Pinguicula ionantha

Godfrey's Butterwort

5-Year Review:
Summary and Evaluation

Godfrey's butterwort in Apalachicola National Forest, Liberty County, Florida. *Photos by Vivian Negrón-Ortiz*

U.S. Fish and Wildlife Service
Southeast Region
Florida Ecological Services
Panama City, Florida

June 2023

5-YEAR REVIEW
Pinguicula ionantha (Godfrey's butterwort)

GENERAL INFORMATION

Current Classification: Threatened

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Reviewers:

Lead Regional Office: Southeast Region, Carrie Straight, (404) 679-7226

Lead Field Office: Florida Ecological Services Field Office, Dr. Vivian Negrón-Ortiz, 850-358-3503

Technical review:

Florida Natural Inventories (FNAI): Amy Jenkins (ajenkins@fnai.fsu.edu), Hanna Rosner-Katz (hrosnerkatz@fnai.fsu.edu), and Jenna Annis (jannis@fnai.fsu.edu): provided comments about management and information for Table 1.

U.S. Forest Service: Jason Drake, jason.drake@usda.gov: reviewed and updated objective 1b.

Florida Forest Service: Michael R. Jenkins, Michael.Jenkins@FDACS.gov: reviewed the Franklin County counts from Tables 1 & 2.

Service: Melanie J. Kaeser, melanie_kaeser@fws.gov: provided count information for Table 1.

Date of original listing: July 12, 1993 (58 FR 37432-37443)

Methodology used to complete the review: In accordance with section 4(c)(2) of the Endangered Species Act of 1973, as amended (Act), the purpose of a status review is to assess each threatened species or endangered species to determine whether its status has changed and if it should be classified differently or removed from the Lists of Threatened and Endangered Wildlife and Plants (50 CFR 424.11). The U.S. Fish and Wildlife Service (Service) evaluated the biology, habitat, and threats of the *Pinguicula ionantha* (Godfrey's butterwort) to inform this status review.

We announced initiation of this review in the Federal Register on May 13, 2022 (87 FR 29364). We received no public comments during the 60-day open comment period; however, key stakeholders were contacted while the review was being written, and various documents and communications were received. This review was accomplished using information obtained from the Recovery Plan of June 1994, 5-yr reviews of 2009 & 2018, unpublished field survey results, reports of current research projects, peer reviewed scientific publications, unpublished field observations by Service, State and other experienced biologists, and personal communications.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. All peer review comments were incorporated as appropriate.

FR Notice citation announcing the species is under active review: 87 FR 29364 (May 13, 2022): Endangered and threatened wildlife and plants: 5-Year Status Review of 35 Southeastern Species.

Species' Recovery Priority Number at start of 5-year review (48 FR 43098): 8C
The Godfrey's butterwort is a species with a moderate the degree of threat, it is in conflict with development, and has high recovery potential.

Review History:
Previous 5-year Review: April 15, 2018 (stable), July 7, 2009 (status: unknown); both reviews recommended no change in status (Service 2018, 2009).

Recovery Data Calls: 2013-2016: Each year, the Service reviews and updates listed species information for inclusion in the required Recovery Report to Congress. Through 2013, we did a recovery data call that included status recommendations such as "Unknown" for this plant. We continued to show that species status recommendation in 2016.

REVIEW ANALYSIS

Listed Entity: Species

Taxonomy and nomenclature
Pinguicula L., the second most diverse genus of the carnivorous Lentibulariaceae, is monophyletic and composed of about 85 to 100 species native to Europe, North America, Asia, and South and Central Americas (Cieslax et al. 2005, Degtjareva et al. 2006). Six species can be found in Florida, of which *P. ionantha* Godfrey is endemic (Gluch 2005). All Florida species belong to the section or subgenus Isoloba (Fleischmann 2021, Cieslax et al. 2005, Gluch 2005). We are not aware of any changes to the taxonomy of this entity, and it is still considered valid by the Service and the scientific community.

Distinct Population Segment (DPS) (61 FR 4722)
The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment of any species of vertebrate wildlife. This definition limits listing of a DPS to only vertebrate species. Because the species under review is a not a vertebrate, the DPS policy does not apply.

Recovery Criteria

Recovery Plan
Recovery plans are not regulatory documents and intended to provide guidance to the Service, States, and other partners on methods of minimizing threats to listed species and on criteria that may be used to determine when recovery is achieved. If the recovery criteria defined in the plan are still valid, meeting recovery criteria can indicate that the species no longer requires protections under the Act. However, when recommending whether a listed species should be delisted, the Service must apply the factors in section 4(a) of the Act (84 FR 45020).

The recovery plan of 22 June 1994, "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)" includes a recovery objective for delisting the species as well as the criterion. The Service considers these criteria are appropriate and relevant; however, no criteria have been met.

The delisting criterion for *P. ionantha* identified in the recovery plan is to adequately protect and manage 15 populations distributed throughout the species' historical range for 10 years. This recovery criterion addresses factors A and B. Factor C is not relevant to *P. ionantha*. Factors D and E, although relevant to this species, were not addressed by the Recovery Plan. *This criterion is ongoing,* has been partially met and is detailed below.

This plant, based on best available information, is known from six counties with the populations primarily found on Apalachicola National Forest (ANF) and Tate's Hell State Forest (THSF) (Table 1, Fig. 1). Five permanent plots in ANF are currently being monitored by the U.S. Forest Service (USFS) and FNAI staff (H. Rosner-Katz, FNAI, 3/17/2023, pers. comm.). Similarly, Tyndall Air Force Base (Tyndall, 13 sites; M. Kaeser, FWS, 3/07/2023, pers. comm.) and Lathrop Bayou (LB, 5 permanent plots within one occurrence; H. Rosner-Katz, FNAI, 3/17/2023, pers. comm.) currently conducts annual surveys for 14 sites with *P. ionantha*. Their findings over the past five years are that the numbers of *P. ionantha* are stable or increasing. Apart from ANF, LB and Tyndall, no long-term monitoring or annual surveys have been initiated for other *P. ionantha* sites.

1. The recovery objectives for this species are to guarantee that the populations in ANF are secure, and to conserve the species outside ANF by protecting habitat through land acquisition, and changes in management practices on government land, rights-of way (ROW), and private land.

    a. Populations in ANF. To date, the ANF has 44 unique Element Occurrences (EOs) many of which contain multiple subpopulations within 1 km of each other (FNAI, 2023). These EOs are considered protected.

    b. Management: Prescribed fire is a regular management activity conducted by the USFS. From 2018-2022, the USFS burned annually on average 90,768 acres, with an average of 27,839 of those acres burned in the growing season. The 44 EOs on the ANF span 53 prescribed fire burn units with an average of 2.6 years since previous burn and an average fire return interval of 3.9 years over the past 21 years. The average fire return interval of 3.9 years is consistent with Kesler et al. (2008); the study suggested that more frequent prescribed burning (ie, <4-year return fire interval) will have a positive impact on population growth due to increases in fecundity and growth. Many of the populations of *P. ionantha* occur in the wettest portion of the wet prairie which is often not burned when water levels are high (A. Jenkins, FNAI, 5/11/2023, pers. comm.). In addition to wet prairies, *P. ionantha* grows within swamp edges where fire does not always reach (J. Annis, FNAI, 5/11/2023, pers. comm.). All prescribed fire data presented here was updated 3/2023 from ANF Fire staff records. (J. Drake, USFS, 4/03/2023, pers. comm.).

Manage rights-of-way, is an ongoing action for ANF as *P. ionantha* is found scattered along the ANF right-of-way (ROW) on State Route (SR) 65 (Mittiga et al. 2017). The Florida Department of Transportation (FDOT) routinely consults with the Service under section 7 of the Act on all major road construction activities and protective measures are normally established. Management of ROW outside SR 65 has not been initiated.

c. Secure protection outside ANF is an ongoing action. To date, about 27 extant protected populations have been secured (Table 1). Management plans have been developed and implemented for six locations outside ANF (Table 1)

Table 1. Locations, number of occurrences, and estimated plant counts (EPC) outside Apalachicola National Forest.

County	Location	Occurrences	Pre-2018 EPC	2022 EPC	2023 EPC
Bay	Lathrop Bayou	1	482	*658	*1854
Bay	Tyndall Air Force Base	4	2,191	994	◆3,212
Franklin	Apalachicola River Wildlife and Environmental Area	6	392	unknown	unknown
Franklin	Box-R Wildlife Management Area	1 (potentially extirpated)	none	unknown	unknown
Franklin	Tate's Hell State Forest	14	unknown	▲35	unknown
Gulf	Apalachicola River Wildlife and Environmental Area	1	unknown	unknown	unknown
Gulf	St. Joseph Bay State Buffer Preserve	2	7,324	♣1,173	unknown

* = counts are within 5 selected permanent plots, not a population estimate of the whole population.

◆ = includes the translocated population and permanent plots so not a direct count.

▲ = counts are for one site conducted in 2020 (Molano-Flores et al. 2021)

♣ = counts are for two sites conducted in 2020 (Molano-Flores et al. 2021)

Biology and Habitat Summary

The previous 5-year reviews in 2009 and 2018 provide details on the life history and biology that will not be repeated here unless there is new information to indicate changes in our interpretation or past information or if context is needed for discussions below (Service 2009 and 2018; https://ecos.fws.gov/ecp/species/6805).

Abundance, population trends

Pinguicula ionantha is a carnivorous plant located in Bay, Calhoun, Franklin, Gulf, Liberty, and Wakulla counties, Florida (Fig. 1). At present, we have 93 EOs that are within 1 km of each other (FNAI 2023). Several EOs appear to be extirpated due to loss of habitat and/or habitat modification (e.g., Wakulla County site), or uncertain (e.g., Calhoun County site) (Figs. 1 and 2; Table 2). We have some population trends for ANF, Tyndall, and LB, all based on surveys

conducted for the past three to five years (Table 1). Trends for other sites are needed as plant presence/absence or density estimates have been based on infrequent visits (Service 2018).

Demographic studies indicated that *P. ionantha* is a fire-dependent species (Kesler et al. 2008). Lack of fire, or reduced fire frequency, and subsequent growth of shrubs and saplings in the understory, reduces *P. ionantha* abundance. Where proper fire management is implemented (optimal fire return interval is <4 years), it stimulates the emergence of individuals and maintains healthy, stable populations and ecosystems (e.g., populations at ANF, St. Joseph Bay State Buffer Preserve [SJBSBP], and THSF).

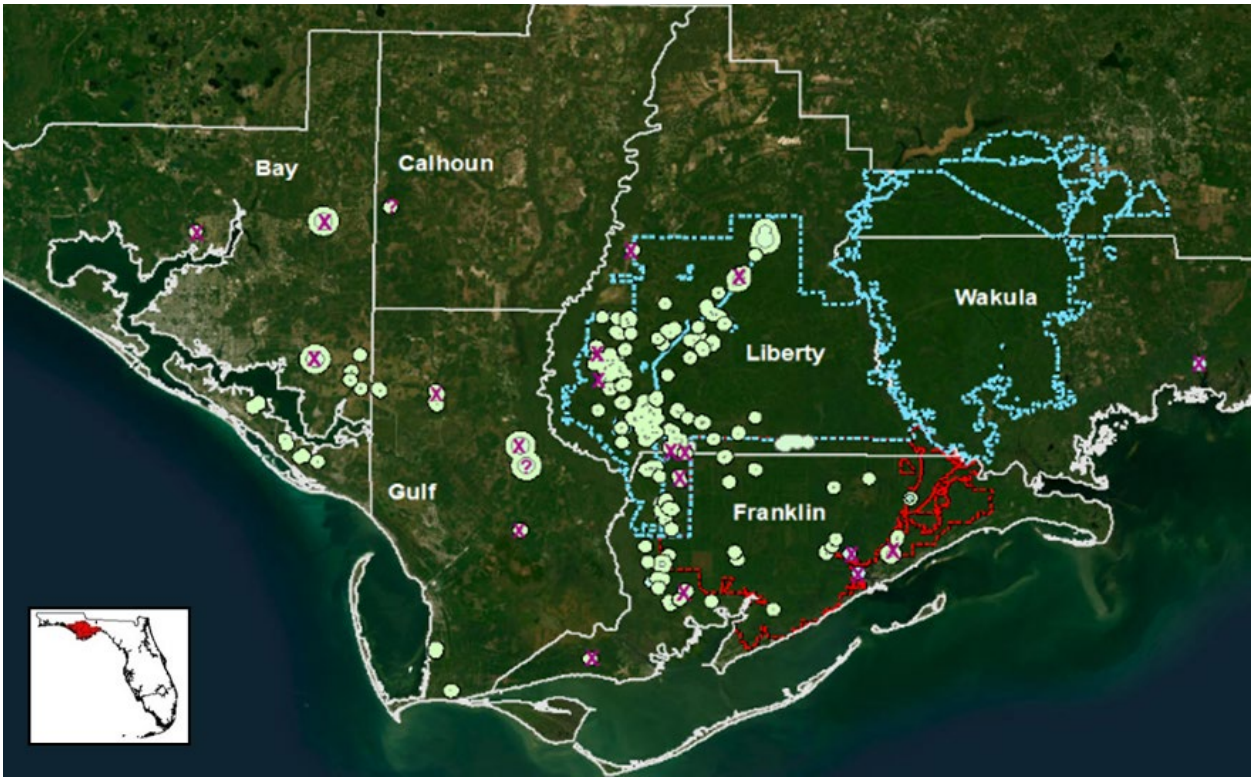

Figure 1. Map of Florida (inset) showing the counties and locations of *P. ionantha*. Occurrences with an X indicate that populations or plants were not found during most recent surveys. Occurrences with a ? indicate unknown and possibly extirpated occurrences. Public lands: Tate's Hell State Forest (red), Apalachicola National Forest (blue).

Table 2. Estimated number of Element Occurrences (EOs) on public and private lands, and the numbers assumed/estimated to be extirpated.

County	Number of EOs on Public Lands	Number of EOs on Private Land	Number of Occurrences Assumed to be Extirpated
Bay	5	5	‡5
Calhoun	0	1	‡1
Franklin	22	1	‡1
Gulf	3	4	?4
Liberty and Franklin	*24	0	╪7
Wakulla	0	1	‡1
Total	54	12	▼19

*Apalachicola National Forest; ▼EOs were last seen from 2004-2009 (Service 2018); **?** unknown status; ╪EOs assumed extirpated on public lands; ‡EOs assumed extirpated on private lands

Genetics

The relatively low level of genetic diversity associated with this species is a concern as it may impair fitness and evolutionary adaptability in a changing environment (Zaya et. al 2016). There has been no new information related to the genetics of the species since the last 5-year review (Service 2018, Zaya et al. 2017).

Threats (Five-Factor Analysis) Summary

The status of a species is determined from an assessment of factors specified in section 4 (a)(1) of the Act, including:

Factor 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 *P. ionantha* and remains the primary threat to this plant. Commercial timber production, urban development, and fire management and exclusion of fire have resulted in ecosystem degradation. Development pressures in the Florida panhandle are severe; urbanized land is projected to increase two-fold in the near future. Informal and formal consultations resulted in minimizing impacts from road projects, specifically for SR 65 in the ANF.

Privately owned forests managed (clearcutting, mechanical site preparation, and bedding) for commercial timber production, is a primary threat to *P. ionantha* habitat. The paper mill located in Panama City (Bay County) that received timber from thousands of acres of pine plantation was closed in June 2022. In 2013, the Timberland Company sold more than 380,000 acres of its land to AgReserves, Inc., a tax-paying company owned by the Mormon Church. Timberlands sold in Bay, Calhoun, Franklin, Gadsden, Gulf, Jefferson, Leon, Liberty and Wakulla counties contain six documented *P. ionantha* EOs. Within Bay and Gulf County, AgReserves, Inc. has converted timberlands into pasture lands for cattle, which include five EOs; therefore, the status of those EOs is unknown.

Many *P. ionantha* locations are found along U.S. and state roads. Construction activity may

directly kill individual plants or convert habitat to unsuitable habitat; widening may convert native habitat to managed roadside; and culvert modification may change drainage patterns, which may change seasonal hydrology. Evidence suggests past road improvements have resulted in localized extirpation of Godfrey's butterwort in ANF (Kesler and Trusty 2008). Therefore, because they contribute to habitat loss, road widening, and new roads continue to pose a threat to the species.

Applying prescribed fire more frequently (i.e., < 4-year fire return interval) is expected to have a positive impact on population growth due to increases in fecundity and growth (Service 2018). Increased fire return intervals and fire exclusion continues to threaten to *P. ionantha* habitat and population numbers. Lack of appropriate fire management, and subsequent growth of shrubs (particularly encroachment of *Cyrilla racemiflora* L., commonly known as swamp titi) and saplings in the understory, in addition to shading by planted pines, inhibits emergence of this species (Kesler et al. 2008). Declining fire frequency reduces *P. ionantha* abundance in areas where it was previously observed in large quantities. Emergence of this species is prolific within one year of the fire event (Kesler and Trusty 2008).

Factor B. Overutilization for commercial, recreational, scientific, or educational purposes: The magnitude of this threat has been reduced but poaching on a smaller scale remains a problem. Butterworts are widely cultivated, grown, and sold by plant enthusiasts and nurseries. *Pinguicula ionantha* was overcollected in the 1970s (58 FR 37440). Many thousands of plants propagated by tissue culture were sold without permits, but the plant is no longer commercially available in large quantities.

In order to implement conservation measures and regulations, the Service granted a permit (TE061005-1) to the International Carnivorous Plant Society (ICPS) in 2003, which allows the society to sell seeds of endangered and threatened carnivorous plants only within the U.S[1]. In addition, an annual report is required stipulating their selling activities. Collecting guidelines for live plants are being developed by the ICPS: they do not recommend collecting live plants unless it is for scientific purposes such as herbaria, the species has never been introduced to cultivation, or because a variant (a taxon exhibiting slight differences in form). The Nurseries Stock Restrictions manual summarizes the entry status of regulated plant material capable of or intended for propagation (USDA 2008).

Factor C. Disease or predation: There is no evidence to suggest that this factor is a threat.

Factor D. Inadequacy of existing regulatory mechanisms:

Seeds: The seeds of threatened species are not regulated if they come from cultivated plants (7 CFR 319.37.2, U.S. Department of Agriculture [USDA] 2008). Since *P. ionantha* is a threatened species, growers can obtain and sell seeds from other growers.

Private Land: Several populations of *P. ionantha* occur on private timberland and ROWs not funded or maintained with federal funds. While the Act requires Federal agencies to carry out programs for the conservation of endangered and threatened species, no such programs are

[1] http://www.carnivorousplants.org/statements/seedcollect.html

stipulated for *private landowners.* The Act does not provide for protection of plants on private lands as long as the activity is permissible under state/local laws. The State requires permission of private landowners for collecting of State-listed plants from their property.

State and County protection: *Pinguicula ionantha* is protected under Florida State Law, chapter 581.185: Preservation of native flora of Florida[2], which includes preventions of take, transport, and the sale of the plants listed under the State Law. Bay County code of ordinance (Bay County 2023; chapter 19- Environmental Standards[3]) provides restrictions, constraints, and requirements to protect and preserve designated habitat conservation areas for rare, threatened, or endangered species (section 1907) and wetlands (section 1909). Calhoun, Gulf, Franklin, and Liberty counties do not have such regulations.

Factor E. Other natural or manmade factors affecting its continued existence:

Herbicide. We no longer consider this a threat because mowing is now the common practice to maintain ROWs in Florida. Franklin and Liberty counties allow only "selective application or spot treatment" due to impacts concerning the ANF and waters within Apalachicola Bay and River basin.

Saltwater inundation caused by hurricanes. In 2005, Kesler and Trusty (2008) observed that the number of *P. ionantha* plants decreased from about 100 to two individuals in a population in Franklin County, after flooding and inundation with saltwater from Hurricane Francis in 2004.

Sea Level Rise (SLR, Fig. 2). Using the NOAA Sea Level Rise and Coastal Flooding Impacts Viewer[4], the projection indicates potential impacts to 9 to 11 known *P. ionantha* EOs by intrusion of saltwater beginning at one-foot SLR. Within this scenario, ANF will be least affected and most important location for the survival of this species.

[2] https://www.flsenate.gov/Laws/Statutes/2013/581.185
[3] https://www.baycountyfl.gov/DocumentCenter/View/611/Chapter-19-Land-Development-Regulations-2013-PDF
[4] https://coast.noaa.gov/slr/

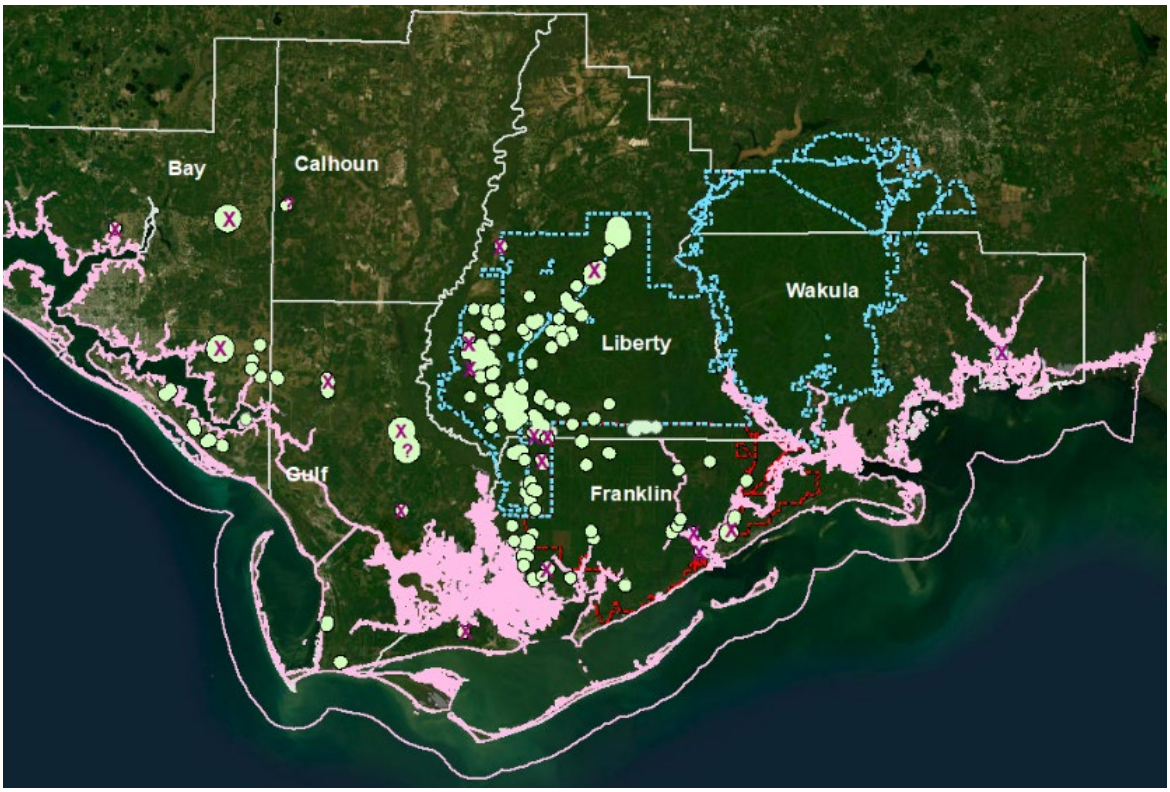

Figure 2. Sea level rise projections at 1ft (pink color). Impacts: Bay County: Lathrop Bayou population, and 1-2 Elemental Occurrences at Tyndall Air Force Base; Franklin County: 6- 7 Elemental Occurrences; Gulf County: 1 Elemental Occurrence.

Synthesis

Godfrey's butterwort is a carnivorous plant presently located in six Florida panhandle counties. The species' populations primarily found on Apalachicola National Forest and Tate's Hell State Forest. There are approximately 54 occurrences on public lands and an additional 12 on private lands. Most of the *P. ionantha* populations have less than 1000 individuals, therefore any impact to existing populations (specifically sites outside the Apalachicola National Forest) could cause loss of these populations. It is extremely vulnerable because of its limited range, its specific habitat preference, and rarity of habitat. The main threat to this species is habitat loss through urbanization, other land use changes, and incompatible land management practices (e.g., fire suppression, lengthening time between prescribed fire, mowing). No problems have been detected with disease and predation. But sea level rise and coastal flooding impacts to this species are emergent threats that demand immediate planning actions. About 22 (26%) of the 93 known EOs appear to be extirpated due to development and/or habitat modification. Sea level rise at 1ft predicts potential impacts to another 9 to 11 documented EOs, increasing total extirpations to an estimated 34%. Surveys, finding new sites away from the coast as well as drafting a reintroduction/translocation plan are important actions for this species. Current monitoring data indicate an increase in the number of plants in Apalachicola National Forest, Lathrop Bayou, and Tyndall. *Pinguicula ionantha* continues to meet the definition of a threatened species as a result of the habitat destruction or modification due to urban development, fire exclusion and sea level rise.

RECOMMENDATIONS FOR FUTURE ACTIVITIES

1. Address the delisting criterion, 'adequately protect and manage 15 populations distributed throughout the species' historical range for 10 years'. This study could use the sites from Kesler and Trusty (2008) established plots.
    a. Continue the long-term monitoring ANF, Tyndall, and LB sites, and set up plots in SJSBP and THSF.
    b. As sea levels rise, seawater intrusion increases in duration, frequency, and spatial extent. To assess the effect of salinity on *P. ionantha*, sites where intrusion of salt water occurs should be considered for long-term monitoring.
2. Conduct surveys/inventories on potentially new sites.
    a. Calhoun and Wakulla counties. Historically, *P. ionantha* was documented in Wakulla and Calhoun. Therefore, surveys are strongly recommended in these counties within the habitat types or vegetation communities associated with the species.
    b. This action can include the use of aerials and species distribution modeling methods to initially determine potential sites, with subsequent field inventory of the site using a consistent, statistically valid, repeatable inventory method. If new populations are discovered, protection should be sought.
3. Manage ROW

    Continue fostering conservation practices for utility and highway ROWs with the Forest Service, FDOT, and USFWS; a ROW Best Management Practices plan should be developed and implemented.
4. Develop a stand-alone plan for managing listed plants at the ANF and THSF, and integrate it to their Management Plan.
5. Since habitat loss and degradation are leading causes of endangerment for *P. ionantha*, designating habitat that is critical for survival and recovery is recommended.
6. Complete a comprehensive census (e.g., the total number of individuals, number of flowering vs. non-flowering plants, and whether seedling recruitment is occurring) throughout the present distribution including all the historical locations to determine the species' status.
7. Establish (or continue) frequent growing-season fire regimes (i.e., <4 yr interval) on selected areas such as ANF, SJBSBP, THSF, and Tyndall to maintain optimal conditions of *P. ionantha* populations. Re-visit sites shortly after a burn event, and mark and count individual plants. Populations tend to be more evident after a fire event.
8. Garden propagation and reintroduction. An *ex-situ* plant collection should be actively pursued and implemented with a botanical garden.

    In February 2016, 238 plants were removed from the F-22 Munitions Storage Complex on Tyndall AFB prior to new bunker construction and relocated to a wet prairie at Tyndall AFB. Post-transplanting monitoring is ongoing since 2017.

9. Investigate if there is a soil seed bank persistence of *P. ionantha* seeds throughout the species geographic range. The following studies were inconclusive; therefore, better observations are needed to clarify the type of seed bank present in this species. A few points from these studies:
    - The lack of a persistent seed bank was suggested by Kesler et al. (2008), as they observed a 430-day delay in the population growth response of *P. ionantha* to dormant season fires.
    - Molano-Flores et al. (2014) found the emergence of two *Pinguicula* seedlings from soil collections, but identification to species was not possible because seedlings did not reach the flowering stage during the study.
    - Molano-Flores et al. (2021) subsequent seed germination and seed bank studies on multiple populations of *P. ionantha*, *P. lutea*, and *P. planifolia* suggest:
        - transplanting seedlings is not recommended unless moisture and humidity are retained, and root disturbance is minimized.
        - sprouted seeds of *P. ionantha* with emerging cotyledon, previously soaked in gibberellic acid solution and rinsed with distilled water, were transplanted to a soilless mixture but did not survive
        - 6 months post-collection seeds kept in cold storage for about 5 months have high potential for germination
        - viability potential of seeds in the seed burial trail was at least 2 months (that was the duration of their study)
10. Conduct population biology studies at ANF

    Survey for seedling recruitment and survival of tagged individuals (plant height and reproduction) for a period of 3-5 years in or near roadside populations of SR 65 and pinelands.

REFERENCES

Bay County. 2023. Bay County, Florida, Code of Ordinances. http://www.municode.com/Resources/gateway.asp?pid=14281&sid=9. Municode.com. Accessed May 2023.

Cieslax, J.S. Polepalli, A. White, K. Müller, T. Borsch, W. Barthlott, J. Steiger, A. Marchant, and L. Legendre. 2005. Phylogenetic analysis of *Pinguicula* (Lentibulariaceae): Chloroplast DNA sequences and morphology support several geographically distinct radiations. American J. Bot. 92: 1723–1736.

Degtjareva, G.V, S.J. Casper, F.H. Hellwig, A.R. Schmidt, J. Steiger, and D.D. Sokoloff. 2006. Morphology and nrITS Phylogeny of the genus *Pinguicula* L. (Lentibulariaceae), with special attention to embryo evolution. Plant Biol. 8: 778–790.

Fleischmann, A. 2021. On the infrageneric classification of *Pinguicula*. Carniv. Pl. Newslett. 50: 174-188.

Florida Natural Areas Inventory (FNAI). 2023. *Pinguicula ionantha* element occurrence record. Tallahassee, FL.

Gluch, O. 2005. *Pinguicula* species (Lentibulariaceae) from the southeastern United States: observations of different habitats in Florida. Acta Bot. Gallica. 152: 197-204.

Kesler, H.C. and J.L. Trusty. 2008. Godfrey's butterwort (*Pinguicula ionantha*) conservation action plan. Folius Consulting. Camp Hill, AL.

Kesler, H.C., J.L. Trusty, S.M. Hermann, and C. Guyer. 2008. Demographic responses of *Pinguicula ionantha* to prescribed fire: a regression-design LTRE approach. Oecologia 156: 545-557.

Mittiga, M., V. Negron-Ortiz, and J. Tupy. 2017. Managing Florida Department of Transportation Rights-of-Way to Benefit Federally Protected and Native Plants, and Pollinators. 14 pp. https://ecos.fws.gov/ServCat/DownloadFile/233649

Molano-Flores, B., J. Coons, J. Annis, J. O'Brien, M.A. Feist, J. Koontz, J.D. Maruszak, and J. Menglekoch. 2014. Seed ecology and population genetic studies for *Pinguicula ionantha* (Godfrey's butterwort) and *Scutellaria floridana* (Florida scullcap). Illinois Natural History Survey Technical Report Technical Report 2014 (27). Prairie Research Institute, Illinois Natural History Survey, Champaign, Illinois. 66 pp. + Appendices (122 pp).

Molano-Flores, B., S. Johnson, and J. Coons. 2021. Ex- and in-situ seed germination, seedling survivorship, and seed bank studies for *Pinguicula ionantha* populations and its congeners. 31 pp.

U.S. Department of Agriculture (USDA). 2008. Nursery stock restrictions manual. p. 289.

U.S. Fish and Wildlife Service (Service). 1994. Recovery 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). Southeast Region, Atlanta, Georgia. 38pp.

U.S. Fish and Wildlife Service (Service). 2008. *Pinguicula ionantha* Godfrey's butterwort 5-Year Review: Summary and Evaluation. Panama City Field Office, Panama City, Florida. 24 pp .https://ecos.fws.gov/ecp/species/6805.

U.S. Fish and Wildlife Service (Service). 2018. *Pinguicula ionantha* Godfrey's butterwort 5-Year Review: Summary and Evaluation. Panama City Field Office, Panama City, Florida. 26 pp. https://ecos.fws.gov/ecp/species/6805.

U.S. Fish and Wildlife Service (Service). 2022. Endangered and threatened wildlife and plants: 5-Year Status Review of 35 Southeastern Species. Federal Register 87: 29364-29366.

Zaya, D.N., B. Molano-Flores, M.A. Feist, J.A Koontz, and J. Coons. 2017. Assessing genetic diversity for the USA endemic carnivorous plant *Pinguicula ionantha* R.K. Godfrey (Lentibulariaceae). Conserv. Genetics 18: 171-180.

RESULTS / SIGNATURES

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Pinguicula ionantha* (Godfrey's butterwort)

Current Classification: Endangered.

Recommendation resulting from the 5-Year Review:

_____ Uplist to Endangered
_____ Delist
_X_ No change needed

Review Conducted By: Dr. Vivian Negrón-Ortiz, Florida Ecological Services Field Office.

FIELD OFFICE APPROVAL:

Division Manager, Classification and Recovery, Florida Ecological Services Field Office, Fish and Wildlife Service

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Approve _____

** Since 2014, in the Florida Ecological Services Field Office, the Classification and Recovery Division Manager has delegated authority to approve 5-year reviews that do not recommend a status change.*