# Pygmy fringe-tree
# *(Chionanthus pygmaeus)*

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


Photo: David Bender / USFWS

**U.S. Fish and Wildlife Service**
**Southeast Region**
**South Florida Ecological Services Field Office**
**Vero Beach, Florida**

# 5-YEAR REVIEW
# Pygmy fringe-tree *(Chionanthus pygmaeus)*

## I. GENERAL INFORMATION

**A. Methodology used to complete the review:** This review is based on monitoring reports, surveys, and other scientific information, augmented by conversations and comments from biologists familiar with the species. The review was conducted by a botanist and biologist in the South Florida Ecological Services Field Office of the U.S. Fish and Wildlife (Service). Literature and documents used for this review are on file at the South Florida Ecological Services Field Office. All recommendations resulting from this review are a result of thoroughly reviewing the best available scientific information on the pygmy fringe-tree. Public notice of this review was given in the *Federal Register* on April 9, 2009, with a 60-day public comment period (74 FR 16230). No part of the review was contracted to an outside party. Comments received and suggestions from peer reviewers were evaluated and incorporated as appropriate (see Appendix A).

**B. Reviewers**
**Lead Region:** Southeast Region, Kelly Bibb, 404-679-7132

**Lead Field Office:** David Bender and Marilyn Stoll, South Florida Ecological Services Field Office, 772-562-3909

**Cooperating Field Office:** Jacksonville Ecological Services Field Office, 904-232-2580

**C. Background**

**1. Federal Register Notice citation announcing initiation of this review:** April 9, 2009. 74 FR 16230

**2. Species status:** Uncertain (2009 Recovery Data Call). Florida Natural Areas Inventory has 46 extant occurrence records, 31 of which are protected on 15 managed areas. Fire suppression and habitat loss continue to be threats to occurrences on private land, except those owned by Archbold Biological Station and The Nature Conservancy. Inadequate prescribed fire implementation remains a significant threat at many managed sites. Most scrub sites are not burned frequently enough to maintain habitat and mechanical surrogates may not provide the same benefits as fire. Further loss of unprotected populations is likely as development continues on the Lake Wales Ridge. Unprotected habitat continues to be developed for agriculture, housing, and other uses. Because the status of only one of the 46 known occurrences was reported in 2009, not enough data are available to infer overall population trends for the past year. In addition, trends in threats are continuing at the same level. Therefore, the overall species status is uncertain.

**3. Recovery achieved:** 1 (0 to 25 percent of recovery objectives achieved).

**4. Listing history**
Original Listing
FR notice: 52 FR 2227
Date listed: January 21, 1987
Entity listed: Species
Classification: Endangered

**5. Associated rulemakings**: None

**6. Review History**:

5-year review November 6, 1991 (56 FR 56882). In this review, different species were simultaneously evaluated with no species-specific in-depth assessment of the five factors or threats as they pertained to the species' recovery. The notices summarily listed these species and stated that no changes in the designation of these species were warranted at that time. No changes were proposed for the status of pygmy fringe-tree**.**

South Florida Multi-Species Recovery Plan (MSRP) (May 18, 1999)

Recovery Data Call: 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, and 2009

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

2 (a species with a high degree of threat coupled with high recovery potential).

**8. Recovery Plan**

Name of plan: South Florida Multi-Species Recovery Plan (MSRP)
Date issued: May 18, 1999
Dates of previous revisions: Recovery plan for nineteen central Florida scrub and high pineland plants. 1996 (revised plan). Recovery plan for nineteen central Florida scrub and high pineland plants. 1990 (original plan).

## II. REVIEW ANALYSIS

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

The Endangered Species Act (ESA) defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate fish or wildlife. This definition limits listing DPS to only vertebrate species of fish and wildlife. Because the species under review is a plant, the DPS policy is not applicable.

## B. Recovery Criteria

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

**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.

Stabilization Criterion 2 and Reclassification Criterion 3. These criteria identify xeric oak scrub as the only habitat of pygmy fringe-tree. The species also occurs in other xeric upland habitats including sandhill, scrubby flatwoods, and xeric hammock. These habitats have different fire regimes, species composition, and vegetation structure.

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

**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**.

The stated Recovery Objective is to stabilize, then reclassify from endangered to threatened. Delisting criteria have not been developed.

Pygmy fringe-tree may be considered stabilized when:

1. Existing populations, within the historic range of pygmy fringe-tree are adequately protected from further habitat loss, degradation, and fire suppression.

This criterion has been partially met. Habitat conditions and necessary management to maintain habitat conditions to support pygmy fringe-tree have not been established.

Fifteen of 46 extant occurrences (33 percent) are located on private property (Florida Natural Areas Inventory [FNAI] 2009) where they have no protection from habitat destruction or modification and are unlikely to be managed with prescribed fire (Turner et al. 2006). Sixteen of 62 previously known occurrences (26 percent) are considered extirpated as of this review. All of the extirpated occurrences were on private property, with many destroyed since the pygmy fringe-tree was federally listed. See Table 1 and 2 for occurrence data.

Protection of pygmy fringe-tree is inadequate in the northern limit of its range in Lake, Orange, and Osceola Counties. The northernmost extant occurrence, located in Orange County at the Alice K. Strite Property (FNAI Element Occurrence Record [EOR] 66) is protected, but the last remaining extant occurrence in Lake County (EOR 56) is not protected. Only one of five known occurrences at the northern end of the species occurrence is currently protected. The species may be extirpated from Osceola County.

Protection of pygmy fringe-tree is inadequate in the southern limit of its range. Only one unprotected (EOR 27) and two protected (EOR 15 and 65) extant occurrences remain at the southern range limit. Three unprotected occurrences (EOR 9, 12, and 19) are considered extirpated. In addition, pygmy fringe-tree occurrences on both protected and unprotected sites throughout the species range are inadequately protected if active management to maintain habitat conditions for pygmy fringe-tree is not implemented. This criterion addresses factors A and E.

2. These sites are managed to maintain xeric oak scrub, sandhill, scrubby flatwoods, and xeric hammock to support pygmy fringe-tree.

This criterion has been partially met. Pygmy fringe-tree does not appear to be particularly sensitive to fire frequency and is known to persist at sites that have not experienced recent or frequent fires. However, fire is a natural disturbance that maintains scrub and sandhill habitat, and is necessary to manage these habitats. Fire management recommendations specific to pygmy fringe-tree have not been developed. Active management to maintain habitat is unlikely at unprotected sites on private land. Fire management may be inadequate even though sites are protected for conservation. There is a backlog of long-unburned habitat within conservation areas on the Lake Wales Ridge (The Nature Conservancy [TNC] 2010). Many sites are not burned frequently enough to maintain habitat, and mechanical vegetation treatments might not provide the same benefits as fire (Menges and Gordon 2010). This criterion addresses factor A.

Pygmy fringe-tree may be reclassified from endangered to threatened when:

1. Enough demographic data are available to determine the appropriate numbers of self-sustaining populations and sites needed to assure 95 percent probability of persistence for 100 years.

This criterion has not been met. No demographic studies have been conducted that are sufficient to produce a population viability analysis (PVA). Demographic data on this species is extremely limited. The number of populations needed to satisfy the stated probability of persistence criteria has yet to be established. This criterion addresses factor A.

2. These sites, within the historic range of pygmy fringe-tree, are adequately protected from further habitat loss, degradation, and fire suppression.

This criterion has been partially met, as explained above for stabilization criterion 1.

3. These sites are managed to maintain the seral stages of xeric oak scrub, sandhill, scrubby flatwoods, and xeric hammock to support pygmy fringe-tree.

This criterion has been partially met, as explained above for stabilization criterion 2.

4. Monitoring programs demonstrate that these sites support sufficient population

sizes, are distributed throughout the historic range, and are sexually or vegetatively reproducing at sufficient rates to maintain the population.

This criterion has not been met. The Service assumes that 'sufficient population size…reproducing at sufficient rates to maintain the population' refer to a number that would be arrived at through a PVA. Since no PVA has been conducted, these numbers are not known. Surveys have not been conducted in the past 10 years for most occurrences, and monitoring programs are in place at only a few sites. Only one of the ongoing programs is rigorous enough to obtain data required to develop a PVA. This criterion addresses factor A and E.

## C. Updated Information and Current Species Status

### 1. Biology and Habitat

Information on the biology and habitat of pygmy fringe-tree is provided in the South Florida Multi-Species Recovery Plan (MSRP) (Service 1999). Relevant biology and habitat information is summarized and updated in this review. The pygmy fringe-tree is perhaps the least-studied of the federally listed plant species of central Florida's endemic rich paleo-dune ecosystems. Research is needed to understand this species reproductive biology, demographic patterns, and habitat requirements.

Plant Description

Pygmy fringe-tree, a member of the Oleaceae (Olive family), is a shrub or small tree usually less than 1 meter (m) tall, but capable of reaching height of 4 m. Its leaves are simple, opposite, mostly 3 to 10 centimeters (cm) long, elliptical in shape, somewhat leathery, and lack stipules. The upper surface of the leaf is dark yellow-green, and smooth; the lower surface is paler and reticulate. The inflorescence, borne from the leaf axils, is a leafy-bracted panicle terminating in clusters of three to six flowers. The densely clustered white flowers are pleasingly fragrant. Each flower consists of a bell-shaped, four-lobed corolla. The fruit is an olive-like drupe 2.0 to 2.5 cm long, oval in shape, and turns purplish-brown when ripe (Ward 1979, Service 1999).

Current Distribution

The pygmy fringe-tree is endemic to central Florida and occurs in scrub, sandhill, xeric hammock (Christman 1988), scrubby flatwoods (Weekley 1999), and transition zones between these communities. It occurs primarily on yellow sand soils, but it also occurs at sites on white sand (Menges et al. 2007). It has been recorded on the Lake Wales and Winter Haven Ridge in Highlands, Polk, Lake, Orange, and Osceola Counties (FNAI 2009, Ward 1979). The Service (1999) falsely reported that pygmy fringe-tree had been extirpated from its historic habitat on the Mount Dora Ridge, but the species is extant at the Alice K. Strite property, managed by Orange County Environmental Protection Division (FNAI 2009).

**a. Abundance, population trends (e.g., increasing, decreasing, stable), demographic features (e.g., age structure, sex ratio, family size, birth rate, age at mortality, mortality rate), or demographic trends:**

Life History

The pygmy fringe-tree is a long-lived, woody perennial whose potential life-span is unknown, but is likely measured in decades. Data on the phenology of the pygmy fringe-tree are sparse. Leafing occurs mid-March and flowers are produced March through early April. Fruits mature in late summer, with seed dispersal in the fall (Gill and Pogge 1974, Ward 1979), but fruits may remain on the plants well into winter (Stout 1989). Little is known about pygmy fringe-tree seed dispersal (Stout 1989). In the wild, seeds have been observed to germinate in late summer (J. Stout, University of Central Florida, pers. comm. 2010). Pygmy fringe-tree can also reproduce clonally via shoots that arise from the plant's rootstock.

Reproduction

The reproductive biology of pygmy fringe-tree has not been thoroughly investigated. Pygmy fringe-tree reproduces most often by root sprouts and seedlings are rarely encountered (Service 1999). In the closely related *C. virginicus*, flowers appear to be functionally dioecious (individual plants are either male or female) (Gill and Pogge 1974), and female flowers have reduced, usually non-functional anthers (Goodrum and Halls 1961). Preliminary research by Weekley (1999) found that this is likely true for pygmy fringe-tree as well. Flowers of female plants had fully developed ovaries but anthers lacked pollen. Flowers of male plants produced pollen, but some also had ovaries and produced fruit. Based on these observations, Weekley (1999) suggested that the species is either polygamous (having a mix of male, female, and hermaphroditic flowers on separate plants) or polygamodioecious (having bisexual and male flowers on some plants, and bisexual and female flowers on others).

Weekley (1999) also remarked that identification of plant gender was difficult in the field due to the small size of the reproductive structures. Based on inspection of a small number of inflorescences in the lab (n=21) he observed that female inflorescences are (1) slightly shorter and less branched than males, and (2) have one-third as many flowers. Weekley (1999) cautioned that these results were preliminary due to the small sample size. In this study, sex ratios at the population level were heavily weighted toward males, with only 13.5 percent of individuals being female (averaged across two study populations).

Insect pollinators are important to dioecious plants because pollen must be transported from one plant to another to achieve fertilization. Wunderlin et al. (1980) observed honey bees (*Apis mellifera*) and Stout (pers. comm. 2010) observed bee flies (*Exprosopa* sp.) visiting flowers of pygmy-fringe trees;

both are likely pollinators. There is little data specific to the pollination biology of pygmy fringe-tree. Research is needed in this area.

Demographic Features and Trends

There have been no published demographic studies of pygmy fringe-tree, although there is a long-term monitoring project underway at TNC's Tiger Creek Preserve (Stout 1989). Recruitment from seed is apparently very rare for pygmy-fringe tree, but the limiting factor is not clear. Seed production is variable from year to year, but fruits are observed in most years. Stout (1989) reported an average of 13.85 fruits per plant for one study population, and counted as many as 33 fruits on some plants. Under nursery conditions, seed germination rates can be high (60 to 70 percent) (Service 1999). Thus, neither seed production nor seed viability would appear to be particularly limiting. Research is needed to determine the reason for low recruitment from seed in populations of pygmy fringe-tree.

The most commonly observed mode of reproduction is clonal stems which sprout from lateral roots. The rate of recruitment for clonal root sprouts reported by Stout (1989) was 18 new shoots in a study population of 111 plants over a 5-year period. New clonal shoots arise in February through March, and may grow to a height of 20 to 40 cm in the first growing season Stout (1989). Ward (1979) and Wunderlin et al. (1980) suggest that individuals may give rise to additional stems if branches become buried by blowing sands, but Stout (1989) saw no evidence to support this claim. All root sprouts he observed appeared to originate from the plant's rootstock. Most plants had one or two stems, and in rare cases as many as nine stems Stout (1989).

Stout (1989) monitored three study populations (n=111) at Tiger Creek Preserve from 1985 to 1989 and concluded that the populations appeared to be stable. He observed high annual survival rates for individuals, and small annual fluctuations in the number of clonal shoots per plant as new shoots emerged and others senesced. Stout (1989) observed very little damage to shoots due to herbivory, although white-tailed deer (*Odocoileus virginiana*) browsed a few of the plants in his study transects. Aside from that observation, the causes of stem mortality were not obvious (Stout 1989). In subsequent years, deer herbivory became more common at Tiger Creek Preserve. The larva of an unknown moth was also observed to cause considerable damage to young leaves in most years (Stout pers. comm. 2010).

Weekley (1999) monitored two small populations (n=19 plants for each) of pygmy fringe-tree on the Arbuckle tract of the Lake Wales Ridge State Forest (LWRSF) from 1997 through 1998. Survival rate for mature plants was 100 percent, although there was mortality of root sprouts, of which 12 percent died during the 2-year study period. Recruitment of new root sprouts was low, with only three new sprouts across both populations over the 2-year period. The mean number of stems per individual (main stem plus root sprouts) was

4.92 when averaged across both populations. The reproductive output was similar for both populations with regard to number of inflorescences produced per stem. During both years, all plants were fertile in one population, while more than half (10 of 19) of the plants remained sterile in the second population. There was a significant decrease in number of inflorescences across both populations in 1998 compared with 1997, with the loss of clonal stems accounting for the decrease (Weekley 1999).

Stout (1989) determined that mature trees may not flower every year and found significant variability between years in the number of trees that flowered. Weekley (1999) investigated fruit production in pygmy fringe-tree and found that only 9.0 percent of flowers resulted in a fruit. Bagged flowers yielded fruit at a rate of 16.2 percent, while the rate for unbagged flowers was 4.4 percent, suggesting that perhaps birds consumed some of the fruit. An unidentified weevil infested about 40 percent of the fruit that were produced, but the fate of these seeds was unclear because seeds were undamaged in some weevil-infested fruits. Stout (1989) also reported damage to fruits by an unidentified weevil, stating that weevils infested 100 percent of fruits that overwintered on the trees. More research is needed to identify this pest and its effect on pygmy fringe-tree seed production.

TNC (2002) monitored occurrences of pygmy fringe-tree at the Tiger Creek Preserve and Saddle Blanket Preserve from 1992 to 1998. The species was recorded in 13 separate locations at the two sites in 1992. In 1998, these locations were visited again, and the species was confirmed extant at 12 of the previous locations. The total number of plants was not estimated, but the areal extent of the occurrences was mapped. Based on these data, TNC (2002) considered the populations stable, and monitoring was discontinued at the two sites. Florida Division of Forestry (FDOF) reports that populations at the LWRSF appear stable. According to FDOF, the population estimate for the entire LWRSF was 366 individuals in 2008 (Clanton 2009). No demographic data was collected in either of these studies.

Fire Ecology

The fire ecology of pygmy fringe-tree is largely undocumented. The species appears to be less sensitive to fire frequency than some of the well-studied scrub endemic gap-specialist species, as evidenced by its persistence and production of fruit in long-unburned sites (Stout 1989). Plants have been observed to resprout from their rootstock post-fire (Small 1924, I. J. Stout, unpubl. manuscript 1993, Weekley 1999). Fire may provide indirect benefits to pygmy fringe-tree by reducing competition from other tree and shrub species. At sites described as overgrown, plants of the species have been described as ‘feeble’ looking (FNAI 2009). Fire appears to encourage root sprouting (Stout pers. comm. 2010). Scrub areas that lack an overstory canopy of trees support the largest number of plants (TNC 1986) and plants in these sites tend to produce more flowers (Stout 1989), suggesting that fire may be important to maintaining robust and vigorous populations. Because

the pygmy fringe-tree evolved in Florida's fire-maintained scrub and sandhill communities, it has most likely developed adaptations that allow it to persist, if not take advantage of, this periodic disturbance (Stout 1989, Weekley and Menges 2003). At the same time, areas with high fuel loads due to long-term fire-suppression, may burn extremely hot and this may cause mortality of pygmy fringe-tree in some cases (Stout pers. comm. 2010).

Abundance

Pygmy fringe-tree typically occurs in small numbers at any given site. Population sizes reported in FNAI (2009) range from 128 plants to a single individual. Most occurrences consist of fewer than 30 plants, and 11 sites in FNAI (2009) had fewer than 10 plants when they were last surveyed. Large populations have been documented at a few unprotected sites on private land, but most of the large populations are located in protected areas, including the FlamingoVillas unit of the LWRNWR, Carter Creek unit of the Lake Wales Ridge Wildlife and Environmental Area (LWRWEA), and the TNC Saddle Blanket and Tiger Creek Preserves (FNAI 2009).

Schultz et al. (1999) surveyed 29 sites targeted for conservation on the Lake Wales Ridge in Lake, Osceola, Polk and Highlands Counties in Florida. Pygmy fringe-tree occurred on 10 of the 29 sites (Schultz et al. 1999). To date, 7 of the 10 sites with pygmy fringe-tree occurrences identified by Schultz (et al. 1999) have been acquired for conservation.

Christman (1988) surveyed 216 scrubs in Polk and Highlands Counties, and found 39 separate scrub sites where pygmy fringe-tree was present. Christman (2006) re-surveyed 200 of the 216 scrubs in 2004 to 2005, but this study only reported data for a subset of species, and pygmy-fringe tree was not included. However, 43 of 216 scrubs (20 percent) surveyed were considered 'lost' by Christman (2006) because they had been mostly developed and were unlikely to support viable populations of rare endemic species. Ten of the 'lost scrubs' formerly supported pygmy fringe-tree.

Summary of Available Data Sources

Florida Natural Areas Inventory (FNAI 2009) has 63 Element Occurrence Records (EORs) for pygmy fringe-tree. One record (EOR 67_0) is a 'parent' record for EORs 67_8 and 67_40, and thus does not count toward the total number of actual occurrences. The Service considers the record for Highlands Hammock State Park (EOR 16) as erroneous because it is not supported by survey data, and more recent surveys (Christman 2006) did not locate the species within the Park. Stout (pers. comm. 2010) provided a record for an occurrence at Lake McLeod. This yields the 62 well-supported records for pygmy fringe-tree occurrences which we evaluated for this review. However, only six of these records have been updated by FNAI since 2000. Most occurrences were last surveyed in the 1980s or 1990s (FNAI 2009). Data from surveys conducted in 2008 and 2009 by Bok Tower Gardens provided

updates for 14 EORs, but surveys were incomplete at three sites due to lack of permission to access the interior sections of these properties (Bok Tower Gardens unpubl. data 2009). Occurrences on protected lands were assumed to be extant unless data indicated otherwise. All occurrences on protected lands are considered extant as of this review.

The status of each occurrence, as far as it is known, is summarized in Table 1.

Extirpated Occurrences

In total, 16 of 62 known pygmy fringe-tree occurrences (26 percent, all on unprotected private lands) are considered extirpated as of this review due to some combination of the factors below. A review of 2006-2008 aerial photographs indicated 8 of the 62 occurrences reported by FNAI (2009) had been destroyed by commercial development or by conversion to citrus groves. The species is likely extirpated at an additional five sites that have been 80 percent or more developed, with limited area of fire-suppressed xeric habitat remaining. Nine occurrences were also previously found within scrub areas that Christman (2006) has since classified as 'lost' because they had been mostly developed, and the Service considers these occurrences to be extirpated. Surveys conducted in 2008 and 2009 by Bok Tower Gardens (unpubl. data 2009) also independently confirmed that the species was extirpated at 5 of these 16 sites. Thus, approximately half (52 percent) of the known occurrences from private land have been extirpated by the combined threats of development, citrus production, and fire suppression.

Extant Occurrences

Extant occurrences comprise 46 of 62 known pygmy fringe-tree occurrences (74 percent) as of this review. Thirty-one of the 46 extant occurrences (67 percent) are protected on 15 managed conservation areas (FNAI 2009). Fifteen of 46 extant pygmy fringe-tree occurrences (33 percent) are located on unprotected, private land. The status of these 15 occurrences is uncertain, but the Service ranked these occurrences likely extant based on a review of 2006-2008 aerial photography that indicated suitable habitat was present in the area of the occurrence. Plants were observed as recently as 2008 at five of the sites (Bok Tower Gardens unpubl. data 2009). However, the Service notes that any of these sites may have been subsequently destroyed. Occurrences on unprotected private land have no protection from development and lack fire and other types of active management. Based on a review of 2006-2008 aerial photographs, 8 of the 15 extant occurrences on private land have been impacted to some degree by residential development, citrus production, or off-road vehicle (ORV) use.

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

The genetic structure of pygmy fringe tree populations has not been studied. Elfers (1989) conducted a phylogenetic study of *Chionanthus* in the Western hemisphere, including *C. pygmaeus* and *C. virginicus.* Hybrids between these two species are known to occur at a few sites, and these plants exhibit intermediate morphological traits and low pollen viability.

**c. Taxonomic classification or changes in nomenclature:**

None. The taxonomy of pygmy fringe-tree is reviewed in the MSRP (Service 1999). Elfers (1989) concluded that *C. pygmaeus* was a distinct species from *C. virginius.* The Integrated Taxonomic Information System (ITIS) recognizes *Chionanthus pygmaeus* Small as a valid taxon (ITIS 2010).

**d. Spatial distribution, trends in spatial distribution (e.g., increasingly fragmented, increased numbers of corridors), or historic range:**

The pygmy fringe-tree is endemic to central Florida and occurs in Highlands, Polk, Lake, Orange, and Osceola Counties (though it may be extirpated in Osceola County). Pygmy fringe-tree occurs west of Lake Apopka in Lake County, and on the Lake Wales Ridge, Winter Haven Ridge, and Mount Dora Ridge in Orange, Polk, and Highlands counties.

Wunderlin and Hansen (2008) Atlas of Florida vascular plants includes voucher specimens of *C. pygmaeus* collected from Seminole, Hillsborough, Manatee, Sarasota, and DeSoto Counties. Elfers (1989) determined that these records were based on misidentifications of *C. virginicus.*

Pygmy fringe-tree is similar to the widespread fringe-tree, *C. virginicus,* whose range extends into central Florida. The two *Chionanthus* species appear to hybridize in cultivation and in habitats other than scrub, though the two are distinct species (Elfers 1989).

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

A detailed discussion of the habitat of the pygmy fringe-tree is provided in the MSRP (Service 1999). Important features are summarized below.

Pygmy fringe-tree inhabits excessively drained sandy soils on the Lake Wales Ridge and the Mount Dora Ridge of central Florida. These undulating 'ridges' are ancient paleo-dune landforms with soils classified as Quartzipsamments. Pygmy fringe-tree occurs across a range of xeric habitats including sand pine (*Pinus clausa*) scrub, oak (*Quercus* spp.) scrub, scrubby flatwoods, sandhill, and hardwood hammocks. It may grow in association with myrtle oak (*Quercus myrtifolia*), Chapman oak (*Quercus chapmanii*),

and sand live oak (*Quercus geminata*), and form thickets along with these oaks and other shrubs such as *Lyonia* species, tallow wood (*Ximenia americana*), silk bay (*Persea humilis*), and scrub hickory (*Carya floridana*).

Sandhill and scrub are fire-dependent plant communities with differing species composition, structure, and fire regime. Sandhill (also known as high pine) is an open-canopied pine (*Pinus palustris* or *P. elliottii* var. *elliotii*) savanna with a sparse midstory of mostly deciduous oaks and a dense groundcover of grasses, forbs, and low shrubs. Wiregrass (*Aristida stricta* var. *beyrichiana*) is ecologically important as a fine fuel that facilitates frequent, low-intensity fires that carry through the forest floor. The natural fire frequency for sandhill is 1 to 5 years**.** Scrub is a community composed of evergreen shrubs, especially scrub oaks (*Quercus myrtifolia, Q. chapmanii,* and *Q. geminata*), with or without a sand pine (*P. clausa*) canopy. The oaks form a dense cover interspersed with patchy openings that consist of bare sand with a sparse cover of herbs. Oaks and other shrubs are periodically top-killed by fire. The natural fire frequency for scrub depends on the type of scrub; 5 to 40 years for sand pine scrub, 5 to 12 years for oak-hickory scrub, and 15 to 30 years for rosemary scrub**.** Land managers should aim to maintain these habitats as a diverse mosaic of sites with regard to time-since-fire based on these modal fire return intervals (Menges 2007).

Weekley (et al. 2008) estimated that approximately 85 percent of the xeric upland habitat on the Lake Wales Ridge was destroyed by 2006, mainly due to development (commercial and residential) agriculture (largely citrus), and cattle ranching. The few hundred acres of remaining sandhill on the Lake Wales Ridge are generally degraded from a history of logging, fragmentation, and fire-suppression (Peroni and Abrahamson 1986). By county, the greatest percent loss of habitat was in Lake County. By soil type, yellow sands areas suffered the greatest loss because they were favored for citrus production (Weekley et al. 2008).

Fire Suppression

Fire suppression started on a regional scale on the Lake Wales Ridge between 70 and 120 years ago. Long-unburned sandhill sites have dense shrub layers and slowly undergo succession to xeric oak hammock. Long-unburned oak scrub sites have dense shrub growth and litter accumulation. In both communities, gap specialists and shade-intolerant endemics tend to decline with time-since-fire (Menges 2007), but this relationship has yet to be established for pygmy fringe-tree. Research is needed to determine the effect of fire on vital rates (growth, survival, recruitment, and flower and fruit production) of the species.

Fire management may be inadequate even though sites are protected for conservation. There is a backlog of long-unburned habitat within conservation areas on the Lake Wales Ridge. For example, 16 of the 63 Lake Wales Ridge conservation sites have not received any fire management since

they were acquired. TNC's fire history database showed that in 2008 (the last year for which data analysis was completed) 123,484 acres are within the recommended fire return interval and 38,359 acres are outside the recommended fire return interval (TNC 2010). The fire management condition of most privately owned parcels is unknown. Fire management is highly unlikely on private properties unless they are designated conservation areas. Undeveloped private sites are likely to be overgrown due to fire suppression.

Acquisition History

In the mid-1980s there were only four large conservation sites on the Lake Wales Ridge. In 1991, the state launched a $3 billion land acquisition program, Preservation 2000. Its successor, Florida Forever, was launched 10 years later. Since 1992, the State of Florida has spent more than $68 million to acquire nearly 24,710 acres of land on the Lake Wales Ridge, with plans to acquire an additional 24,710 acres (FDEP 2008). In 1990, the Service established the first national wildlife refuge in the country designated primarily for plants, the LWRNWR. Particularly problematic and challenging have been the acquisition projects known as megaparcel sites, which include extensive areas of scrub habitat that were previously subdivided and sold to numerous lot owners. To date over 14,000 such lots have been purchased for conservation within the megaparcel sites, in a checkerboard manner, but nearly as many lots have yet to be purchased (Turner et al. 2006).

Land acquisition to date has placed nearly half (21,597 acres, or 48.9 percent) of the remaining 44,157 acres of scrub and sandhill habitat on the Lake Wales Ridge within protected areas. However, many species are likely to remain at great risk of extinction despite ongoing conservation efforts, primarily because even the most optimistic acquisition scenarios will protect only 7.5 percent of the original Lake Wales Ridge habitats, most having already been destroyed (Turner et al. 2006). The protected fragments are surrounded by residential neighborhoods, citrus groves, and other anthropogenic habitats.

A recent analysis of Florida scrub conservation progress based on land acquisition included pygmy fringe-tree among the 36 rare species of the Lake Wales Ridge. Turner et al. (2006) calculated protection indices for each species based on number of locations, extent of occurrence, and area of occupancy. The overall protection index of approximately 1.7 identified pygmy fringe-tree as 'endangered' in their ranking system (Turner et al. 2006).

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

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

Historic habitat loss on the Lake Wales Ridge is discussed above and in the MSRP (Service 1999). Current threats to the habitat of pygmy fringe-tree include habitat loss from development, habitat modification due to long-term fire suppression, and damage from ORVs. On private lands, pygmy fringe-tree is threatened primarily by habitat loss to development, and secondarily by fire suppression. Fifteen of 46 extant occurrences (33 percent) are located on private properties where they have no protection from development and prescribed fire is unlikely (FNAI 2009). The status of many of these occurrences is uncertain. They could be destroyed at any time by the landowners. On public lands, pygmy fringe-tree is protected from habitat destruction due to development, but could be threatened by inadequate fire management (fire too infrequent or non-existent) at some sites. These threats are discussed below.

Development

Habitat destruction from development continues to occur and development pressure remains high. Increasing pressure from population growth is likely to result in further loss of Lake Wales Ridge habitats. Zwick and Carr (2006) analyzed existing land use and landscape patterns to identify areas most likely to be developed to accommodate a growing human population (e.g., not a wetland, near major roads, near other development, or on the coast and thus desirable) and estimated relative losses to agriculture, open space, and conservation to other land uses. They predicted central Florida will experience "explosive" growth, with continuous urban development from Ocala to Sebring, the area encompassing nearly the entire range of pygmy fringe-tree. They estimated 2.7 million acres of native habitat and 630,000 acres of land currently under consideration for conservation purchase will be lost. Also of significance, they state that "more than two million acres within one mile of existing conservation lands will be converted to an urban use, complicating management and isolating some conservation holdings in a sea of urbanization" (Zwick and Carr 2006). Overall, loss of habitat to development will likely continue in central Florida, eliminating many unprotected populations and reducing the area of suitable habitat for pygmy fringe-tree.

Fire Suppression and Inadequate Fire Management

As discussed above, the fire ecology of pygmy fringe-tree is not well-researched. It appears to be less sensitive to fire frequency than some of the well-studied scrub endemic gap-specialist species (Stout 1989). However, fire may provide indirect benefits to pygmy fringe-tree by reducing competition from other tree and shrub species. Fire may be important to maintaining populations that are robust and vigorous rather than feeble or declining. Due to the extent of residential and agricultural development on the Lake Wales Ridge, fire has all but disappeared from the region as a widespread, natural phenomenon. Because there is little chance of prescribed fire being implemented to maintain habitat suitability in fragments on private land, imperiled species on unprotected sites will almost certainly disappear over time (Turner et al. 2006). As discussed previously in this review, fire management is not adequate to maintain scrub and sandhill habitats at some conservation areas. Furthermore, some land managers now utilize mechanical treatments along with fire (or as a surrogate for fire), and the long-term effects of these novel disturbances are unknown (Menges and Gordon 2010).

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

The Final Rule that listed pygmy fringe-tree as endangered identified it as vulnerable to over-collection as ornamental for the horticulture trade (52 FR 2227). However, there is no evidence to suggest that overutilization for commercial, recreational, scientific, or educational purposes has occurred, and the Service does not consider overutilization to be a threat to pygmy fringe-tree at this time.

**c. Disease or predation:**

Pygmy fringe-tree seeds are lost to a variety of animals. Small mammals appear to partially remove the seed coat and consume the seed (Service 1999). Many animals, including white-tailed deer, turkey (*Meleagris gallopavo*) and quail (*Colinus virginianus*), consume the seed of *C. virginicus* (Gill and Pogge 1974, Goodrum and Halls 1961), and may also consume seeds of pygmy fringe-tree (Stout 1989).

Both Stout (1989) and Weekley (1999) documented infestation of pygmy fringe-tree fruits by an unidentified weevil. While infestation rates of fruit were sometimes high (40 percent or more) the fate of these seeds was unclear because seeds were undamaged in some weevil-infested fruits.

Stout (1989; pers. comm. 2010) indicates that white-tailed deer frequently browse the new leaves and shoots of pygmy fringe-tree. The larva of an unknown moth was also observed to cause considerable damage to young leaves in most years (Stout pers. comm. 2010). More research is needed to

identify these pests and evaluate their potential as threats to pygmy fringe-tree.

**d. Inadequacy of existing regulatory mechanisms:**

Pygmy fringe-tree is listed as endangered by the State of Florida on the Regulated Plant Index (Florida Department of Agriculture and Consumer Services Rule 5B-40). This law regulates the taking, transport, and sale of listed plants. It does not prohibit private property owners from destroying populations of listed plants on their property nor require landowners to manage habitats to maintain populations. Existing Federal and State regulations prohibit the removal or destruction of listed plant species on public lands. However, such regulations afford no protection to listed plants on private lands. The ESA only protects populations from disturbances on Federal lands or when a 'Federal nexus' is involved for other lands, meaning any action that is authorized (e.g. permitted), funded or carried out by a Federal agency. In addition, State regulations are less stringent than Federal regulations toward land management practices that may adversely affect populations of listed plants on private land. Existing regulatory mechanisms are inadequate to protect pygmy fringe-tree.

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

Off-road vehicles (ORVs)

ORV impacts have been observed on natural areas on the Lake Wales Ridge (Schultz et al. 1999) and throughout central Florida. ORVs crush, uproot and tear plants as they drive over them. Roads can also facilitate and intensify illegal collection of rare plants and serve as corridors for exotic plant invasion. There is insufficient data to accurately assess the level of threat to pygmy fringe-tree posed by ORV disturbance. The threat is likely to be more significant at unprotected sites.

Non-native plant species

Bahia grass (*Paspalum notatum*), cogon grass (*Imperata cylindrica*), and Natal grass (*Rhynchelytrum repens*) may colonize scrub habitats and have negative effects through direct competition and by altering fire behavior. These species are reported at numerous sites supporting pygmy fringe-tree (Schultz et al. 1999). Mechanical treatments of vegetation, such as roller-chopping, logging, or mowing have been linked to increased presence of these and other invasive species, primarily due to the high degree of soil disturbance associated with the heavy machinery that are used to apply these treatments (Menges and Gordon 2010).

Ex situ measures

Standard *ex situ* conservation measures for pygmy fringe-tree are incomplete. Bok Tower Gardens maintains living plants as part of the Center for Plant Conservation National Collection of Endangered Species, but the 66 plants in the living collection are all from the same wild population at Saddle Blanket Preserve. More populations should be represented in order to capture an adequate sample of the genetic diversity of the species. Approximately 4,000 seeds collected from the same population between 1994 to 2008 are in ambient storage at Bok Tower Gardens, but some of these seeds are already more than 20 years old (Bok Tower Gardens, unpubl. data, 2009). Since the longevity of these seeds in unknown, germination trials should be conducted on stored seed to determine long-term viability of stored seed. Once the longevity of seeds is determined, banks should be restocked with fresh seeds at appropriate intervals to ensure viability of banked seed. Collection of samples from additional populations should be conducted to increase the total genetic diversity represented in storage.

## D. Synthesis

Pygmy fringe-tree is a long-lived shrub or small tree endemic to the Lake Wales Ridge, Winter Haven Ridge, and Mount Dora Ridge in central Florida. Unlike several other listed species endemic to this same region, the pygmy fringe-tree has received little attention from the research community. Aspects of the species biology and ecology are not well understood, including its breeding system, fire ecology, seed dispersal, and barriers to seedling recruitment. A long-term (10 plus years) demographic study is underway at Tiger Creek Preserve, but results are forthcoming. Shorter-term (2 years) demographic studies suggest high survivorship of individual plants with variable rates of stem mortality, clonal recruitment, flowering, and fruiting. Seedlings have rarely been documented in the wild, suggesting that recruitment from seed is a limiting factor. Fruits are taken by birds and mammalian herbivores. Fruits can be heavily infested with an unidentified weevil, but its overall effect on seed production and viability are undetermined.

Pygmy fringe-tree occurs in scrub, sandhill, hardwood hammocks, and ecotones between these communities. These habitats have been severely impacted by development, citrus production, and fire suppression. Weekley (et al. 2008) estimated that 85 percent of these habitats on the Lake Wales Ridge were destroyed by 2006. Observations suggest that pygmy fringe-tree may be somewhat tolerant of the overgrown conditions that have been promoted by decades of fire suppression in central Florida. The species resprouts readily post-fire. Flowering is more abundant and plants appear more vigorous in sites that have an open canopy, suggesting that fire may be useful in reducing competition from surrounding vegetation. Research is needed to better understand the response of pygmy fringe-tree to fire.

None of the recovery criteria for pygmy fringe-tree identified in the MSRP have been achieved to date. Sixteen of the 62 known occurrences (26 percent) are believed to be extirpated as of this review. Only one of three known occurrences in Lake and Orange Counties is protected at this northern limit of the species range, and pygmy fringe-tree may be completely extirpated in Osceola County. Fifteen of the 46 extant occurrences (33

percent) are located on private property where they have no protection and are threatened by habitat loss, primarily to citrus and residential development. Thirty-one of the 46 extant occurrences are protected within 15 conservation areas.

Research is needed to better under the species' ecology and to develop management guidelines. Survey and monitoring programs are limited and no PVA for pygmy fringe-tree has been produced to date. Destruction and modification of xeric upland habitat in central Florida is ongoing. For these reasons, pygmy fringe-tree continues to meet the definition of endangered under the ESA.

## III. RESULTS

A. **Recommended Classification**:

**_X_ No change is needed**

## IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- Acquire private sites with existing populations from willing sellers.
- Work with State, Federal, and non-profit partners to ensure adequate fire and invasive species management is achieved at sites that support pygmy fringe-tree
- Work with private landowners to conserve extant populations.
- Continue demographic monitoring at Tiger Creek Preserve and produce a PVA if data are adequate to do so.
- Initiate detailed demographic monitoring (Level 3 monitoring *sensu* Menges and Gordon 1996) at multiple sites throughout the species range.
- Conduct a prescribed fire in one or more of the study populations at Tiger Creek Preserve to better understand the response of pygmy fringe-tree and to integrate fire management into population viability models
- Determine the overall level of threat posed by seed predators, especially the unidentified weevil.
- Determine the overall level of threat to pygmy fringe-tree posed by leaf herbivory by the unknown moth larva and by white-tailed deer.
- Conduct basic research on the breeding system and pollination biology of pygmy fringe-tree
- Determine limiting factors and preferred microsites for seedling recruitment
- Initiate studies to determine the genetic structure of pymgy fringe-tree populations throughout the specie's range.
- Ensure representation of pygmy-fringe tree at the National Center for Genetic Resources Preservation in Fort Collins, Colorado.
- Strengthen *ex situ* conservation measures by including a wider sample (from numerous sites across the species range) of this species at Bok Tower Gardens, in both stored seed and living collections.
- Conduct germination trials on stored seed to determine their long-term viability.
- Develop a standard methodology for monitoring pygmy fringe-tree on conservation lands

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Table 1. Summary of the Status of known pygmy fringe-tree occurrences (* Christman 2006, ** Bok Tower Gardens unpubl. data 2009, all other data from FNAI 2009).

| FNAI EOR # | County | Site Name | Alternate Site Name | Managing Agency | Status | Last Observation | | | Comment |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Citation | Year | Population Estimate | |
| **Protected Occurrences** | | | | | | | | | |
| 66 | Orange | Alice K. Strite Property | | Orange County Env. Protection Div. | extant | FNAI 2009 | 2007 | 20 or less | |
| 28 | Polk | Allen David Broussard Catfish Creek Preserve State Park | Catfish Creek* | FDEP | extant | FNAI 2009 | 1987 | none | |
| 29 | Polk | Allen David Broussard Catfish Creek Preserve State Park | Lake Pierce East, Heperides* | FDEP | extant | FNAI 2009 | 1988 | none | |
| 16 | Highlands | Highlands Hammock State Park | Highlands Hammock Scrub*, Sebring Southgate Scrub*, Sebring Wolf Lake Scrub* | FDEP | record in error | FNAI 2009 | 1966 | none | record not supported by recent surveys |
| 47 | Highlands | LWRNWR - Carter Creek | Lake Lucas North* | USFWS | extant | FNAI 2009 | 1987 | none | |
| 64 | Highlands | LWRNWR - Carter Creek | | USFWS | extant | FNAI 2009 | 2000 | 20 to 250 | |
| 7 | Highlands | LWRNWR - Flamingo Villas | | USFWS | extant | FNAI 2009 | 1962 | none | |
| 36 | Highlands | LWRNWR - Flamingo Villas | Flamingo Villa* | USFWS | extant | FNAI 2009 | 2000 | 80 to several hundred | |
| 52 | Highlands | LWRNWR - Flamingo Villas | U.S. 98 South* | USFWS | extant | FNAI 2009 | 1987 | none | |
| none | Polk | LWRNWR - Lake McLeod | | USFWS | extant | Stout pers. comm. 2010 | 2010 | 4 | |
| 57 | Polk | LWRSF - Walk-In-Water | | FDOF | extant | FNAI 2009 | 1998 | 4 | |
| 11 | Polk | LWRSF - Walk-In-Water | Tiger Creek Hammock Scrub* | FDOF | extant | FNAI 2009 | 1983 | several | |
| 61 | Polk | LWRSF - Lake Arbuckle | | FDOF | extant | FNAI 2009 | 1989 | 10 or less | |
| 62 | Polk | LWRSF - Lake Arbuckle | | FDOF | extant | FNAI 2009 | 1989 | 10 or less | |
| 63 | Polk | LWRSF - Lake Arbuckle | | FDOF | extant | FNAI 2009 | 1989 | 2 to 20 | |
| 21 | Highlands | LWRWEA - Carter Creek | Grassy Pond NE scrub* | FFWCC | extant | FNAI 2009 | 1998 | 3 | |
| 22 | Highlands | LWRWEA - Carter Creek | Grassy Pond NW scrub* | FFWCC | extant | FNAI 2009 | 1986 | several | |

Table 1. (continued)

| FNAI EOR # | County | Site Name | Alternate Site Name | Managing Agency | Status | Last Observation | | | Comment |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Citation | Year | Population Estimate | |
| 48 | Highlands | LWRWEA - Carter Creek | Carter Creek West*, Bonnet Lake East*, Grassy Pond NE* | FFWCC | extant | FNAI 2009 | 2000 | several hundred to several thousand | |
| 15 | Highlands | LWRWEA - Gould Road | | FFWCC | extant | FNAI 2009 | 2000 | 8 | |
| 65 | Highlands | LWRWEA - Gould Road | | FFWCC | extant | FNAI 2009 | 2000 | none | |
| 23 | Highlands | LWRWEA - Silver Lake | Avon Park Airport Scrub* | FFWCC | extant | FNAI 2009 | 1986 | several | |
| 59 | Highlands | LWRWEA - Silver Lake | County Line East* | FFWCC | extant | FNAI 2009 | 1998 | 1 | |
| 14 | Polk | Saddle Blanket Scrub Preserve | Saddle Blanket Lakes* | TNC | extant | FNAI 2009 | 1998 | 1,000 or more | |
| 58 | Polk | Sun Ray Scrub Preserve | Sun Ray Water Tower Scrub* | TNC | extant | FNAI 2009 | 1998 | "common" | |
| 30 | Polk | Tiger Creek Preserve | | TNC | extant | FNAI 2009 | 1987 | 1 | |
| 31 | Polk | Tiger Creek Preserve | Possum Scrub Trail* | TNC | extant | FNAI 2009 | 1987 | 40 | |
| 32 | Polk | Tiger Creek Preserve | | TNC | extant | FNAI 2009 | 1987 | 50 or more | |
| 33 | Polk | Tiger Creek Preserve | | TNC | extant | FNAI 2009 | 1987 | 50 or more | |
| 34 | Polk | Tiger Creek Preserve | | TNC | extant | FNAI 2009 | 1989 | 100 or more | |
| 35 | Polk | Tiger Creek Preserve | | TNC | extant | FNAI 2009 | 1987 | 200 | |
| 37 | Polk | Upper Lake Marion Creek Watershed | Horse Creek Scrub** | SWFWMD | extant | BTG 2009 | 2008 | 1 | |
| 39 | Polk | Upper Lakes Basin Watershed | Snell Creek* | SFWMD | extant | FNAI 2009 | 1998 | 35 or more | no resurvey in 2005* |
| **Unprotected Occurrences** | | | | | | | | | |
| 19 | Highlands | private property | Bear Hollow Scrub* | n/a | extirpated | BTG 2009 | 2008 | 0 | citrus groves** |
| 44 | Highlands | private property | Bonnet Lake South Scrub* | n/a | extirpated | FNAI 2009 | 1987 | none | 'lost scrub'* |
| 38 | Highlands | private property | College Scrub* | n/a | extirpated | FNAI 2009 | 1987 | none | 'lost scrub'* |
| 24 | Polk | private property | Eagle Lake Scrub*, ** | n/a | extirpated | FNAI 2009 | 1998 | "locally abundant" | 'lost scrub'* |
| 56 | Lake | private property | Ferndale Ridge** | n/a | extant | BTG 2009 | 2009 | 10 to 50 | |
| 50 | Highlands | private property | Grampus scrub* | n/a | extirpated | FNAI 2009 | 1987 | none | 'lost scrub'* |
| 51 | Highlands | private property | Hartt Road West A Scrub* | n/a | extant | FNAI 2009 | 1987 | none | |
| 42 | Osceola | private property | Heidrich Scrub*, ** | n/a | extirpated | FNAI 2009 | 1987 | none | 'lost scrub'* |

Table 1. (continued)

| FNAI EOR # | County | Site Name | Alternate Site Name | Managing Agency | Status | Last Observation | | | Comment |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Citation | Year | Population Estimate | |
| 27 | Highlands | private property | Hendrie Ranch North Scrub* | n/a | extant | FNAI 2009 | 1986 | none | |
| 60 | Polk | private property | Hesperides East Scrub** | n/a | extant | BTG 2009 | 2009 | 8 | incomplete survey** |
| 41 | Highlands | private property | Lake Chilton* | n/a | extant | FNAI 2009 | 1998 | 5 | |
| 4 | Polk | private property | Lake Livingston West Chionanthus* | n/a | extant | FNAI 2009 | 1980 | 128 | |
| 67_40 | Polk | private property | Lake Marion West *, ** | n/a | extirpated | BTG 2009 | 2009 | 0 | developed** |
| 67_8 | Polk | private property | Lake Marion** | n/a | extant | FNAI 2009 | 2009 | 5 | |
| 46 | Highlands | private property | Lake Sebring South Scrub* | n/a | extirpated | FNAI 2009 | 1987 | none | 'lost scrub'* |
| 45 | Highlands | private property | Little Red Water Lake Scrub* | n/a | extirpated | FNAI 2009 | 1986 | none | 'lost scrub'* |
| 25 | Highlands | private property | Moon Ranch Road* | n/a | extirpated | FNAI 2009 | 1979 | "single clump" | |
| 53 | Highlands | private property | Moon Ranch Road* | n/a | extant | FNAI 2009 | 1987 | none | |
| 12 | Highlands | private property | Red Beach Lake East* | n/a | extirpated | FNAI 2009 | 1986 | "locally common" | |
| 6 | Highlands | private property | Sebring Southgate Scrub* | n/a | extirpated | BTG 2009 | 2009 | 0 | developed** |
| 54 | Highlands | private property | Sebring Triangle Northeast* | n/a | extant | BTG 2009 | 2008 | 3 | |
| 5 | Highlands | private property | Sebring Triangle Scrub* | n/a | extant | BTG 2009 | 2009 | 3 | across road from EOR 5** |
| 17 | Highlands | private property | Sun and Lakes Holiday Inn Scrub* | n/a | extant | FNAI 2009 | 1983 | 2 | |
| 55 | Polk | private property | Sun Ray Motel and Restaurant* | n/a | extant | FNAI 2009 | 1987 | none | |
| 18 | Polk | private property | Sun Ray Northeast* | n/a | extirpated | FNAI 2009 | 1983 | 3 | |
| 3 | Polk | private property | Sun Ray South Scrub* | n/a | extant | FNAI 2009 | 1983 | 20 | |
| 20 | Polk | private property | Sun Ray Water Tower Scrub* | n/a | extant | FNAI 2009 | 1983 | 60 | |
| 10 | Polk | private property | Surveyors Scrub* | n/a | extant | FNAI 2009 | 1990 | "common" | |
| 1 | Lake | private property | | n/a | extirpated | BTG 2009 | 2009 | 0 | record was single plant in roadside hedge** |
| 2 | Osceola | private property | | n/a | extirpated | BTG 2009 | 2009 | 0 | golf course** |
| 9 | Highlands | private property | | n/a | extirpated | FNAI 2009 | 1960 | none | |

Table 2. Summary of pygmy fringe-tree occurrences by county (data from Christman 2006, Bok Tower Gardens unpubl. data 2009, FNAI 2009).

| County | Extant | | Extirpated | | Total |
|---|---|---|---|---|---|
| | Protected | Unprotected | Protected | Unprotected | |
| Lake | 0 | 1 | 0 | 1 | 2 |
| Orange | 1 | 0 | 0 | 0 | 1 |
| Osceola | 0 | 0 | 0 | 2 | 2 |
| Polk | 18 | 7 | 0 | 3 | 28 |
| Highlands | 12 | 7 | 0 | 10 | 29 |
| **Total** | **31** | **15** | **0** | **16** | **62** |

**U.S. FISH AND WILDLIFE SERVICE**
**5-YEAR REVIEW OF PYGMY FRINGE-TREE (*Chionanthus pygmaeus*)**

Current Classification Endangered
Recommendation resulting from the 5-Year Review

__X__ **No change is needed**

Review Conducted By David Bender (Botanist) and Marilyn Stoll (Biologist)

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve Robert Price (For Paula Souza) Date 7/6/2010

*The lead Field Office must ensure that other offices within the range of the species have been provided adequate opportunity to review and comment prior to the review's completion. The lead field office should document this coordination in the agency record.*

REGIONAL OFFICE APPROVAL:

*The Regional Director or the Assistant Regional Director, if authority has been delegated to the Assistant Regional Director, must sign all 5-year reviews.*

Acting
**Lead Regional Director, Fish and Wildlife Service**

Approve Aaron L Valenta Date 8-17-10

**Summary of peer review for the 5-year review of pygmy fringe-tree (*Chionanthus pygmaeus*)**

**A. Peer Review Method:** The Service conducted peer review. Three peer reviewers were selected by the Service. Individual responses were requested and received from each of the peer reviewers.

**B. Peer Review Charge:** See attached guidance.

**C. Summary of Peer Review Comments/Report:** The reviewers found the 5-year review comprehensive and all agreed with the main conclusions of the review.

A reviewer stated that he had recently seen numerous pygmy fringe-tree seedlings at the Flamingo Villas unit of the LWRNWR. The Service doubts the accuracy of this observation, while there are many small pygmy fringe-trees at Flamingo Villas, verifiable seedlings are rarely documented. The reviewer most likely observed post-fire resprouting or clonal shoots. This highlights one of the difficulties with observations of this species – discerning seedlings from vegetative root sprouts.

A second reviewer pointed out that pygmy fringe-tree was not extirpated from the Mount Dora Ridge as stated in the review. He noted that the species is extant at the Alice K. Strite property (managed by Orange County Environmental Protection Division), which is located on the Mount Dora Ridge. The reviewer provided a record for an additional protected site that supports pygmy fringe-tree. The reviewer also provided observations about the timing of seed germination in the wild, stating that he observed germination in late summer. The reviewer provided additional data on pollinator, herbivory, and fire response observations, all of which were incorporated into the review.

A third reviewer stated that the uncertain record for Highlands Hammock State Park may actually represent an extirpation of the species at Highlands Hammock. While the Service agrees this may be true, the original record cannot be verified, thus it is not possible to conclude that an extirpation occurred. The reviewer took issue with the statement that pygmy fringe-tree produced sprouts from lateral roots. In fact, sprouts are observed to form around the base of the plant, not from widely spreading lateral roots. This misstatement was removed from the review.

This reviewer identified sections that needed clarification, especially with regard to the status of the species in Osceola County. While the site of one of two occurrences in Osceola County has been surveyed and no plants of pygmy fringe-tree were observed, a second site in Osceola could not be fully surveyed due to lack of access. The unsurveyed site may still support the species, thus the status is uncertain.

**D. Response to Peer Review:** Based on the reviewers' comments, changes were made to the document as described above.

## Guidance for Peer Reviewers of Five-Year Status Reviews

U.S. Fish and Wildlife Service, South Florida Ecological Services Office

March 27, 2009

As a peer reviewer, you are asked to adhere to the following guidance to ensure your review complies with U.S. Fish and Wildlife Service (Service) policy.

Peer reviewers should:

1. Review all materials provided by the Service.

2. Identify, review, and provide other relevant data apparently not used by the Service.

3. Not provide recommendations on the Endangered Species Act classification (e.g., endangered, threatened) of the species.

4. Provide written comments on:
   - Validity of any models, data, or analyses used or relied on in the review.
   - Adequacy of the data (e.g., are the data sufficient to support the biological conclusions reached). If data are inadequate, identify additional data or studies that are needed to adequately justify biological conclusions.
   - Oversights, omissions, and inconsistencies.
   - Reasonableness of judgments made from the scientific evidence.
   - Scientific uncertainties by ensuring that they are clearly identified and characterized, and that potential implications of uncertainties for the technical conclusions drawn are clear.
   - Strengths and limitation of the overall product.

5. Keep in mind the requirement that the Service must use the best available scientific data in determining the species' status. This does not mean the Service must have statistically significant data on population trends or data from all known populations.

All peer reviews and comments will be public documents and portions may be incorporated verbatim into the Service's final decision document with appropriate credit given to the author of the review.

Questions regarding this guidance, the peer review process, or other aspects of the Service's recovery planning process should be referred to Dana Hartley, Endangered Species Supervisor, South Florida Ecological Services Office, at 772-562-3909, extension 236, email: Dana_Hartley@fws.gov.