

Euphorbia telephioides
(Telephus spurge)

**5-Year Review:
Summary and Evaluation**



Female plant



Male plant

Photos by Vivian Negrón-Ortiz, St. Joseph Buffer Preserve, Gulf County.

**U.S. Fish and Wildlife Service
Southeast Region
Panama City Field Office
Panama City, Florida**



5-YEAR REVIEW

Euphorbia telephioides / Telephus spurge

I. GENERAL INFORMATION

A. Methodology used to complete the review

This review was accomplished using information obtained from the Recovery Plan of June 1994, biological opinions prepared by U.S. Fish and Wildlife Service (USFWS, Service), several documents prepared by Ecological Resource Consultants, Inc., unpublished field survey results, reports of current research projects, peer reviewed scientific publications, unpublished field observations by Service, State and other experienced biologists, and personal communications. These documents are on file at the Panama City Field Office. A *Federal Register* notice announcing the review and requesting information was published on April 26, 2007 (72 FR 20866). Comments and suggestions from peer reviewers were incorporated as appropriate (see Appendix A). No part of this review was contracted to an outside party. This review was completed by the Service's lead recovery botanist for this plant in the Panama City Field Office, Florida.

B. Reviewers

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C. Background

1. FR Notice citation announcing initiation of this review:

72 FR 20866 (April 26, 2007)

2. **Species status:** Stable (Recovery Data Call 2007); six populations are properly protected; five new occurrences were documented; recent surveys conducted on several sites found the species in excellent conditions.

3. **Recovery achieved:** 1 (0 - 25% recovery objectives achieved); Recovery Data Call 2007; most recovery actions are ongoing or have been partially met.

4. Listing history

Original Listing

FR notice: 57 FR 19813

Date listed: June 8, 1992

Entity listed: species

Classification: Threatened

5. Associated rulemakings

Not applicable

6. Review History

Recovery Plan: June 22, 1994

Status Review: No formal 5-year reviews have been conducted on *E. telephioides* since the Recovery Plan was written and approved.

Recovery Data Call:

2003 (uncertain); 2004 (improving); 2005 (stable); 2006 (stable); 2007 (stable).

7. Species' Recovery Priority Number at start of review (48 FR 43098)

The telephus spurge is assigned a recovery priority of 2 because the degree of threat to its persistence is high, it is a species, and has a high recovery potential.

8. Recovery Plan or Outline

Name of plan: Recovery Plan for four plants of the lower Apalachicola Region, Florida: *Euphorbia telephioides* (telephus spurge), *Macbridea alba* (white birds-in-a-nest), *Pinguicula ionantha* (Godfrey's butterwort), and *Scutellaria floridana* (Florida skullcap).

Date issued: June 22, 1994

Dates of previous plans: N/A

II. REVIEW ANALYSIS

A. Application of the 1996 Distinct Population Segment (DPS) policy

Euphorbia telephioides is a plant; therefore, it is not covered by the DPS policy.

B. Recovery Criteria

1. Does the species have a final, approved recovery plan containing objective, measurable criteria?

The recovery plan includes a recovery objective to promote conservation of habitats for *E. telephioides*. For the species to be considered for delisting, the general criteria is to adequately protect and manage 15 populations distributed throughout the species' historical range for 10 years. The plan states that these goals are by necessity only preliminary, and they will be refined (see IV. Recommendations for Future Actions).

2. Adequacy of recovery criteria

a. Do the recovery criteria reflect the best available and most up-to-date information on the biology of the species and its habitat?

No. The recovery criteria were based on the available data at the time the plan was published 13 years ago. For instance, the habitat was described as 'scrubby oaks on low sand ridges near coast', a very narrow account in view of present information. The number of localities, which were not specified in the plan, was based on a Florida Natural Areas Inventory (FNAI) report dated 1989. To date, current survey work has increased the distribution of this species to other localities within the three counties; in addition it has suggested the extirpation of some sites. Furthermore, it was not known that the species is functionally dioecious, a breeding system that would affect viable population size from a conservation perspective if the sex ratio within a population deviates from 1:1.

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria?

No. The recovery plan generally only addressed factor a – habitat destruction and modification, which is still a threat. See section II.C.2 for description of current information and threats.

3. List the recovery criteria as they appear in the recovery plan, and discuss how each criterion has or has not been met, citing information. For threats-related recovery criteria, please note which of the 5 listing factors are addressed by that criterion. If any of the 5-listing factors are not relevant to this species, please note that here.

The immediate goal of the 1994 recovery plan that addressed *E. telephioides* was written as ‘to ensure the continued conservation of this plant in Apalachicola National Forest and to encourage conservation of its habitat in areas outside the Forest’. The general criteria listed in the plan as typically being set for delisting a plant species is to adequately protect and manage 15 populations distributed throughout the species’ historical range for 10 years. In section IV, we recommend for the plan’s recovery criteria to be revised and better defined and in section II.C. 1 and 2, we present current information on status and threats to the species.

This plant based on best available information does not occur on the Apalachicola National Forest. However, in terms of the general criteria given to consider this plant for delisting, reference in section II.C.1, Table 1, Table 2, and Table 3 for the most up-to-date survey information on the lists of locations that have this plant. Also, to date, six protected populations have been secured (USFWS 2005): four populations on the St. Joseph Buffer Preserve (Gulf County), and the North Glades and the Breakfast Point Mitigation Bank (BPMB) populations (Bay County).

C. Updated Information and Current Species Status

1. Biology and Habitat

a. Abundance, population trends, demographic features or demographic trends:

Euphorbia telephioides is restricted to the Florida panhandle, specifically to coastal Bay, Franklin, and Gulf counties (Figure 1). In 1989, *E. telephioides* was known from only 22 sites (FNAI 1989). The number of populations has increased to 38 sites (Tables 1-3; Figures 1-4) based on recent survey work (FNAI 2007; 2007 FWS surveys).

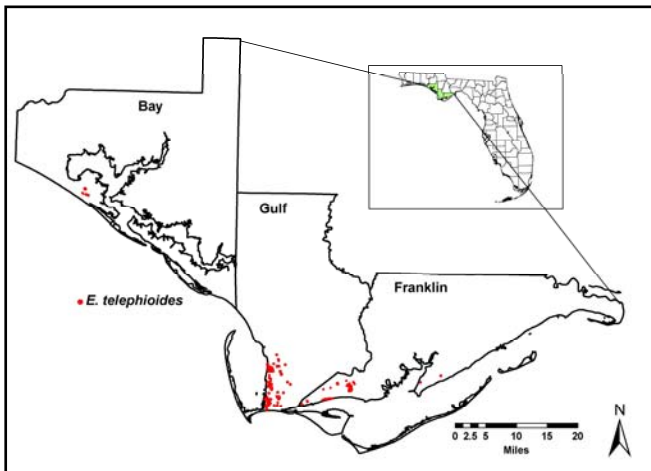


Fig. 1. Map of Florida (inset) showing the counties and locations of *E. telephioides*.

About nine locations appear to be extirpated by development, and/or habitat modification. Because the surveys were conducted irregularly, with most sites visited only once, we have poor information regarding trends.

Many locations originally described with abundant plants were found in subsequent surveys to be variably altered, thus possibly interfering with the search for *E. telephioides*

(Tables 1- 3). For instance, areas with ‘very dense pine plantation with almost no herbaceous understory’ or ‘flatwoods with very dense, long unburned understory’ were described as lacking

the species despite previous reports of species occurrence in the sites. This species is of ephemeral nature, that is, it can be abundant at newly disturbed sites, and then tends to disappear when the sites are revisited a few years later. The plants possess a large tuberous root (Wurdack, 2007, pers. comm.), which help individuals to survive disturbances (e.g., desiccation, fire, mowing, pine site prepped); therefore, while the shoot (stem and leaves) is not visible they are probably still there. The information below is organized by county, and provides a detailed account of population trends.

Bay County

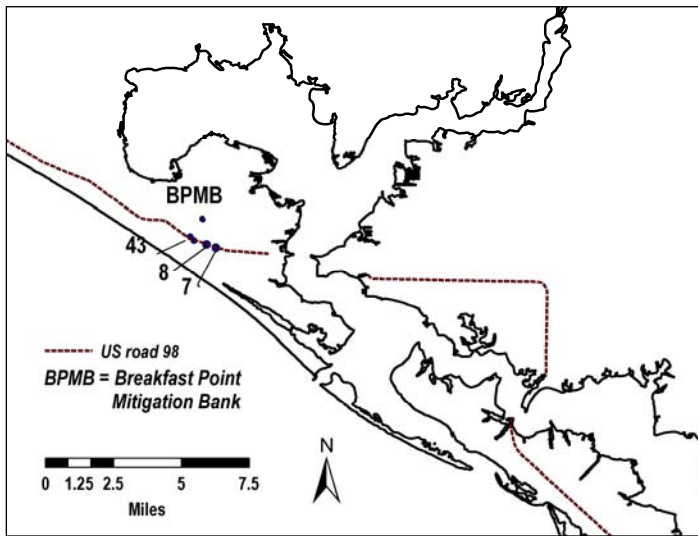


Fig. 2. Populations at Bay County.

Five surveys conducted in four Bay County locations between 1988 and 2007 indicated the presence of more than 18,650⁺ plants (USFWS 2007b; Ecological Resource Consultants 2004; Table 1). This is an estimated number given that some potential areas have not been evaluated, and others have been extirpated by development. Three locations, reported from FNAI surveys conducted in 1988, 2001, 2003 and 2004 (Table 1) occur in a partially

forested area along US 98 (Figure 2). The FNAI survey

in 2001 for populations no. 8 and 43 indicated that the plants were not visible due to very dense understory or scrub layer vegetation, contrasting with the observation of the area in the 1988 survey. FNAI population no. 8 has been completely destroyed (USFWS 2007b) due to development of a shopping center. FNAI population no. 43 is abundant and appears to be thriving (Negrón-Ortiz, 2007, pers. observ.).

Originally FNAI population no.7 covered an area of 8.62 acres with approximately 17,250 plants, but it was partially impacted by development in 2005 (Ecological Resource Consultants 2004; USFWS 2005) leaving 4.52 acres with about 6,831 plants. This fragmented location is known as the North Glades site (Ecological Resource Consultants 2004; USFWS 2005, 2007b). The site has been maintained by mowing but may require fire to control the development of a thick understory.

The 200⁺ plants located at BPMB (see Table 1) are found in a pine plantation and are being managed and monitored (USFWS 2005, 2007b; Ecological Resource Consultants 2004, 2007). Since the inception of management in 2005, the population has significantly increased to 1,000 plants (Tobe, 2007, pers. comm.).

Table 1. Number of individuals per population reported from five surveys conducted on four populations of telephus spurge in Bay County. Data were taken from FNAI and the Service. The 2004 count for population 43 consists of counts of two subpopulations separated by ‘;’. * = partially destroyed; ** = completely destroyed; BPMB = Breakfast Point Mitigation Bank; --- no survey.

Population	1988	2001	2003	2004	2007
7 (N. Glades)		100 ⁺	0	17,250	*6,831
8	200	30	---	---	**
43	200 ⁺	---	---	25 ⁺ ; 100 ⁺	200 ⁺
BPMB				200 ⁺	1000
Total	400 ⁺				8,031 ⁺

Gulf County

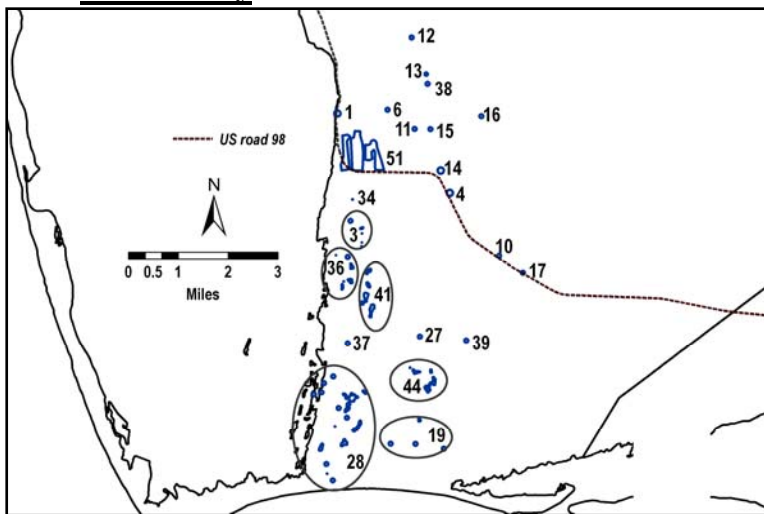


Fig. 3. Populations at Gulf County. Circles (or polys) show multiple source points for same occurrence.

Eight surveys conducted in 23 Gulf County locations between 1988 and 2006 indicated the presence of more than 16,323 plants (Table 2). These sites are found clustered in a 28 square mile area east and south of Port St. Joe, in habitats mostly dominated by longleaf or slash pine. Six of these locations are found along US 98 (Figure 3). Eight locations were surveyed

only once (Table 2). Therefore, the current status of the plants and/or populations is unknown. Unsuccessful surveys for FNAI populations 1, 10, and 17 could be explained by habitat alteration, (i.e., cutover, rutted, ditched (FNAI 2007)) and suggest extirpation (USFWS 2007b). FNAI’s most recent survey for populations 14 and 15 showed a marked decline in numbers (Table 2). These two sites were found in moderate to dense pine plantations, thus the plant tap roots are possibly there, and the shoots could re-appear after a “burn or after thinning the plantation” (FNAI 2007).

Four occurrences (FNAI 3, 28, 36, and 44) are protected and managed at St. Joseph State Buffer Preserve (SJB) (USFWS 2007b; Negron-Ortiz, 2007, pers. observ.), and contain the largest number of individuals (Table 2). A site containing about 255 plants located west of SR-30 and referred to as the Shallow Reed development is expected to be protected from direct impact through on-site wetland mitigation (USFWS 2007b), but long-term management is uncertain.

Ongoing surveys for Gulf County populations are expected to provide more current information on status.

Table 2. Number of individuals per population reported on eight surveys conducted on 23 populations of telephus spurge in Gulf County. Numbers followed by ‘ ; ’ represent subpopulations; --- no survey; SJBP = St. Joseph State Buffer Preserve. Data were taken from FNAI (2007). Totals were not presented because populations are being currently surveyed.

Population	1988	1996	1999	2000	2001	2003	2004	2005/2006
1 (1967)	---	---	---	0	---	---	---	---
3 (SJBP)					30 ⁺ ;1000	25; 50; 50;100	---	---
4 (1988)		---	---	---	5	---	---	---
6			10-20	250 ⁺	---	---	---	---
10	1,500	---	---	---	0	---	---	---
11	30-40			2	20	---	---	---
12	200-300	---	---	---	---	---	---	---
13	10-20	---	---	1	---	---	---	---
14	50-100	---	---	---	2	---	---	---
15	15-20	---	---	---	5	---	---	---
16	50-100	---	---	---	---	---	---	---
17	50	---	---	---	0	---	---	---
19	3-20	25-30, 20-30 ⁺	---	---	---	150	---	---
27		50-100, mostly seedlings	---	---	many	---	---	---
28 (SJBP)						100-500; 10; 250; 1350 ⁺ ; 575; 520; 200	---	---
34					1000's	---	---	---
36 (SJBP)						~50; 20; 570	100 ⁺	---
37	5	---	---	---	---	---	---	---
38				23	---	---	---	---
39					1000's	---	---	---
41					10-20	475; 400; 230; 1,450	---	---
44 (SJBP)						50; 125; 855	---	---
51								3,000

Franklin County

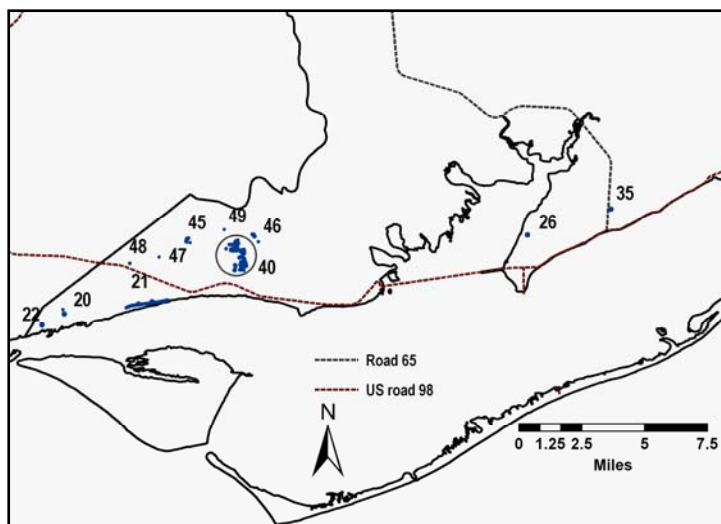


Fig. 4. Populations at Franklin County. Circle show multiple source points for same occurrence.

Five surveys conducted at eleven Franklin County locations indicated the presence of about 2,723 plants. Five newly discovered populations (45 - 49) were documented in 2007 (Table 3, Figure 4). Populations 26 and 35 (Figure 4, Table 3) were documented only from herbarium specimen information.

Plants at population 26 were referred to as 'frequent' (without

providing an actual account of plants) in 1987, but were not located in the 2005 and 2007 surveys. Habitat had been significantly altered by a residential development. Population 35 was revisited in June 2007, but no plants were found due most likely to the density of the understory of the pine plantation. Both populations may be extirpated (USFWS 2007b).

The marked difference in the number of plants reported over time for population 21 was due to habitat changes. Originally, the site was described as 'an open savanna along roadside'. However, by the 2001 survey, the site had been modified into 'a power line row or a dense young pine plantation.'

Table 3. Number of individuals per population reported on five surveys conducted on eleven populations of telephus spurge in Franklin County. Data were taken from FNAI and the Service. ' ; ' represent subpopulations; rd = residential development; --- no survey.

Population	1988	2000	2001	2005	2007
20	~50	---	30	---	---
21	100-1000	---	15; 15	---	70; 146 ⁺
22	50	~50	---	---	---
26 (1987)	---	---	---	0	rd
35 (1990)		---	---	---	0
40			5	---	1,400
45					110-160
46					~36
47					3
48					1
49					23
Total	~200-1,000				~1,789-1,812 ⁺

b. Genetics, genetic variation, or trends in genetic variation (e.g., loss of genetic variation, genetic drift, inbreeding, etc.):

A genetic study using allozyme data by Drs. Hamrick (University of Georgia, Athens, Ga), Negrón-Ortiz (USFWS, Panama City, FL), and Dorset (University of Georgia, Athens, Ga) has been initiated and is ongoing. The study will estimate the levels and distribution of genetic diversity within and among populations of *E. telephioides*. The information obtained from this research will help determine which populations should be priorities for conservation. The study is proposed to be completed by 2008. No previous genetic studies have been conducted for this species.

c. Taxonomic classification or changes in nomenclature:

Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Malpighiales
Family: Euphorbiaceae
Genus: *Euphorbia* L.
Species: *telephioides* Chapman
Common name: telephus spurge

***Euphorbia* L.** This genus, commonly called the spurges, is diverse worldwide, and belongs to the family Euphorbiaceae. Like all members of this family the spurges have milky sap, and unisexual flowers, with plants either monoecious or dioecious (Judd et al. 1999). The cymose inflorescences [flower cluster in which the main and branch stems each end in a flower that opens before those below it or to its side) are extremely modified cyathia (a flower cluster or inflorescence containing unisexual flowers without petals), and the genus is monophyletic based on this structure (Steinmann & Porter 2002). *Euphorbia* consists of about 2,160 annual or perennial herbs, woody shrubs or tree species, with approximately 107 native *Euphorbia* species in the United States and Canada. The genus is currently divided into five subgenera (Webster 1967), several sections and subsections (Bridges and Orzell 2002). Within subsection *Inundatae*, five *Euphorbia* taxa are currently recognized as endemic to portions of southern Georgia to southern Florida with some extending west to southern Mississippi (Bridges and Orzell 2002). All are adapted to recurrent natural fires, and found on sandy outer coastal plain ridges of Pleistocene, Pliocene, or Miocene age (Bridges and Orzell 2002).

***Euphorbia telephioides* Chapman.** Telephus spurge is a perennial herbaceous plant of about 30-40 cm (12-16 in) in height. The leaves are alternate, sessile, obovate to oblanceolate, and somewhat succulent, an adaptation to decrease evaporation during seasonal water stress. It has one to three, occasional more low stems conveying a bushy appearance, and possesses a long tuberous root which might help survive disturbances such as fire, mowing and/or water stress. It is functionally dioecious (Bridges and Orzell 2002), with staminate (male) and

pistillate (female) plants differing in morphology (Wurdack, 2007, pers. comm.). Female plants tend to have wider leaves and fewer pistillate flowers than male plants (Negrón-Ortiz, 2007, pers. observ.). Male plants have narrower leaves and possess numerous terminal flowers conveying a bushy look. Flowering is from March through August with terminal umbellate inflorescences modified into reddish-green cyathia (Bridges and Orzell 2002). Ovaries develop into capsules, explosive when ripe, with seeds ranging in color from silver and gray, to tan and brown (Peterson and Campbell 2007).

This species was named in 1860 by Alvan Wentworth Chapman. In 1903, Small transferred *E. telephioides* to *Tithymalus telephioides* (Chapm.). In 1933, the same author renamed the species *Galarhoeus telephioides* after splitting the genus into smaller genera. Webster (1967) re-established *E. telephioides* after establishing in the genus the section *Tithymalus* subsection *Inundatae*. Bridges and Orzell (2002) lectotypified the species based on a herbarium specimen found at the NY herbarium which represents material collected by Chapman from Franklin County prior to 1860. No changes in nomenclature are recommended.

d. Spatial distribution, trends in spatial distribution, or historic range:

Euphorbia telephioides is endemic to the Florida panhandle and restricted to Bay, Gulf, and Franklin counties. It is unknown whether *Euphorbia telephioides* was once continuously distributed throughout the three counties or populations were restricted to local habitat patches. The present remaining patches are separated by clear cuts, pine plantations or residential/commercial development.

In 1992 when the species was listed, it was known from 22 localities in the three counties, all within 4 miles of the Gulf coast (57 FR 19813). To date, the species is still constrained to the same three counties, but the number of occurrences within the counties, specifically Gulf County, has increased to 38. Development has resulted in (or potentially resulted in) extirpation of several of those populations (no. 1, 8, 10, 17, 26), and has left other sites highly fragmented (e.g., North Glades site). The habitat preference originally described for the species has been expanded (see section C.1.e below).

e. Habitat or ecosystem conditions (e.g., amount, distribution, and suitability of the habitat or ecosystem):

At the time the recovery plan was written, the habitat was described as ‘scrubby oaks on low sand ridges near coast’. To date, *E. telephioides* is known to occur in a wider range of habitats. It has been reported from xeric¹ to mesic pine

¹Xeric pine flatwoods has about a meter of well-drained dry soil, and becomes inundated during significant precipitation such as during hurricanes (Abrahamson and Hartnett 1990). Mesic pine flatwoods are less well-drained, seasonally inundated flatlands distinguished by an open canopy of broadly distributed slash pine, with nutrient poor sandy soils (Ecological Resource Consultants 2005). Scrubby flatwoods, a variant of the flatwood association, is considered an ecotone between flatwoods and scrub, and it is found on well-drained white sand (Abrahamson and Hartnett 1990).

flatwoods and in scrubby pinelands dominated by wiregrass and/or *Pinus palustris* or *P. elliotii*. Although uncommon, telephus spurge was observed growing in wetlands with seepage slope species and in small thick clumps of wire grass surrounded by pine or cypress (Rountree et al. 2005).

Telephus spurge can be locally abundant along disturbed sandy, sunny roads, and in sites with bedding. It can be found sporadically abundant in dense grass of unburned scrubby flatwoods (Negrón-Ortiz, 2007, pers. observ.). It has also been noted in upland communities, which have been historically burned with a two to three year fire frequency (J. Huffman, 2007, pers. comm.). In general, the plants do well on sandy, acidic soil, with no litter, and low organic and moisture content (Peterson & Campbell 2007).

2. Five-Factor Analysis (threats, conservation measures, and regulatory mechanisms)

a. Present or threatened destruction, modification or curtailment of its habitat or range:

Habitat modification is the primary threat identified in the Recovery Plan for telephus spurge, and remains the main threat to date for this plant. The long history of timbering, urban development, and fire management and suppression in this region has changed the ecosystems. The threats are discussed in more detail below:

1. Development of the outer Coastal Plain in the Apalachicola for pulpwood production

The timber industry in North Florida became well established in the 1850's (FNAI 2005). It started in Franklin County in the 1870's and supported a large portion of the economy for decades. It continued to be a prominent industry until the mid-1990's (Howell and Hartsell 1995). The St. Joe Paper Company in Port St. Joe was sold and shut down in 1999. The Company has changed its emphasis to residential and commercial development; therefore this industry is no longer considered a primary threat.

2. Coastal real estate and road development

Urban development continues to threaten telephus spurge. The St. Joe Company owns extensive areas of land in Northwest Florida, including tracts near Tallahassee and Panama City, with Gulf of Mexico beach frontage and waterfront properties. The Company focuses on commercial and residential development along roadways and near or within business districts in the region. Many *E. telephioides*' locations are found along US 98, and road widening and new roads continue to negatively affect the species from habitat loss. Urbanized land in Florida, statewide, is projected to double by 2060 along with doubling of the population to 36 million (<http://1000fof.org/PUBS/2060/01-Northwest-Florida>). According to the study, much of the new development will be focused along roadways. In addition, growth is projected for Bay County, particularly in West Bay and east along SR 22 toward Callaway.

3. Fire suppression

Suppression of fire during the dormant season continues to threaten the pineland and savanna's flora as fire is an important factor in the maintenance of flatwoods (Abrahamson and Hartnett 1990). Fire influences community structure and composition (Abrahamson and Hartnett 1990), and with insufficient frequency in longleaf pine communities, a woody midstory quickly develops (Glitzenstein et al. 1995), negatively affecting the understory diversity.

Thus, fire suppression continues to be a threat to telephus spurge. Lack of fire, and subsequent growth of shrubs (particularly encroachment of *Cyrilla racemiflora* L., commonly known as swamp titi) and saplings in the understory, inhibits *E. telephioides* emergence (Negrón-Ortiz, 2007 pers. observ.; FNAI 2007). Declining fire frequency reduces *E. telephioides* abundance in areas where it was previously observed in great quantities (FNAI 2007; J. Huffman, 2007, pers. comm.). In recently burned areas, however, plant emergence is prolific (Negrón-Ortiz, 2007, pers. observ.).

Several studies have shown that frequent prescribed fire regimes are important for maintenance of flatwoods diversity (Hiers et al. 2007). Therefore, frequent prescribed burnings, i.e., 2 – 3 yr intervals, are needed to maintain optimal *E. telephioides* populations (J. Huffman, 2007, pers. comm.).

b. Overutilization for commercial, recreational, scientific, or educational purposes:

There is no evidence to suggest that this factor is a threat.

c. Disease or predation:

There is no evidence to suggest that disease or predation are threats. However, biocontrol agents have been released to control the weed leafy spurge, *Euphorbia esula*, an invasive native to Eurasia, which is widely distributed throughout the U.S. Fifteen different insects have been tested, approved and released for biological control of leafy spurge. To date, *E. esula* does not occur in Florida, but if this weed reaches this area and one or more of the biocontrol agents is released (or dispersers naturally), these insects could threaten *E. telephioides* populations, unless their diets are so selective that they do not feed on it.

d. Inadequacy of existing regulatory mechanisms:

Section 7(b)(4) and 7(b)(2) of the Act generally do not apply to listed plants species. However, limited protection of listed plants from take is provided to the extent that the Act prohibits the removal and reduction to possession of federally listed threatened and endangered plants or the malicious damage of such plants on areas under federal jurisdiction, or the destruction of endangered plants on non-federal areas in violation of state law or regulations or in the course of any violation of a state criminal trespass law. Several populations of *E. telephioides* occur on private timberland and road rights-of-way (ROW). While the Act

requires federal agencies to carry out programs for the conservation of endangered and threatened species, no such programs are stipulated for private landowners. Neither section of the Act provides protection for plants on private lands. The State requires permission of private landowners for collecting of state-listed plants from their property.

Telephus spurge is protected under Florida State Law, chapter 85-426, which includes preventions of taking, transport, and the sale of the plants listed under the State Law. The rule Chap. 5B-40, Florida Administrative Code, contains the "Regulated Plant Index" (5B-40.0055) and lists endangered, threatened, and commercially exploited plant species for Florida; defines the categories; lists instances where permits may be issued; and describes penalties for violations (<http://www.virtualherbarium.org/EPAC>).

Bay County code of ordinance (chapter 19- Environmental Standards), under sections 1907 and 1909, provides restrictions, constraints and requirements to protect and preserve designated habitat conservation areas for rare, threatened, or endangered species, and wetlands (<http://www.municode.com/Resources/gateway.asp?pid=14281&sid=9>). Gulf and Franklin Counties do not have such regulations.

Highway ROW maintenance activities are not always reviewed for threatened and endangered species impact. However, if there is an activity affecting protected species, then the Service can request a consultation with the Florida Department of Transportation under the Act (M. Mittiga, 2007, pers. comm.). According to Sheridan and Penick (2002), ROWs represent a potentially underutilized area for rare plant conservation and could augment species preservation and recovery efforts.

e. Other natural or manmade factors affecting its continued existence:

Herbicide. While the Recovery Plan mentioned that the use of herbicide or the wrong type of herbicide is a threat when it is used to control vegetation on power line ROWs, we no longer consider this a threat to telephus spurge because mowing is now the common practice to maintain ROWs in Florida (M. Mittiga, 2007, pers. comm.). Franklin County allows only "spot treatment" due to impacts concerning the Apalachicola National Forest and waters within Apalachicola Bay and River.

D. Synthesis

The 1994 Recovery Plan for *E. telephioides* reflects the knowledge of the species at the time it was prepared. Numerous surveys and baseline data have significantly increased our understanding of the species, its range and abundance, thus this five-year review provides a more current assessment of the species status and threats.

Euphorbia telephioides is mainly threatened by habitat destruction. Urban development, timbering, and inadequate fire management, i.e., fire suppression, are the main pressures

reducing or eliminating individual populations. Where fire management is implemented, it stimulates the emergence of individuals and maintains healthy, stable populations.

Recent surveys throughout the three counties have increased the number of occurrences. In many of these populations, the total numbers of plants are numerous (see population section), and can be maintained with adequate management and conservation. The plant's distribution has remained stable, and few long-term extirpations have been documented. Consultation under section 7 of the Act has resulted in minimizing impacts from development. In general, the plants seem to be well adapted to fire-prone habitats and no problems have been detected with disease, predation or reproduction.

The species occurs on both private and public lands. Plants occurring on US 98 ROWs are maintained by the Florida Department of Transportation, and recent surveys found the species in excellent condition in a few Bay and Franklin County sites. Most of the private land has been converted to pine plantation and urban development. Since fire has been suppressed from these lands, a dense hard wood understory is present, inhibiting this species. As an endemic species restricted to three counties with populations occurring on private lands and ROWs, telephus spurge is threatened by intense development pressures where urbanized land is projected to increase two-fold in the near future, focusing new development along roadways especially in Bay County. Therefore, permanent protection and management are necessary to conserve this species. *Euphorbia telephioides* should remain as a threatened species, because the present threat of habitat modification via development and road construction and maintenance remains significant. In addition, the criteria for delisting the species, i.e., protect and manage 15 populations distributed throughout the species' historical range for 10 years, have not been met. For the reasons summarized here, telephus spurge meets the definition of a threatened species.

III. RESULTS

A. Recommended Classification:

No change is needed

B. New Recovery Priority Number: 2c

Rationale: *Euphorbia telephioides* remains subject to a high degree of habitat destruction due to development. The species' recovery potential is high, as the managements needs are well understood and documented to have a high probability of success. As the species is in conflict with development and growth, the conflict category 'c' has been added to the Recovery Priority number.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

1. Generally, all available ecological and molecular data should be used when validating the design of efficient *ex situ* and *in situ* conservation management protocols, and when identifying populations of conservation importance (Richards et al. 2006).

- i. Population genetic studies, i.e., allozyme studies
It is imperative to understand the extent and pattern of genetic variability throughout these populations for guiding *in situ* conservation. For instance, if unique alleles are identified for a given population, they should receive priority conservation efforts through conservation easements or land acquisition. Genetic data can indicate interrelationships between populations, the abilities to withstand present and future perturbation of the environment, and in many cases can provide data to understand the evolutionary history and origins of species.
- ii. Establish and implement monitoring
Populations of conservation importance should be identified using the information from the genetic studies, and a long-term, i.e., 10 years, monitoring program should be developed and implemented. Plants should be monitored several times during the first 12-month period to assess the best monitoring schedule (e.g. annually, biannually). Data from monitoring should be evaluated through 5 year reviews.
 - a. Establish permanent plots on at least 10 -15 protected locations throughout the species' historical range. If all the populations are genetically monomorphic for alleles, then only 10 populations could be chosen, and monitored at regular intervals. Priority for populations should include those sites that can be managed with fire.
 - b. For each plot:
 - i. Estimate the sex ratio, density, and abundance of individuals.
 - ii. If possible, investigate basic ecological questions (e.g., pollinators; flowering period; annual variability in flowering; seed production).
 - iii. Monitor the effect of fire (if the areas are burned) on density, fecundity, and size structure.
2. Collect voucher specimens (e.g., herbarium specimens, samples for DNA analyses, preserve material, seeds and whole plants) from areas proposed to be developed and 1) transplant to suitable sites, and 2) distribute to herbaria, botanical gardens, and interested scientists.
3. Conduct botanical surveys on areas of potentially suitable habitat for *E. telephioides*.
4. Establish frequent fire regimes, i.e., 2-3 yr interval, on selected areas such as St. Joseph State Buffer Preserve to maintain optimal conditions of *E. telephioides* populations.
5. Continue fostering a working partnership with the St. Joe Company and other developments to address and minimize potential impacts associated with development and fire suppression.

6. The recovery plan should be updated to revise and better define objective measurable criteria for this plant and better address the five factors.

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U.S. FISH AND WILDLIFE SERVICE

5-YEAR REVIEW of *Euphorbia telephoides*

Current Classification: Threatened

Recommendation resulting from the 5-Year Review

 x No change is needed

Reclassification Priority Number: 2c

The review was completed by botanist Dr. Vivian Negrón-Ortiz, Panama City Field Office.

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve *Scott A. Carmody* Date 2/22/08

REGIONAL OFFICE APPROVAL:

Lead Regional Director, Fish and Wildlife Service

Approve *David J. Jennings* Date 3/6/08

APPENDIX A: Summary of peer review for the 5-year review of *Euphorbia telephioides* (*Telephus spurge*)

A. Peer Review Method: *Provide information on any peer review methods or processes used, including type of peer review.*

The document was peer-reviewed internally by Hildreth Cooper, Mary Mittiga, Lorna Patrick, and Janet Mizzi. They mostly provided editorial comments. Once the comments were added to the document, it was sent to three outside reviewers (see below). The outside peer reviewers were chosen based on their qualifications and knowledge of the species.

Dr. Wurdack's research deals with the phylogeny and evolution of Euphorbiaceae with a secondary interest in the southeastern US flora. Although his research on *E. telephioides* was mostly informal and not done in a rigorous systematic fashion, it includes repeated field examination of five populations, cultivation of plants in Maryland, and initial work on floral anatomy/morphology relating to dioecy (male and female reproductive organs occur on different individuals).

Dr. Tobe has done considerable work on *E. telephioides*. He has collected baseline data, monitored, and managed two populations in Bay County. He has observed carefully the flowers and diagrammed the sequence of flower maturation.

Dr. Johnson is very knowledgeable about the ecosystems of the Florida panhandle. Working as a community ecologist for the Florida Natural Areas Inventory, she has searched for *E. telephioides* throughout its historic range and observed this species in different habitats. Based on her experience, she can help predict whether the plants can be found in a habitat not previously searched.

B. Peer Review Charge: *Include any instructions provided to peer reviewers, including scope and objectives of peer review and any specific advice sought.*

We indicated our interest in all comments the reviewers may have about the document, specifically their overall assessment of the status of telephus spurge. Do the data summarized, or any other pertinent data of which they were aware, suggest that this species should remain listed as threatened, uplisted as endangered, or delisted?

C. Summary of Peer Review Comments/Report

Dr. J. Tobe provided comments related to the sequence of flower maturation which helps understand the breeding system of the species. He also included an article discussing functional andromonoecy [sexual system in which individuals bear both hermaphrodite (male and female) and staminate (male) flowers)] in *Euphorbia*. He indicated that the existing population at BPMB has gone from about 200 plants in 2005 to over 1,000 plants in 2007 (J. Tobe, unpub. data).

Dr. K. Wurdack provided a careful review which included five sections. His thoughts are summarized below:

1. Recovery action 3.2.

The reviewer agrees that mowing has proven effective for maintaining power line populations, but is unclear how to effectively monitor these plants since they appear to persist for long periods under poor conditions via storage tubers and the plants become hard to find in denser vegetation. He mentioned the issue of whether the plants possess a true tap root, and references to a tap root should be qualified. He suggested monitoring sites such as the North Glades, with a census including subsurface test investigations to determine if plants are extirpated, or not.

2. Recovery criterion 5

The reviewer does not consider that the criterion “has been met” because the effort described, while sufficient in scope, had an extremely low success rate.

3. Taxonomic classification

Dr. Wurdack provided recommendations regarding the present placement of Euphorbiaceae. He corrected the spelling of Chapman’s first name (Alvan not Alvin); a common mistake in the literature. He was not certain that the nomenclature of *E. telephioides* is fully settled given that Bridges & Orzell (2002) did not treat other related species of *Euphorbia*, and the lectotype designated by them does not match the online type image collection at NY. He stated that the evolutionary relationships of *E. telephioides* remain to be tested, and if legitimately collected material is available, a phylogenetic placement can be easily obtained. He suggested that the inferences from Steinmann & Porter (2002) regarding *Euphorbia* subgenus *Esula* is very unnatural (para- and/or polyphyletic) therefore *E. telephioides* will need to be removed from sect. *Esula* sensu stricto.

4. Disease or predation.

The reviewer suggested evaluating this threat given that considerable efforts have been made to seek biocontrol agents for the weed *Euphorbia esula*, an invasive native to Eurasia, which is present in several states. To date, 15 different insects have been tested, approved and released for biological control of leafy spurge.

5. Recommendations for future actions.

He concurs that much basic research needs to be done, especially regarding the biology of the species, and that a fire regimen would provide best management for *E. telephioides*.

Dr. A. Johnson sent data for updating tables and maps according to their latest protocol. FNAI’s protocol consists of modifying their data by 1 km separation distance between occurrences of same species and multiple source points (or polys or lines) for same occurrence.

D. Response to Peer Review

Most of Dr. Tobe's comments were incorporated into the document. The only remark not used was his suggestion that *E. telephioides* is functionally andromonecious (as the article suggested for species of *Euphorbia*), because data is lacking for this species. Based on my observations in the field (as well as Dr. Wurdack, 2007, pers. comm.), the species appears to be functionally dioecious (Negrón – Ortiz, pers observations, 2007). More observations are needed.

Dr. Wurdack's peer review comments number two to five were incorporated into the document; as a result some sentences were deleted from the text. Comments related to Recovery action 3.2 were partially accepted. We don't consider relevant the issue of tap root as the plant does possess a tuberous root. Investigations related to the North Glade population are in progress.

Tables and maps were updated with the new data sent by Dr. Johnson.