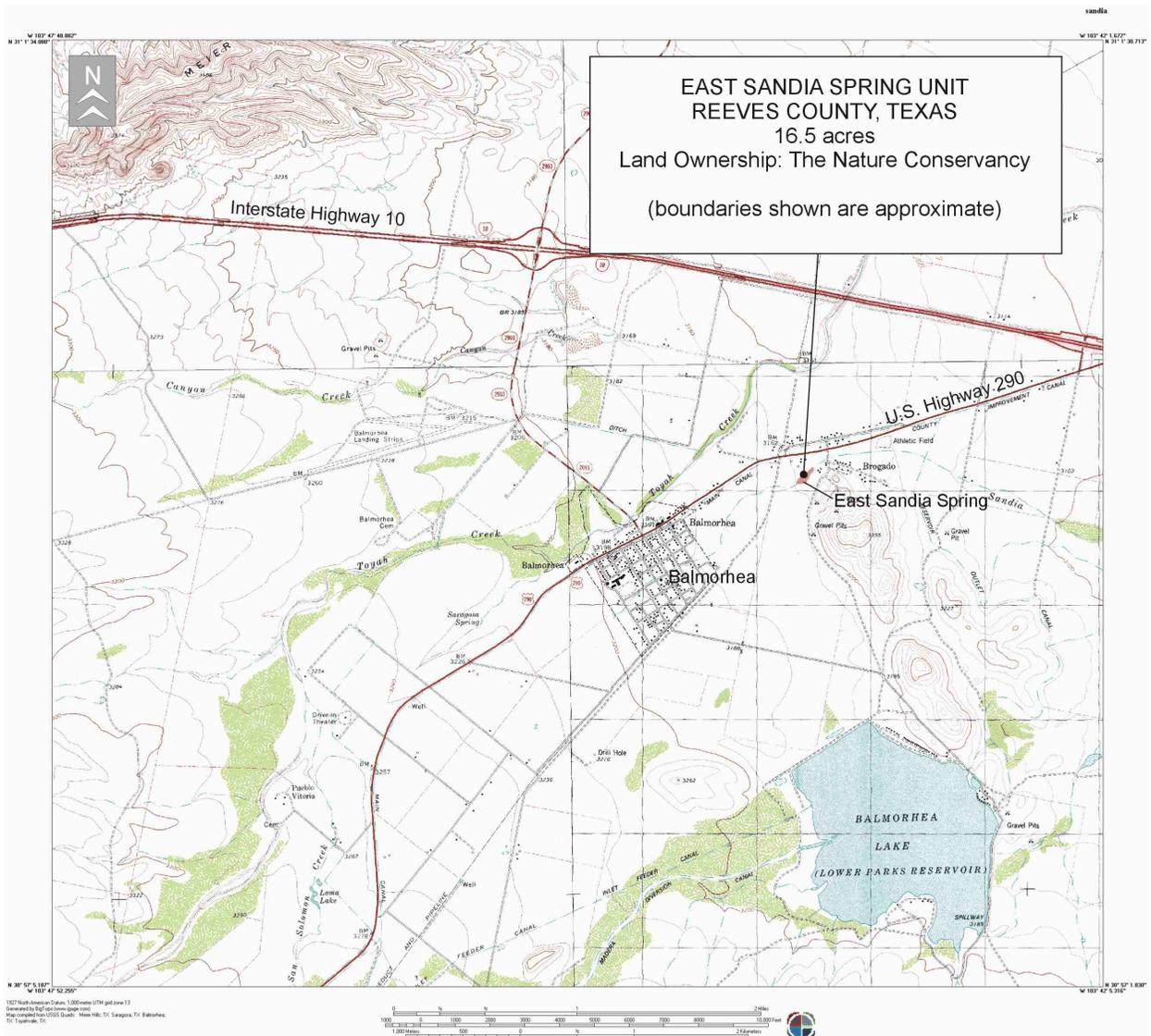


Figure 6. The East Sandia Spring Unit of proposed critical habitat.



All surrounding riparian vegetation and mesic soil environments within the spring, outflow, and portion of Leon Creek are included in the unit. This unit encompasses about 380 acres of private land owned by The Nature Conservancy.

2.3.4 East Sandia Spring Unit, Reeves County, Texas This spring habitat also supports a population of Pecos assimineae. The East Sandia Spring unit includes the spring, surrounding seeps, and all submergent vegetation and moist soil habitat found at the margins of these areas. This unit encompasses about 16.5 acres of private land owned by The Nature Conservancy (Figure 6).

2.4 Alternative II

Alternative II would include only the East Sandia Spring Unit and the Diamond Y Springs Complex Unit, as described in Alternative I (section 2.3.3 and 2.3.4). Alternative II would exclude the Sago Springs and Bitter Creek Complex and Impoundments Complex units on Bitter Lake National Wildlife Refuge.

Exclusion of Bitter Lake National Wildlife Refuge from critical habitat designation may be warranted because the benefits of excluding the refuge areas may exceed the benefits of including them in critical habitat designation.

Bitter Lake National Wildlife Refuge was established on 8 October 1937 by Executive Order 7724 “as a refuge and breeding ground for migratory birds and other wildlife.” The Refuge Recreation Act (16 U.S.C. 460-1) identifies the refuge as being “suitable for incidental fish and wildlife-oriented recreational development, the protection of natural resources, and the conservation of endangered species or threatened species.” The Wilderness Act of 1964 (P.L. 88-577) directs the Service to “maintain

wilderness as a naturally functioning ecosystem” on portions of the Refuge. While the Refuge was originally established to save wetlands vital to the perpetuation of migratory birds, the isolated gypsum springs, seeps, and associated wetlands protected by the Refuge have been recognized as providing the last known habitats in the world for several unique species. Management emphasis of the Refuge is placed on the protection and enhancement of habitat for endangered species and federal candidate species, maintenance and improvement of wintering crane and waterfowl habitat, and monitoring and maintenance of natural ecosystem values.

The Refuge is located at a juncture between the Roswell Artesian Groundwater Basin and the Pecos River. These two systems and their interactions account for the diversity of water resources on the Refuge including sinkholes, springs, wetlands, oxbow lakes, and riverine habitats. Bitter Lake National Wildlife Refuge has a federally reserved water right that essentially protects ground water levels of the Roswell Basin in the Refuge vicinity. The Refuge has undergone adjudication of their federally reserved water rights by the State of New Mexico (order signed May 1997). The Refuge is currently in negotiations with the New Mexico Interstate Stream Commission, a State agency responsible for administering New Mexico’s water resources, to quantify these reserved rights.

The Refuge has in place a Final Comprehensive Conservation Plan (Plan) that was approved in September 1998. The Plan serves as a management tool to be used by the Refuge staff and its partners in the preservation and restoration of natural resources on the Refuge. The plan is intended to guide management decisions over the next five to ten years and sets forth strategies for achieving Refuge goals and objectives within that

time frame. Key goals of the Plan related to the four invertebrate species include the following:

- 1) restore, enhance and protect the natural diversity on the Refuge including threatened and endangered species by a) appropriate management of habitat and wildlife resources on refuge lands and b) strengthening existing, and establishing new cooperative efforts with public and private stakeholders and partners; and
- 2) restore and maintain selected portions of a hydrological system that more closely mimics the natural processes along the reach of the Pecos River adjacent to the Refuge by a) restoration of the river channel, as well as restoration of threatened, endangered and special concern species; and b) control exotic species and manage trust responsibilities for maintenance of plant and animal communities and to satisfy traditional recreational demands.

Specific objectives related to these goals include restoring populations of listed or candidate aquatic species to a sustainable level and monitoring wildlife populations. Both of these objectives apply directly to the four invertebrate species.

Because the Refuge is already managed expressly for conservation of wildlife, including the four invertebrate species, there may be minimal benefit from designating critical habitat for the four invertebrate species within Bitter Lake National Wildlife Refuge. The benefits of excluding the Refuge may include a reduction in administrative costs associated with engaging in section 7 consultations. Administrative costs include time spent in meetings, preparing letters and biological assessments, and in the case of formal

consultations, the development of a biological opinion.

In summary, the benefits of excluding the Refuge from designation of critical habitat for the four invertebrate species may outweigh the benefits of including the Refuge in critical habitat. Including the Refuge would result in very minimal, if any additional, benefits to conservation of the four invertebrate species, as explained above. Conversely, including the Refuge in the designation would require additional administrative effort and cost during the section 7 consultation process. Although the additional effort to consider and analyze the affects of various projects on critical habitat may not be substantial, it would require the Refuge to use additional resources that may be otherwise be used towards beneficial projects for wildlife on the Refuge.

2.5 Comparison of Alternatives

The following table summarizes the potential effects or characteristics of the alternative critical habitat designations on the environment. Potential effects on resources are summarized from the analyses presented in Chapter 3.

2.6 Preferred Alternative

Alternative II is the alternative preferred by the Service.

Table 1. Comparison of potential effects of alternative critical habitat designations, as compared to existing conditions, by resource category.

Resource Category	No Action Alternative	Alternative I	Alternative II
Conservation of the Four Invertebrate Species	<ul style="list-style-type: none"> - §7 consultation on potential effects of proposed federal actions on the four invertebrate species under the jeopardy standard - No §7 consultation on potential effects to critical habitat under the destruction or adverse modification standard - Non-regulatory or educational benefits from critical habitat designation may not occur 	<ul style="list-style-type: none"> - §7 consultation on potential effects to critical habitat under the destruction or adverse modification standard for federally supported actions would ensure that habitat essential for conservation of the species retains its suitability - Non-regulatory and educational benefits to conservation of the four invertebrate species would occur, including informing the public of areas important for conservation of the species, and focusing attention on and awareness of those areas 	<ul style="list-style-type: none"> - Exclusion of Bitter Lake National Wildlife Refuge would not reduce protection of habitat of the four invertebrate species on the Refuge compared to Alternative I, because the Refuge is already managed to conserve the four invertebrate species - Non-regulatory and educational benefits associated with critical habitat designation are already realized on the Refuge; exclusion of the Refuge from critical habitat designation would not change the occurrence of these benefits
Water Resources	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under the jeopardy standard would be required for federally supported water projects - Federally supported water projects that could substantially reduce or eliminate flow from springs, seeps, outflow channels, or wetlands inhabited by any of the four invertebrate species would likely trigger formal consultation under the jeopardy standard for the four invertebrate species as well as other species that are already listed under the Act - State regulation of water resources in the Roswell basin would prevent substantial, sustained draw-down of the groundwater sources that support the springs in the Middle Tract of Bitter Lake National Wildlife Refuge that are inhabited by the four invertebrate species 	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects - Minor changes in federally supported water projects through section 7 consultation may occur in the form of additional conservation recommendations to reduce impacts to primary constituent elements - Substantive changes to reasonable and prudent alternatives developed under the jeopardy standard for federally supported water projects would not be likely to occur with addition of critical habitat designation 	<ul style="list-style-type: none"> - §7 consultation on effects under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit - Minor changes in federally supported water projects through section 7 consultation may occur in the form of additional conservation recommendations to reduce impacts to primary constituent elements for projects potentially affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit - Substantive changes to reasonable and prudent alternatives developed under the jeopardy standard for federally supported water projects would not be likely to occur with addition of critical habitat designation

Table 1, continued

Resource Category	No Action Alternative	Alternative I	Alternative II
Oil and Gas	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under the jeopardy standard would be required for federally supported actions - Oil and gas project with federal involvement are in the Bitter Lake National Wildlife Refuge area are already subject to stipulations for protecting groundwater - Potential for additional requirements on oil and gas well development on federal lands is low 	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects - Minor changes in federally supported oil and gas projects through section 7 consultation may occur in the form of additional conservation recommendations to reduce impacts to primary constituent elements - Substantive changes to reasonable and prudent alternatives developed under the jeopardy standard for federally supported oil and gas projects would not be likely to occur with addition of critical habitat designation 	<ul style="list-style-type: none"> - §7 consultation on effects under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit - Minor changes in federally supported oil and gas projects through section 7 consultation may occur in the form of additional conservation recommendations to reduce impacts to primary constituent elements for projects potentially affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit - Substantive changes to reasonable and prudent alternatives developed under the jeopardy standard for federally supported oil and gas projects would not be likely to occur with addition of critical habitat designation
Land Management	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under the jeopardy standard would be required for federally supported actions - Land management activities conducted on Bitter Lake National Wildlife Refuge, the Diamond Y Springs Preserve, or the East Sandia Spring Preserve would continue to be implemented as they have in the recent past 	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects - No changes would occur in land management activities conducted on Bitter Lake National Wildlife Refuge, the Diamond Y Springs Preserve, or the East Sandia Spring Preserve compared to the No Action alternative 	<ul style="list-style-type: none"> - §7 consultation on effects under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit - No changes would occur in land management activities conducted on the Diamond Y Springs Preserve, or the East Sandia Spring Preserve compared to the No Action alternative

Table 1, continued

Resource Category	No Action Alternative	Alternative I	
Livestock Grazing and Dairy Operations	<p>- §7 consultation on effects to the four invertebrate species under the jeopardy standard would be required for federally supported actions</p>	<p>- §7 consultation on effects to the four invertebrate species under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects</p> <p>- Minor changes in livestock grazing and dairy operations that have a federal nexus through section 7 consultation may occur in the form of additional conservation recommendations to reduce impacts to primary constituent elements</p> <p>- Substantive changes to reasonable and prudent alternatives developed under the jeopardy standard for federally supported actions related to livestock grazing and dairy operations would not be likely to occur with addition of critical habitat designation</p>	<p>- §7 consultation on effects under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit</p> <p>- Grazing activities in the vicinity of the Diamond Y and East Sandia Springs preserves are unlikely to be affected by critical habitat designation because lands are in private ownership and potential for federal nexus is low (i.e. there has not been presence of federal nexus in grazing actions in these areas in the past)</p>
Recreation	<p>- §7 consultation on effects to the four invertebrate species under the jeopardy standard would be required for federally supported actions</p> <p>- Management actions related to recreation on Bitter Lake National Wildlife Refuge and The Nature Conservancy preserves would not change</p>	<p>- §7 consultation on effects to the four invertebrate species under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects</p> <p>- No additional effects on recreation actions compared to No Action alternative</p>	<p>- §7 consultation on effects under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects affecting the Diamond Y Springs Complex Unit and East Sandia Spring Unit</p> <p>- No additional effects on recreation actions compared to No Action alternative</p>

Table 1, continued

Resource Category	No Action Alternative	Alternative I	
Socioeconomic Conditions and Environmental Justice	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrates under the jeopardy standard would be required for federal actions - Actions on private lands that have the potential to result in take of any of the four invertebrate species would be subject to section 10 of the ESA, which requires development of a Habitat Conservation Plan as part of an application to the Service for an incidental take permit 	<ul style="list-style-type: none"> - §7 consultation on effects to the four invertebrate species under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects - Economic impacts due to critical habitat designation alone would result from additional effort required by federal agency staff to include critical habitat considerations in section 7 consultations - Other economic impacts, such as special requirements for oil and gas well development in the Habitat Protection Zone, land management activities by The Nature Conservancy, would occur regardless of critical habitat designation 	<ul style="list-style-type: none"> - §7 consultation on effects under both the jeopardy and adverse modification/destruction of critical habitat standards would be required for federally supported projects affecting the Diamond Y Spring Complex Unit and the East Sandia Spring Unit - Additional effort required by federal agency staff to include critical habitat considerations in section 7 consultations would be required only for projects potentially affecting the Diamond Y Springs Complex Unit and the East Sandia Spring Unit

3.0 AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

This chapter describes aspects of the environment that may potentially be impacted by designating critical habitat for the four invertebrate species. Potential effects of critical habitat designation under each alternative are then described for the various resource categories. Resource categories addressed in the analysis were selected based on issues identified during the public comment period on the proposed rule (*cf.* section 1.7) and conservation considerations for the four invertebrate species.

3.1 Assessment of Impacts

3.1.1 Nature of Impacts from Critical Habitat Designation

Impacts on the environment from designation of critical habitat stem from the section 7 consultation requirements of the ESA (*cf.* section 1.4.1.2). Under section 7(a)(2) of the ESA, federal agencies are required to consult with the Service on actions that they fund, implement, or authorize, which may affect listed species or critical habitat (50 CFR §402). The purpose of section 7 consultation, with respect to critical habitat, is to ensure that the actions of federal agencies do not destroy or adversely modify critical habitat. Critical habitat is defined as habitat that is essential for the conservation of a listed species.

Critical habitat designation does not have any impact on the environment other than through the section 7 consultation process. Critical habitat designation alone does not establish blanket rules or restrictions on land use, nor does it

automatically prohibit or modify any activity. Each proposed federal action that may potentially affect designated critical habitat is analyzed individually during the section 7 consultation process. Individuals, organizations, states, local governments, and other non-federal entities are potentially affected by the designation of critical habitat only if their actions occur on federal lands, require a federal permit, license, or other authorization, or involve federal funding.

The potential for destruction or adverse modification of critical habitat is assessed by determining the effects of the proposed action on primary constituent elements or habitat qualities that are essential to the conservation of the species. These anticipated effects are then analyzed to determine how they will influence the function and conservation role of the affected critical habitat unit. This analysis provides the basis for determining the significance of anticipated effects of the proposed action on critical habitat. The threshold for destruction or adverse modification is evaluated in the context of whether or not the critical habitat would remain functional (or retain the current potential for primary constituent elements to be functionally established) to serve the intended conservation role for the species.

In the case of the four invertebrate species, most of the proposed critical habitat is occupied by one or more of the species. The only potentially unoccupied areas within proposed critical habitat are within the Impoundment Unit Complex on Bitter Lake National Wildlife Refuge (Figure 4). Conservation of the four invertebrate species will require, in part, sustaining existing populations.

Therefore, the primary conservation value of proposed critical habitat for the four invertebrate species is to sustain existing populations. The threshold for destruction or adverse modification at the Sago Springs and Bitter Creek Complex Unit, Diamond Y Springs Complex Unit, and East Sandia Spring Unit would likely be a reduction in the capability of the habitat to sustain existing populations. It is likely that actions that would reduce the capability of the habitat to sustain a population would also result in take (67 FR 6459: 6468). Consequently, the outcome of section 7 consultations at these units may not be materially different with designation of critical habitat compared to listing of the species alone.

The Impoundment Complex Unit on Bitter Lake National Wildlife Refuge may also have additional conservation value above sustaining existing populations, in that there are unoccupied areas within proposed critical habitat that may allow for future expansion of existing populations. Expansion of existing populations at this unit would likely be an element of recovering the four invertebrate species. Accordingly, a second threshold for destruction or adverse modification at the Impoundment Complex Unit may be a reduction in the suitability of the habitat to support expansion of existing populations.

All of the proposed critical habitat is currently occupied by at least one listed aquatic or wetland-associated species. The species include: Pecos gambusia, interior least tern (*Sterna antillarum*), Pecos sunflower, and Pecos bluntnose shiner (*Notropis simus pecosensis*) at Bitter Lake National Wildlife Refuge; Leon Springs pupfish (with designated critical habitat), and Pecos sunflower at the Diamond Y Springs Complex Unit; and Comanche Springs pupfish and Pecos sunflower at East Sandia Spring Unit. Habitat requirements of currently listed species that occur in proposed critical habitat overlap with those of

the four invertebrate species. Consequently, many of the habitat elements relevant to conservation of the four invertebrate species are currently considered in section 7 consultations. This reduces the probability of there being additional conservation requirements arising from section 7 consultations that include consideration of designated critical habitat for the four invertebrate species.

Examples of actions not likely to destroy or adversely modify critical habitat include, but are not limited to, oil and gas exploration in areas where surface or ground water is not connected to proposed critical habitat areas, ground water pumping or use that does not significantly lower aquifer levels or reduce spring discharges, domestic sewer hook-ups to city wastewater treatment facilities within ground water recharge zones of supporting aquifers (67 FR 6459: 6469), and projects implemented in accordance with biological opinions issued by the Service .

Some activities may be considered to be of benefit to the four invertebrate species and, therefore, would not be expected to adversely modify critical habitat when carefully planned. Examples of such beneficial actions could include re-establishing populations of the four invertebrate species within their historic range, removal and control of salt cedar to improve habitat and hydrologic conditions at springs and seeps, restoration of wetlands, and removal of nonnative species.

3.1.2 Impact Assessment Method

Many projects analyzed in the context of NEPA involve a specific action with well-defined parameters, such as proposed reconstruction of a highway bridge over the Pecos River that has a specific construction time frame and well-defined

project boundary. In contrast, critical habitat designation is a complex action.

The consequences of section 7 consultation on potential effects to the four invertebrate species and critical habitat may be highly variable, depending on the characteristics, context, location, duration, geographic extent, and timing of each proposed action subject to consultation. This complexity is heightened by the dynamic nature of the natural environment. Biological conditions that influence the magnitude of potential impacts may change over time and from place to place. The complexity of the effects of critical habitat designation was addressed by using past section 7 consultations that involved the four invertebrate species and interviews with Service biologists on potential future consultation issues as a basis for the impact assessment.

A separate analysis of the economic impacts of all conservation activities for the four invertebrate species was conducted and relevant results were incorporated into this EA (Industrial Economics, Inc., 2005).

The proposed action analyzed in this EA is designation of critical habitat. Therefore, the No Action alternative was defined as listing of the four invertebrate species as endangered, but without designation of critical habitat. Listing of the four invertebrate species and designation of critical habitat are associated actions. It is possible that the four invertebrate species could be listed without designation of critical habitat. However, the opposite is not possible: critical habitat cannot be designated unless the four invertebrate species are listed.

3.2 Conservation of The Four Invertebrate Species

3.2.1 Existing Conditions

As described above in section 3.1.2, existing conditions are defined as listing of Roswell springsnail, Koster's springsnail, Pecos assimineia, and Noel's amphipod as endangered without critical habitat designation. Under these conditions, consultation with the Service would be triggered when a proposed federal action is likely to affect any of the four invertebrate species. This could include actions that directly or indirectly affect occupied habitat.

With listing of the four invertebrate species as endangered, a federal action agency would make the initial determination of whether or not their action would affect any of the species. If the action agency determines that there would be no effect, they would not be required to consult with the Service. Section 7 consultation would be triggered when it is determined that the proposed federal action has the potential to affect any or all of the four invertebrate species. The four invertebrate species would receive protection from unauthorized take, which is defined to include not only physical harm to individuals but also significant habitat modification or degradation that results in impairment of behavioral patterns such as breeding, feeding, or sheltering.

Since June 1998, there have been about 14 consultations with the Service on projects that included analysis of potential effects on the four invertebrate species. Eleven of these were intra-Service consultations on projects proposed on Bitter Lake National Wildlife Refuge (eight) or Diamond Y Spring (three). The remaining three

were consultations on projects proposed in the vicinity of Diamond Y or East Sandia Spring in Texas.

One of the primary threats to the four invertebrate species is destruction or modification of their habitat (67 FR 6459: 6462; New Mexico Department of Game and Fish, 2005). Surface water at many springs throughout the range of the four invertebrate species has been reduced or eliminated during the 20th century, and habitats at many remaining springs have been modified (New Mexico Department of Game and Fish, 2005). Conservation of the four invertebrate species depends upon protection of the few remaining habitats that they occupy because their geographic distribution is restricted to several small, isolated areas. Protection of habitat has been identified as a cornerstone in conservation of other listed springsnail species with restricted geographic distributions (*e.g.*, Service, 1994a; Service, 1995a; Service, 1995b; Service, 2002). Because all four of the invertebrate species have life spans of only about one year, even short-term impacts to habitat could result in elimination of populations or extinction of one or more of the species.

Both Bitter Lake National Wildlife Refuge and The Nature Conservancy manage habitat on their lands for conservation of the four invertebrate species and other rare or sensitive wetland-associated or aquatic species. For example, Bitter Lake National Wildlife Refuge constructed dikes to isolate the spring and seep habitats inhabited by the four invertebrate species from the impoundments managed primarily for waterfowl and shorebird habitat (consultation 2-22-03-F-159).

The New Mexico Department of Game and Fish completed a recovery and conservation plan for the four invertebrate species in 2005 (New Mexico Department of Game and Fish, 2005).

The plan identified conservation measures, such as reestablishing populations of the four invertebrates within their historic range. Implementation of conservation measures would require developing cooperative relationships with other entities, as there were no regulatory mechanisms available to the Department of Game and Fish for conservation actions.

The Nature Conservancy is in the process of developing management plans for the East Sandia Springs Preserve and the Diamond Y Springs Preserve. The Nature Conservancy has worked with energy production companies at the Diamond Y Preserve to reduce the potential for spills or leaks of oil into the Diamond Y Spring Complex (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

3.2.2 Effects on the Four Invertebrate Species

3.2.2.1 No Action Alternative No section 7 consultations pursuant to the critical habitat provisions of the ESA would be conducted. In a practical sense, this would mean that federal actions that are not expected to affect any of the four invertebrate species, but are planned in habitats that have proposed primary constituent elements and that are within the proposed critical habitat designation boundary, would not trigger section 7 consultation.

The conservation value of critical habitat designation may not be realized with the No Action Alternative. Critical habitat designation provides a regulatory mechanism, through section 7 consultation, to evaluate the effects of proposed actions on key habitat features within areas that are essential to the conservation of the species. Thus, changes to important habitat characteristics, or primary constituent elements, could be tracked

to ensure that critical habitats retain their value, capability, and potential for conservation of the species. These benefits to conservation of the four invertebrate species may not occur with the No Action Alternative.

The non-regulatory aspects of critical habitat designation that would contribute to conservation of the four invertebrate species may also not be realized with the No Action Alternative. These non-regulatory aspects include informing the public and private sector of areas that are important for species recovery, focusing attention on specific geographic areas that are essential to conservation of the four invertebrate species, identifying areas that may require special management considerations or protection, and providing protection to areas where significant threats to the species have been identified to help avoid accidental damage to such areas.

3.2.2.2 Alternative I Alternative I would have the effect of requiring section 7 consultation when proposed federal actions may affect primary constituent elements within the boundaries of designated critical habitat. Section 7 consultation on potential effects to primary constituent elements associated with actions on private lands would occur only when a federal action, such as funding or permitting, is involved.

Critical habitat designation may provide a mechanism to ensure that habitat characteristics and function essential for conservation of the four invertebrate species are retained in the critical habitat units. Conservation of the four invertebrate species will likely require their restoration to areas of historically occupied habitat either through natural dispersal or translocation (*e.g.*, Service, 1994a: 11; Service, 2002: 32-37; Service, 2004a: 21-22). Unoccupied suitable habitat within the Impoundment Complex Unit (Figure 4) may provide areas for natural dispersal of individuals.

The capability for natural dispersal may be vital for conservation of the four invertebrates in cases where habitat at occupied sites becomes unsuitable and the only means for population persistence is dispersal to nearby, suitable habitats. Alternative I may contribute to conservation of the four invertebrate species by ensuring that existing, potential dispersal sites within designated critical habitat retain their habitat suitability.

The non-regulatory aspects of critical habitat designation that would contribute to conservation of the four invertebrate species could be realized with implementation of Alternative I. These benefits may include informing the public and private sector of areas that are important for species recovery and where conservation actions may be most effective. Critical habitat designation focuses attention to and awareness of specific geographic areas that are essential to conservation of the four invertebrate species. Critical habitat also identifies areas that may require special management considerations or protection, and may help provide protection to areas where significant threats to the species have been identified to help to avoid accidental damage to such areas. When a federal agency proposes an action and can see that the action is located within the boundaries of a critical habitat unit, they can plan their projects in a proactive fashion consistent with section 7(a)(1) of the ESA.

3.2.2.3 Alternative II Excluding the units on Bitter Lake National Wildlife Refuge from critical habitat designation would not reduce the degree of habitat protection on the Refuge for the four invertebrate species. This is because the Refuge is managed expressly for conservation of wildlife, including the four invertebrate species. The Refuge would continue to implement measures for the conservation of the four invertebrate species if the Sago Springs and Bitter Creek Complex and

Impoundment Complex units are not designated as critical habitat. The Refuge would continue to cooperate and participate in research and monitoring associated with conservation of the four invertebrate species. The non-regulatory aspects of critical habitat designation are currently being realized on the Refuge. Interpretive information at the Refuge describes the occurrence and ecology of the four invertebrate species. Areas important for the conservation of the four invertebrate species on the Refuge are currently known and delineated. Exclusion of the Refuge units from critical habitat designation would have the benefit of avoiding increased administrative costs associated with inclusion of critical habitat considerations in intra-Service section 7 consultations.

3.3 Water Resources

3.3.1 Existing Conditions

The 500-year source-water capture zone for the springs that support the four invertebrate species on Bitter Lake National Wildlife Refuge was delineated in 1999 (Wolford *et al.*, 1999). In 2002, there were 4,119 wells that withdrew 221,350 acre-feet of groundwater annually within the 12-township block that encompasses this source-water capture zone (New Mexico Department of Game and Fish, 2005). Irrigation accounted for 89 percent of the groundwater use, while domestic wells accounted for slightly less than three percent of groundwater use from the wells (New Mexico Department of Game and Fish, 2005).

The New Mexico Office of the State Engineer acknowledged a federal water right serving Bitter Lake National Wildlife Refuge "limited to existing conveyance depletions, as determined following a five year monitoring study pursuant to a Reserved Water Rights Stipulation dated

December 6, 1996" (State of New Mexico, 2002: 10). The five-year monitoring period has been completed and the Service and Office of the State Engineer are currently evaluating the data to determine the amount of the conveyance depletion (P. Tashjian, Service, pers. comm., 12 April 2005). This water right would apply to the Sago Springs and Bitter Creek area, as well as to the seeps and springs that supply the impoundments on the Middle Tract of the refuge.

Current and future regulation of groundwater pumping in the Roswell Basin by the New Mexico Office of the State Engineer is likely to prevent any impacts to spring flows on the Middle Tract of Bitter Lake National Wildlife Refuge from groundwater withdrawal (State of New Mexico, 2002: 5). The New Mexico Office of the State Engineer has stated that "Administration of the basin protects all water users, including the Service, in times of drought and against overdiversion" and that "as a fully administered basin, any future effects on the water supply for these habitats would be due to a lack of recharge resulting from drought, and not from overpumping" (State of New Mexico, 2002: 10).

East Sandia Spring is likely fed by shallow groundwater rather than the deeper aquifer in Cretaceous limestone that discharges at other springs in the area (Service, 2004b: 13-14). Water uses in the area around East Sandia Spring are primarily agricultural. The Reeves County Water Improvement District #1 diverts approximately 19,425 acre-feet of surface water from the local artesian spring system. The District provides irrigation water to about 10,600 acres along Toyah Creek, primarily within Reeves County but with a small portion in Jeff Davis County (Service, 2004b: 2-3). Extensive groundwater pumping for irrigation use also occurs in the area, although this has diminished in recent years due to the overall decline in agricultural production (Sharp, 2001).

Diamond Y Spring discharges relatively saline water (Service, 1985: 6; 64 FR 56581: 56582) from the Rustler Aquifer (Boghici and Van Broekhoven, 2001: 212). Groundwater at the spring apparently is not suitable for irrigation, municipal, or domestic use because of the high salinity and mineral content (Service, 1985: 6). However, diversion of spring water and groundwater pumping in the area was implicated in the loss of flow at Leon Springs and the upper reaches of Leon Creek (45 FR 54678).

Over 90 percent of the water used in Pecos and Reeves counties in Texas is obtained from groundwater, and irrigation accounts for about 85 to 90 percent of water use in these counties (Boghici, 1999). The principal source of groundwater for irrigation, municipal, and industrial uses in Pecos and Reeves counties, Texas, is the Cenozoic Pecos Alluvium aquifer (Boghici, 1999). Anticipated demand for groundwater from this aquifer to the year 2030 is in excess of the estimated recharge rate. However, the Cenozoic Pecos Alluvium aquifer should have enough fresh water to meet anticipated needs although aquifer storage will likely be reduced. It is expected that aquifer storage would be reduced by about 561,459 acre-feet (6.8 percent) from 2000 to 2030 (Boghici, 1999).

There have not been any consultations on proposed water resources projects involving effects to the four invertebrate species. However, the Service did conduct formal consultation on the effects of continuing federal support for irrigation operations by the Reeves County water Improvement District #1 on Comanche Springs pupfish and Pecos gambusia in the vicinity of East Sandia Spring (Service, 2004b). The Service determined that aquatic taxa inhabiting the spring outlets would not be adversely affected by ongoing irrigation operations. Reasonable and

prudent measures specified in the biological opinion focused on minimizing mortality of fish in irrigation ditches and did not have any bearing on taxa inhabiting the spring outlets.

All of the areas proposed for critical habitat designation are currently occupied by other listed species. Therefore, federal actions that may affect spring flows in habitats occupied by any of the four invertebrate species would trigger section 7 consultation on potential effects on other listed species. Measures to protect these other listed species (*i.e.*, Pecos sunflower, Pecos gambusia, Leon Springs pupfish, Comanche Springs pupfish) would likely be comprehensive enough to ensure protection of the four invertebrate species as well.

3.3.2 Effects on Water Resources

3.3.2.1 No Action Alternative Section 7 consultations on the effects of water projects would be required under the jeopardy standard when there is a federal nexus (*e.g.*, federal lands, permitting, or funding is involved). Federally supported water projects that could substantially reduce or eliminate flow from springs, seeps, outflow channels, or wetlands inhabited by any of the four invertebrate species would likely trigger formal consultation under the jeopardy standard for the four invertebrate species as well as other species that are already listed under the Act. The effects of section 7 consultations on water resources projects would be similar to existing conditions, where consultations address potential effects on co-occurring aquatic species that are already federally listed.

3.3.2.2 Alternatives I and II Critical habitat designation under alternative I or II is not likely to have any substantial additional effect on water resources compared to the No Action alternative (*i.e.*, listing of the four invertebrate species with

no critical habitat designation). Almost all of the critical habitat proposed under alternatives I or II is occupied by one or more of the four invertebrate species, and its conservation value rests mainly in the capability of the habitat to support existing populations (*cf.* section 3.1.1). Any action that reduces spring flow in occupied habitats to the point that capability of the habitat to support one or more of the four invertebrate species is adversely affected is likely result in an adverse effect determination under the jeopardy standard (67 FR 6459: 6468). Critical habitat designation may result in additional discretionary conservation recommendations to reduce impacts to primary constituent elements related to spring flow. However, it is unlikely that reasonable and prudent alternatives developed under the jeopardy standard for federally supported water projects would be changed substantially with the addition of critical habitat designation.

The East Sandia Spring and Diamond Y Springs Complex critical habitat units are occupied by Pecos assiminea. The Diamond Y Springs Complex unit is also currently designated as critical habitat for the Leon Spring pupfish (45 FR 54678). The Sago Springs and Bitter Creek Complex critical habitat unit on Bitter Lake National Wildlife Refuge is occupied by all four species. Only the Impoundments Complex critical habitat unit on Bitter Lake National Wildlife Refuge has potentially unoccupied habitat (G. Warrick, Service, pers. comm., 21 March 2005). Due to the karst geology and groundwater characteristics of the area, any federally supported water project that affects spring flow in unoccupied habitat in the Impoundments Complex Unit would also likely affect occupied habitat.

Critical habitat designation is unlikely to affect groundwater withdrawal actions in the Roswell Basin, because spring flows in the proposed critical habitat on Bitter Lake National Wildlife

Refuge are already protected by existing water rights afforded by the New Mexico Office of the State Engineer's administration of the Roswell Basin. The Office of the State Engineer has stated that "both shallow and artesian pumping levels have stabilized and will continue to remain at relatively constant levels under basin administration" (State of New Mexico, 2002: 10). Thus, state regulation would prevent substantial, sustained draw-down of the groundwater sources that support the springs within proposed critical habitat, regardless of critical habitat designation.

3.4 Oil and Gas

3.4.1 Existing Conditions

There are approximately 196 natural gas and oil wells in the 12-township area encompassing the source-water capture zone for the Middle Unit of Bitter Lake National Wildlife Refuge (New Mexico Petroleum Research Center, 2002). These wells have produced 25,846,714,000 cubic feet of natural gas and 158,724 barrels of oil since about 1972. About 6,666,408 gallons of water have also been produced from these wells over the same 30-year period (New Mexico Petroleum Research Center, 2002). Most of the wells (68 percent) are located on federal land, with 17 percent located on state land and the remaining 15 percent on private land (New Mexico Petroleum Research Center, 2002). Development of additional natural gas and oil wells in the source-water capture zone is likely. Development of another 91 natural gas and oil wells is likely in the foreseeable future on lands managed by the Bureau of Land Management within the source-water capture zone (H. Parman, Bureau of Land Management, pers. comm., 22 August 2002).

The Bureau of Land Management designated an area for protection of habitat of Pecos gambusia

from potential groundwater contamination by oil and gas well drilling operations (Bureau of Land Management, 2002). This area, referred to as the Habitat Protection Zone, includes a portion of the source-water capture area for the springs in the northern part of the Middle Tract of Bitter Lake National Wildlife Refuge, where *Pecos gambusia* co-occurs with the four invertebrate species. The Habitat Protection Zone includes 17 existing oil and gas leases with a total of 20 wells. Up to another 66 wells may be developed within the Habitat Protection Zone in the future. Stipulations for oil and gas wells in the Habitat Protection Zone include storage of drilling muds in steel tanks and use of cement to seal the entire length of the well casing.

The Oil Conservation Division of the New Mexico Energy, Minerals, and Natural Resources Department regulates oil and gas well drilling and casing in part to prevent contamination of groundwater (19 NMAC 15.3). For example, regulations at 19.15.3.106.A (Sealing Off of Strata) state that "During the drilling of any oil well, injection well or any other service well, all oil, gas, and water strata above the producing and/or injection horizon shall be sealed or separated in order to prevent their contents from passing into other strata." There are no known instances of groundwater contamination by leaking oil or gas wells in the source-water capture zone for the Middle Unit of Bitter Lake National Wildlife Refuge (W. C. Olson, Oil Conservation Division, pers. comm., 11 October 2002).

Surface spills of hydrocarbon liquids on Bitter Lake National Wildlife Refuge have been documented (Service 1994b; Service, 1996; Service, 1997a; Service, 1998b). However, none of these spills has resulted in contamination of surface water in habitats occupied by the four invertebrate species.

Diamond Y Spring is located in the Gomez Ellenburger oil and gas field (Figure 5). The 22,000-acre Gomez Ellenburger field is one of the largest natural gas-producing fields in the U.S. (Smith, 2005). The field was discovered in 1962 and by 1993 over four trillion cubic feet of gas had been produced. Gas reserves in the field are deep, requiring wells to be drilled to depths of around 20,000 feet. Production from the field peaked in 1979 when there were 112 wells that produced 188,383,794,000 cubic feet of gas and 194 barrels of hydrocarbon liquids. Gas production then declined through the 1980s. By 1992, there were 94 wells producing 80,686,761,000 cubic feet of gas and 247 barrels of fluids annually (Smith, 2005). A gas plant is located about 0.25 miles due south of Diamond Y Spring. Oil and gas development in the vicinity of East Sandia Spring is sparse.

Surface spills of hydrocarbon liquids has occurred in the past at Diamond Y Spring, and has resulted in fish kills (45 FR 54678). However, in the late 1970s, Trans Pecos Soil and Water Conservation District in cooperation with the Soil Conservation Service (now the Natural Resources Conservation Service) constructed a dike around the spring to prevent future oil spills from entering the spring habitat (Service, 1985: 7). Exxon also voluntarily placed oil pipelines above ground and in a double-casing in the vicinity of the spring and its outflow to prevent leaks into aquatic habitat (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

There has been one section 7 consultation on an oil and gas project with federal involvement in the vicinity of habitats occupied by the four invertebrates. This was an informal consultation in 2004 regarding proposed abandonment of 58 miles of pipeline in Winkler, Ward, Reeves, and Pecos counties, Texas (consultation no. 2-15-04-I-0169). The proposed project involved

permitting by the Federal Energy Regulatory Commission. It was determined that the proposed action would not have any effect on any of the four invertebrate species or any co-occurring, listed, aquatic taxa such as Leon Springs pupfish. There were no conservation recommendations made by the Service regarding protection of aquatic habitats in this consultation.

3.4.2 Effects on Oil and Gas

3.4.2.1 No Action Alternative As described in section 3.3.2.1, section 7 consultations on effects of oil and gas projects would be required under the jeopardy standard when there is a federal nexus (*e.g.*, federal lands, permitting, or funding is involved). The effects of section 7 consultations on federally supported oil and gas projects would be similar to existing conditions, where consultations address potential effects on co-occurring aquatic species that are already federally listed.

Proposed oil and gas well development on federal lands adjacent to Bitter Lake National Wildlife Refuge would be subject to section 7 consultation under the jeopardy standard for Pecos gambusia, the four invertebrate species, Pecos bluntnose shiner, and other listed species. Stipulations required by the Bureau of Land Management and the New Mexico Oil Conservation Division regarding protection of groundwater and aquatic habitats during well development would be implemented.

Oil and gas well development in the vicinity of Diamond Y Spring and East Sandia Spring occurs on private lands with no federal involvement. Therefore, section 7 consultations would not occur for these projects.

3.4.2.2 Alternatives I and II Critical habitat designation under alternative I or II would likely cause minor increases in time required by federal agency staff to conduct section 7 consultation, compared to existing conditions. With Alternative II, this impact would apply only to projects potentially affecting the Diamond Y Springs Complex Unit or the East Sandia Spring Unit.

Designation of critical habitat for the four invertebrate species would not result in additional section 7 consultations on federally supported oil and gas projects. Section 7 consultation on oil and gas development adjacent to Bitter Lake National Wildlife Refuge would be triggered under the jeopardy standard for other listed species (*e.g.*, Service, 1997b) and the four invertebrate species, regardless of critical habitat designation. Potential effects to designated critical habitat for Pecos bluntnose shiner would also be included in such consultations (*e.g.*, Service, 1997b).

Potential impacts from oil and gas projects would be to spring flow and water quality. Any impacts from federally supported oil and gas projects that appreciably reduce the capability of critical habitat to sustain existing populations would also be likely to result in take. Impacts to spring flows or water quality only in unoccupied habitat are unlikely to occur because of the karst geology and groundwater characteristics in the project area. Existing measures developed to protect spring flow and water quality in habitat occupied by Pecos gambusia (Service, 1997b) would also protect the capability of habitat to support the four invertebrate species and allow their populations to expand into unoccupied habitat.

Inclusion of considerations for critical habitat for the four invertebrate species in section 7 consultations may result in the addition of

discretionary conservation measures to reduce impacts to primary constituent elements related to spring flow and water quality. However, critical habitat designation for the four invertebrate species is not likely to result in substantive changes to mandatory reasonable and prudent alternatives.

3.5 Land Management

3.5.1 Existing Conditions

The Nature Conservancy manages lands they own consistent with their mission statement, which is to "preserve the plants, animals and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive." Major land management activities conducted by The Nature Conservancy at the Diamond Y Spring and East Sandia Springs preserves include prescribed burning, removal of nonnative species such as salt cedar (*Tamarix chinensis*), and restoration of disturbed sites (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005). The Nature Conservancy coordinates with the Service on projects proposed on the preserves to ensure that actions are planned to optimize benefits to the four invertebrate species and other species of concern, such as other endemic aquatic invertebrates, Pecos sunflower, Leon Springs pupfish, and Comanche Springs pupfish (N. Allan, Service, pers. comm., 22 March 2005).

There have been three intra-Service section 7 consultations on projects proposed at Diamond Y Spring. Removal of nonnative fishes from Diamond Y Spring using antimycin, netting, and trapping was conducted in the past for conservation of Leon Springs pupfish (consultation nos. 2-15-98-F-1318 and 2-15-99-I-361). A stream discharge gage was also installed

at the Diamond Y Spring outflow (consultation no. 2-15-99-I-067).

Bitter Lake National Wildlife Refuge is managed for wildlife conservation, which includes restoration and maintenance of biological integrity, diversity, and environmental health. Major land management activities on Bitter Lake National Wildlife Refuge include water level management in impoundments to provide habitat for waterfowl, shorebirds, and other groups of species, habitat restoration, prescribed burning, control of salt cedar, and management of noxious weeds (G. Warrick, Service, pers. comm, 21 March 2005).

There have been eight intra-Service section 7 consultations on projects proposed on Bitter Lake National Wildlife Refuge. Six of these consultations were on projects to control noxious weeds and salt cedar using mechanical removal and herbicide treatments. Following are two examples of projects proposed on Bitter Lake National Wildlife Refuge.

The refuge proposed to conduct a prescribed burn in winter 2004-2005 at Unit 15 and to treat Russian knapweed (*Acroptilon repens*) along the west side of the unit using the herbicide imazapyr. These activities were planned within proposed critical habitat (consultation no. 2-22-05-I-0215). The refuge determined that the action may affect Koster's springsnail and Pecos assimineia. Measures proposed to minimize risk to these species were: 1) establishing a 50-yard buffer for herbicide treatments around habitats occupied by the species; 2) using a herbicide approved for use in aquatic habitats; 3) conducting prescribed burning during the winter when water levels at the springs and seeps are highest; and 4) conducting the prescribed burning using a head-fire, which would move through the area quickly and reduce the potential for development of high soil

temperatures. The Service concurred that the project, as planned, would not adversely affect either Koster's springsnail or Pecos assiminea.

A formal intra-Service consultation was conducted on a project proposed in 2002 to rehabilitate impoundments on the refuge. One of the purposes of the project was to isolate springs and seeps along the west side of the impoundments from water level fluctuations in the impoundments for the purpose of protecting habitat for the four invertebrate species (consultation no. 2-22-03-F-159). The Service determined that the project was not likely to adversely affect the four invertebrate species. No project modifications were developed specifically for the four invertebrate species.

3.5.2 Effects on Land Management

3.5.2.1 No Action Alternative Land management activities conducted on Bitter Lake National Wildlife Refuge, the Diamond Y Springs Preserve, or the East Sandia Spring Preserve would continue to be implemented as they have in the recent past. Both The Nature Conservancy and Bitter Lake National Wildlife Refuge would continue to plan and implement prescribed burning, noxious weed control, salt cedar removal, habitat restoration, and other projects for the benefit of the four invertebrate species and other aquatic and wetland species on their lands.

3.5.2.2 Alternatives I and II Compared to the No Action alternative, critical habitat designation would not have any affect on land management activities proposed on The Nature Conservancy preserves or Bitter Lake National Wildlife Refuge other than a minor increase in federal agency staff time under Alternative I to include critical habitat considerations in section 7 consultations. This

impact would not occur on Bitter Lake National Wildlife Refuge with selection of Alternative II.

Critical habitat designation may have a beneficial effect on land management activities at the Diamond Y Spring and East Sandia Spring preserves. Critical habitat designation at these sites may increase the recognition of their importance in conservation of biological diversity and improve the potential for acquiring funding for habitat restoration and conservation work at these sites (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

3.6 Livestock Grazing and Dairy Operations

3.6.1 Existing Conditions

No livestock grazing occurs on the Middle Tract of Bitter Lake National Wildlife Refuge (G. Warrick, Service, pers. comm., 21 March 2005). Livestock grazing occurred at the Diamond Y Springs Preserve until 1990 (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005). Livestock grazing, consistent with habitat management goals at the preserve, could be resumed again in the future, but there are currently no plans to do so (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

Chaves County, New Mexico, is ranked 11th in the United States for milk production (New Mexico Department of Agriculture, 2002). In 2002, there were 41 dairy operations in Chaves County, which combined produced 17,771,836 cwt of milk (one cwt = one-hundred pounds of raw milk). Dairy operations are primarily located south of Roswell in the Dexter and Hagerman area (Chaves County Development Foundation, 2005), which is not within the source-water capture zone

of springs and seeps in the Middle Tract of Bitter Lake National Wildlife Refuge.

Wastewater effluent discharge from dairy operations is regulated by a National Pollutant Discharge Elimination System (NPDES) General Permit for Discharge from Concentrated Animal Feeding Operations (permit no. NMG010000). The Environmental Protection Agency is currently consulting with the Service to designate areas of concern for threatened and endangered species.

3.6.2 Effects on Livestock Grazing and Dairy Operations

3.6.2.1 No Action Alternative There would be no changes to existing livestock grazing conditions with implementation of the No Action alternative (*i.e.*, listing of the four invertebrate species as endangered without critical habitat). Ongoing section 7 consultation on the NPDES General Permit for Concentrated Animal Feeding Operations would require consideration of impacts to the four invertebrate species.

3.6.2.2 Alternatives I and II Designation of critical habitat under Alternative I would not have any substantial effects on livestock grazing and dairy operations compared to the No Action alternative. There would be minor increases in federal agency staff effort required to include critical habitat considerations in section 7 consultations on the NPDES General Permit for Concentrated Animal Feeding Operations. This impact would not occur with selection of Alternative II. Additional discretionary conservation recommendations may be specified to reduce potential impacts to primary constituent elements of proposed critical habitat for the four invertebrate species. However, it is unlikely that any mandatory reasonable and prudent alternatives developed under the jeopardy

standard for the four invertebrate species and other listed, aquatic species would be changed substantially with designation of critical habitat.

3.7 Recreation

3.7.1 Existing Conditions

Bitter Lake National Wildlife Refuge provides several types of public recreation opportunities that are available during normal hours of operation (*i.e.*, daylight hours). At the Middle Tract of the refuge, where critical habitat is proposed, recreation activities include hunting, bird-watching, hiking, bicycling, and wildlife observation and photography. The wildlife refuge averages 40,000 visitors annually (Service, 2001). Visitor estimates for the years 1991 through 2001 are shown in Table 2.

A wildlife viewing route, which can be followed by auto, bicycle, or on foot, begins at the visitors' center and makes an eight-mile loop. The route borders the north side of Hunter's Marsh and south side of Unit 3 and encircles Units 5, 6, 7, and 15 (Figure 4). In the middle tract, public access is prohibited from the north boundary of the tract south to the wildlife viewing loop, which effectively excludes Unit 3, Sago Springs, and Bitter Creek from public access. Wildlife viewing tours guided by refuge staff are conducted once a month from October through May. These tours allow participants into areas normally closed to the public.

Table 2. Annual visitor estimates at Bitter Lake National Wildlife Refuge, 1991 - 2001 (Service, 2001).

Calendar Year	No. of Visitors
2001	43,570
2000	38,676
1999	36,680
1998	32,093
1997	41,385
1996	52,713
1995	35,698
1994	33,571
1993	36,585
1992	43,482
1991	40,051

Four short walking trails are located in the middle refuge tract. Unit 5, nearest the current visitors' center, has a short walking trail (Butterfly Trail) leading from visitors' center to the Unit 5 overlook. Some spurs to this trail below the viewing platform encroach into the proposed critical habitat. A new visitors' center is proposed along the driving route in this unit but would be located outside the critical habitat boundaries. Three other trails (Dragonfly, Desert Upland, and Oxbow) with viewing platforms are also in the middle tract in Units 6 and 7, but they are also generally outside of the proposed critical habitat boundaries. The Dragonfly Trail, for example, terminates at a viewing platform in Unit 6 that is located on the edge of critical habitat above the springditch (G. Warrick, Service, pers. comm., 31 March 2005).

Hunting waterfowl, upland birds, and deer is allowed only within certain portions of the refuge.

Within the proposed critical habitat boundaries, hunting is allowed only in Hunter Marsh. Other hunting areas are in the Middle Tract, but outside of the critical habitat boundaries, and on the North Tract. About 250 hunters use the Middle Tract each year to hunt waterfowl.

The refuge was the focus of a dragonfly festival one weekend each year from 2001 through 2003. The event was sponsored by Friends of Bitter Lake National Wildlife Refuge, a non-profit group. In the past, the festival was held in Roswell with tours to the refuge. Another festival is planned for August 2005 but will be held on-site at the refuge (G. Warrick, Service, pers. comm., 29 March 2005).

Recreation activities on The Nature Conservancy lands are allowed only by permission from The Nature Conservancy to ensure protection of the sensitive plant and animal species that occur on these lands. For example, Balmorhea Christmas Bird Count participants have been allowed to conduct bird surveys on the Sandia Springs Preserve. The Nature Conservancy also hosts tours of each area for groups making such request. Just one or two tours are usually given each year at Sandia Springs Preserve while Diamond Y Springs Preserve annually has about eight to 10 tours. Tour groups have ranged in size from as few as three to as many as 40 participants (J. Karges, The Nature Conservancy, pers. comm., 29 March 2005).

3.7.2 Effects on Recreation

3.7.2.1 No Action Alternative No designation of critical habitat for the four invertebrate species would not affect availability or management of public or private recreation activities as no changes to management with listing of the species alone would occur.

3.7.2.2 Alternatives I and II Designation of critical habitat would not affect existing public recreation uses at Bitter Lake National Wildlife Refuge under Alternative I. Since the refuge is currently managed to protect the habitats of the four invertebrate species, future recreation developments would not be placed in these habitats, whether critical habitat is designated or not. Current recreation opportunities would continue to be provided to the public (G. Warrick, Service, pers. comm., 21 March 2005).

Likewise, there would be no effect on recreation opportunities on Nature Conservancy lands. The practice of managing these lands for conservation of Pecos assimineia, and other species, would continue to limit the availability of recreation activities (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

3.8 Socioeconomic Conditions and Environmental Justice

Regulations for implementing NEPA require analysis of social effects when they are interrelated with effects on the physical or natural environment (40 CFR §1508.14). Federal agencies are also required to "*identify and address disproportionately high and adverse human health or environmental effects*" of their programs and actions on minority populations and low-income populations, as directed by Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations).

3.8.1 Existing Conditions

3.8.1.1 Land Use The area proposed as critical habitat for the four invertebrate species includes

two parcels in New Mexico and two parcels in Texas totaling 1,523.5 acres (67 FR 6459). These four parcels are located in three counties: Chaves County, New Mexico; Reeves County, Texas; and Pecos County, Texas. The two proposed critical habitat units in New Mexico (Sago Springs and Bitter Creek Complex Unit and Impoundment Complex Unit), totaling 1,127 acres, are located within the Bitter Lake National Wildlife Refuge and are managed by the Service. The remaining two units (Diamond Y Springs Complex Unit and East Sandia Spring Unit) comprise 396.5 acres of private land in Texas owned by The Nature Conservancy. The Nature Conservancy lands are surrounded by other private lands. Bitter Lake National Wildlife Refuge is bordered by federal lands managed by the Bureau of Land Management and by state and private lands.

The four proposed critical habitat units are located within public and private lands currently being managed at least primarily, if not exclusively, for protection of fish, wildlife, and plants and their habitats. Private and public lands adjacent to the national wildlife refuge generally support production of livestock and agricultural products, residential development, and oil and gas development. As discussed in section 3.5, certain recreation activities are allowed at Bitter Lake National Wildlife Refuge, and The Nature Conservancy permits limited recreation activities by permission. The Nature Conservancy also allows local residents access through the Sandia Springs Preserve (which includes critical habitat Unit 4) for non-consumptive uses, such as visiting the community cemetery or strolling.

3.8.1.2 Communities None of the four proposed critical habitat units is located in a developed community. Surrounding private lands are mostly ranch lands with occasional houses. Homes closest to the four proposed critical habitat units include a ranch house located a few hundred

yards from the East Sandia Spring Complex and federal employee housing near the visitors' center at Bitter Lake National Wildlife Refuge. Communities closest to each of the proposed critical habitat units are shown in Table 3 along with their populations and approximate distance from their respective units.

Table 3. Communities and their populations nearest each proposed critical habitat unit (U.S. Census Bureau, 2005a; U.S. Census Bureau, 2005b). Distances between unit and nearest community are approximate.

Critical Habitat Unit	Nearest Community	Population	Distance Between Unit and Nearest Community
Sago Springs/Bitter Creek Complex	Roswell, NM	45,293	9 miles
Impoundments Complex	Roswell, NM	45,293	9 miles
Diamond Y Springs Complex	Fort Stockton, TX	7,846	10 miles
East Sandia Spring	Balmorhea, TX	527	1 mile

Fort Stockton, Texas and Roswell, New Mexico, the communities closest to three of the four proposed critical habitat units, are full-service communities with emergency services, schools, medical centers, and other community resources. Balmorhea, Texas, near East Sandia Spring Complex, is a small village with few services located just south of Interstate 10. The closest full-service community to this unit is Fort Stockton, about 50 miles east on Interstate 10.

3.8.1.3 Economy The areas proposed as critical habitat for the four invertebrate species are rural lands currently being managed primarily for natural resource conservation. Lands surrounding

the refuge and The Nature Conservancy lands are largely used for natural resource extraction activities (*i.e.*, oil and gas development, livestock grazing, and agricultural production).

Primary employment sources in Chaves, Reeves, and Pecos counties are government, health care and social assistance services, and trade, transportation, and utilities (Industrial Economics, 2005). Major industries in these three counties, as determined by payroll, are health care and social assistance services, retail trade, transportation, manufacturing, and mining (Industrial Economics, 2005).

From 1990 to 2000, the population of Chaves County grew by 6.1 percent. During the same period, Reeves County population increased by 14.5 percent while the population of Pecos County decreased by 17.1 percent. Both Texas counties have shown a population decline since the 2000 census (Industrial Economics, 2005:3-1).

3.8.1.4 Environmental Justice The population of New Mexico and Texas and the combined population of their associated counties is shown in Table 4.

Table 4. Population characteristics in the project area. The table shows population of the two states and combined population of counties within each state that are included in the areas proposed for designation of critical habitat for the four invertebrate species (U.S. Census Bureau, 2005a).

State	Total State Population	Combined Population of Counties with Proposed Designated Habitat in Each State
New Mexico	1,818,046	61,382
Texas	20,851,820	29,946

Selected population demographics of these states are compared to the demographics of the combined potentially-affected counties within each state in Figure 7. The demographics selected for comparison include the composition of populations based on: 1) race (Figure 7A); 2) persons of Hispanic or Latino origin versus other origins (Figure 7B); and 3) persons with income below and above the poverty level (Figure 7C). The purpose of selecting these demographics is for making a determination as to whether or not implementation of the proposed action would disproportionately adversely affect minority or low-income groups in accordance with Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.

Both New Mexico and Texas have slightly lower percentage of white persons statewide than in their respective counties in the affected project area (Figure 7A). Conversely, the population of Chaves County, New Mexico and the combined populations of Reeves and Pecos counties in Texas have slightly lower percentages of racial minorities than are found in the overall populations of their respective states (Figure 7A). About 66.8 percent of all New Mexicans are white while 72 percent of Chaves County citizens are white. Statewide, 71 percent of the Texas population is white while 75.8 percent of the combined population of Reeves and Pecos counties is white.

The breakdown between Hispanic or Latino and non-Hispanic or Latino populations is about the same statewide in New Mexico as compared to Chaves County (Figure 7B). About 42.1 percent of New Mexico citizens are Hispanic or Latino while 43.8 percent of Chavez County residents are Hispanic or Latino. There is a substantial difference, though, between the population of Texas and its potentially-affected counties when

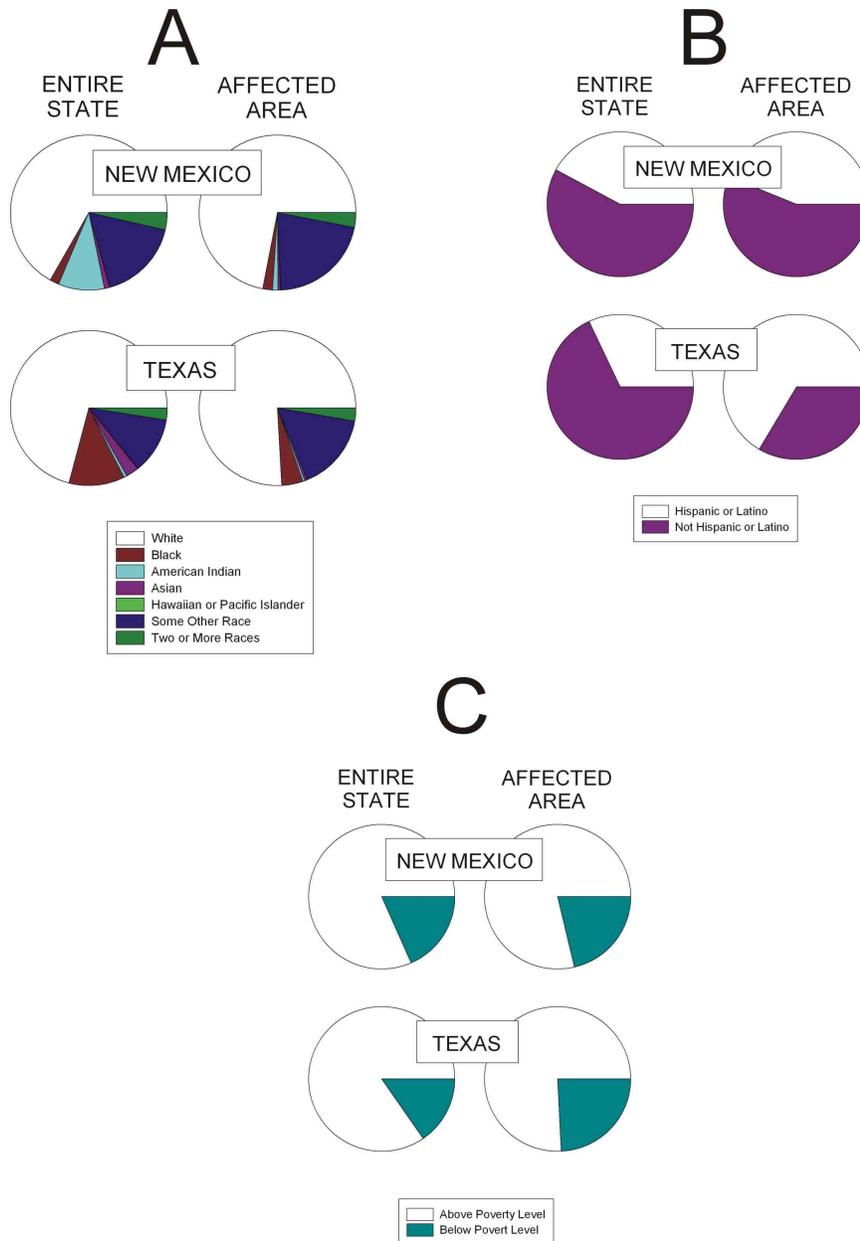
comparing Hispanic or Latino populations. About one-third of the population of Texas is Hispanic or Latino, but approximately two-thirds of the population of Reeves and Pecos counties is Hispanic or Latino (Figure 7B).

In 1999, there was a slightly higher percentage (three to four percent) of persons in Chaves County living below the poverty level than those across the entire state of New Mexico (Figure 7C). Within the affected county areas in Texas, substantially more (approximately seven to nine percent) individuals are living below the poverty level than the statewide average for Texas (Figure 7C).

3.8.2 Effects on Socioeconomic Conditions and Environmental Justice

3.8.2.1 No Action Alternative Section 7 consultation under the jeopardy standard would be required on federal actions that have the potential to affect habitat occupied by the four invertebrate species. Actions on private lands that have the potential to result in take of any of the these species would be subject to section 10 of the ESA, which requires development of a Habitat Conservation Plan as part of an application to the Service for an incidental take permit.

Figure 7. Demographic characteristics of the project area. Selected demographics for population of the State of New Mexico compared with Chaves County, New Mexico and the State of Texas compared with the combined population of Reeves and Pecos counties, Texas (U.S. Census Bureau, 2005c; U.S. Census Bureau, 2005d; U.S. Census Bureau, 2005e).



3.8.2.2 Alternatives I and II Land use in and surrounding the proposed critical habitat units is not expected to change with either of the alternative critical habitat designations compared to the No Action alternative (*i.e.*, listing of the four invertebrate species as endangered without critical habitat). Federal and private lands within and adjacent to proposed critical habitat units that are currently managed for conservation of wildlife and their habitats would continue to be managed for conservation purposes (*i.e.*, Bitter Lake National Wildlife Refuge and The Nature Conservancy preserves) or for multiple public uses (*i.e.*, Bureau of Land Management lands).

Designation of critical habitat with either alternative would not affect community services or community cohesion. No residences or businesses would be displaced. Community resources such as schools, law enforcement, medical services, and social services, would not change as a result of designation of critical habitat.

An economic study of the effects of the proposed critical habitat designation concluded that there would be no loss of jobs or reduction of industry production in Reeves, Pecos, or Chaves counties if either of the critical habitat designation alternatives are selected (Industrial Economics, 2005).

The economic analysis determined that there would be an estimated annual economic impact of \$3.8 to \$7.5 million over 20 years as a result of critical habitat designation under Alternative I (Industrial Economics, 2005:ES-2). Approximately 91 percent of forecasted costs were attributed to activities that could affect the Sago Spring and Bitter Creek Complex Unit and the Impoundment Complex Unit while 9 percent of the costs would be expected to result from activities within or surrounding the East Sandia

Spring Unit and Diamond Y Springs Complex Unit (Industrial Economics, 2005:ES-5). Oil and gas development within the Habitat Protection Zone would be expected to generate about 81 percent of the total cost. Federal, state, and The Nature Conservancy management activities would be predicted to generate another 15 percent of these costs (Industrial Economics, 2005:ES-2,3).

However, most, if not all of these costs would be incurred regardless of critical habitat designation. For example, costs associated with modifications to oil and gas well development within the Habitat Protection Zone would occur regardless of critical habitat designation for the four invertebrate species. The well development costs are associated with existing stipulations implemented for protection of Pecos gambusia. Also, The Nature Conservancy would continue to manage its preserves for the conservation of biological diversity, including Pecos assiminea, regardless of critical habitat designation (J. Karges, The Nature Conservancy, pers. comm., 22 March 2005).

Measurable economic benefits may be associated with natural resources restoration, which could include endangered species recovery and habitat restoration (Baker, 2005). Critical habitat designation may focus attention on habitat restoration projects that can benefit local companies such as Boss Reclamation, a Roswell, New Mexico firm that provides salt cedar removal services.

As no measurable detrimental effects from the designation of critical habitat are anticipated in regards to communities or individuals (*e.g.*, loss of homes, businesses, or jobs; disruption of community services or community cohesion), there would be no disproportionate adverse effects on low-income or minority populations. The proposed action is in compliance with E.O. 12898.

3.9 Cumulative Effects

Cumulative effects are the effects from other projects that are not part of this proposed action, which may have an additive effect when combined with the effects expected from the proposed action. The geographic extent for which cumulative effects are considered vary for each resource. The past, present, and reasonably foreseeable future actions in the proposed critical habitat analysis area that, combined with the proposed action, could contribute to cumulative effects include:

- effects of listing, critical habitat designation, and section 7 consultations for other species and other designated critical habitats; and
- existing land management policies and plans.

Effects of proposed critical habitat designation on most resource areas generally consist primarily of the potential for minor increases in federal agency staff effort during section 7 consultations to incorporate critical habitat considerations and addition of discretionary conservation measures to reduce impacts to primary constituent elements. These potential impacts are not likely to result in substantial cumulative effects, when added to the effects of existing section 7 consultations for other species and existing land management plans and policies.

3.10 Relationship Between Short-Term and Long-Term Productivity

Proposed designation of critical habitat is a programmatic policy that would have no effect on short-term or long-term productivity.

3.11 Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are those effects that cannot be reversed. For example, the extinction of a species is an irreversible commitment. Irretrievable commitments of resources are those that are lost for a period of time, but may be reversed, such as building a shopping center on farmland. The land cannot be used for farming again until the pavement is removed and soils are restored to productivity. Designation of critical habitat for the four invertebrate species would result neither in irreversible or irretrievable commitments of resources.

4.0 COUNCIL ON ENVIRONMENTAL QUALITY ANALYSIS OF SIGNIFICANCE

Pursuant to the Council on Environmental Quality regulations for implementing NEPA, preparation of an environmental impact statement is required if an action is determined to significantly affect the quality of the human environment (40 CFR §1502.3). Significance is determined by analyzing the context and intensity of a proposed action (40 CFR §1508.27).

Context refers to the setting of the proposed action and includes consideration of the affected region, affected interests, and locality (40 CFR §1508.27[a]). The context of both short- and long-term effects of proposed designation of critical habitat are the proposed critical habitat units in Chaves County, New Mexico and Pecos and Reeves counties, Texas, and the surrounding areas. The effects of proposed critical habitat designation at this scale, although long-term, would be small.

Intensity refers to the severity of an impact and is evaluated by considering ten factors (40 CFR §1508.27[b]). The intensity of potential impacts that may result from designation of critical habitat for the four invertebrate species under Alternative I or Alternative II is low.

- The potential impacts may be both beneficial and adverse, but minor.
- There would be no effects to public health or safety from proposed designation of critical habitat, and the proposed action would not affect unique characteristics of the geographic area.

- Potential impacts from critical habitat designation on the quality of the environment are unlikely to be highly controversial and do not involve any uncertain, unique, or unknown risks.
- Proposed designation of critical habitat for the four invertebrate species does not set a precedent for future actions with significant effects and would not result in significant cumulative impacts.
- Significant cultural, historical, or scientific resources are not likely to be affected by proposed designation of critical habitat.
- Proposed critical habitat designation may have a beneficial effect on Koster's springsnail, Roswell springsnail, Pecos assimineia, and Noel's amphipod.
- Proposed critical habitat designation would not violate any federal, state, or local laws or requirements imposed for the protection of the environment.

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