## Draft Recovery Plan for Whorled Sunflower (*Helianthus verticillatus*)



Photo of whorled sunflower courtesy of Dr. Jennifer Mandel.

Prepared by

M. Scott Wiggers U.S. Fish and Wildlife Service Ecological Services Jackson, Mississippi

For

South Atlantic–Gulf and Mississippi Basin Regions U.S. Fish and Wildlife Service Atlanta, Georgia

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Date:

# DRAFT RECOVERY PLAN FOR WHORLED SUNFLOWER (Helianthus verticillatus)

This Draft Recovery Plan describes the criteria for determining when the whorled sunflower should be considered for reclassification from endangered to threatened status as well as the criteria for determining when whorled sunflower should be considered for removal from the *List of Endangered and Threatened Plants* (50 CFR 17.12). It also lists site-specific actions that will be necessary to meet those criteria and estimates the time and cost for implementing recovery actions. Brief descriptions of the species' status, habitat requirements, and limiting factors are included. A detailed discussion of these and other topics pertinent to the recovery of whorled sunflower can be found in the Species Status Assessment (SSA) and the Draft Recovery Implementation Strategy (RIS). These supplemental documents are available at *https://ecos.fws.gov/*. The RIS and SSA are finalized separately from the Recovery Plan and will be updated on a routine basis.

Current Species Status: Whorled sunflower (Helianthus verticillatus) was federally listed as endangered on August 1, 2014 (79 FR 44712) and is also state listed as endangered by two of the five states where the species is found: Georgia and Tennessee. Whorled sunflower is known from nine populations, eight of which are extant. This species has a disjunct distribution with two populations found near the state line in Cherokee County, Alabama, and adjacent Floyd County, Georgia; two populations in Marshall County, Mississippi; one population in Benton County, Mississippi; one population each in Tennessee's Madison and McNairy counties; and one population in Franklin County, Virginia. Whorled sunflower was also historically known from Chester County, Tennessee, but the original population discovered in the 1800s has not been relocated and is presumed extirpated. On August 26, 2014, four units were designated as critical habitat for whorled sunflower in Cherokee County, Alabama, Floyd County, Georgia, and Madison and McNairy Counties, Tennessee (79 FR 50990). Whorled sunflower was not known from Mississippi or Virginia when critical habitat was designated; therefore, no critical habitat units were designated in these states. Critical habitat units are located within two U.S. Environmental Protection Agency (USEPA 2013) level IV ecoregions: Southern Shale Valleys (in Alabama and Georgia) and Northern Hilly Gulf Coastal Plain (in Tennessee). Mississippi's populations occur in the Loess Plains ecoregion while Virginia's only known population is in the Southern Crystalline Ridges and Mountains ecoregion. Whorled sunflower is assigned a recovery priority number of 5, which indicates the species faces a high degree of threat with a low recovery potential (48 FR 43098, 48 FR 51985).

*Habitat Requirements and Limiting Factors:* Whorled sunflower is found in moist-soiled sites with little to no overstory canopy present. Historically, the species is thought to have occurred in prairies and open woodlands, but today, while some subpopulations and populations are found in remnant prairies and woodlands, most populations are found in degraded sites along agricultural fields and road, railroad, or utility rights-of-way.

Most populations of whorled sunflower are small, isolated, and have little potential for natural recolonization should they be extirpated due to restricted habitat availability and limited connectivity among populations. The greatest threats to this species are loss or degradation of habitat and problems inherent in small, isolated populations. The main causes for habitat degradation or loss include incompatible mechanical and chemical vegetation management for

industrial forestry, right-of-way maintenance, and agriculture, and shading and competition from successional vegetation. Small, isolated populations could reduce reproductive fitness by limiting the availability of compatible mates or increasing inbreeding, which may contribute to reduced seed production and viability, thereby limiting the species' ability to recover from habitat loss or degradation. The isolated nature of known populations combined with the species' dependence on remnant prairies and prairie-like habitats limit its potential to recolonize sites should local extirpations occur (79 FR 44712).

**Recovery Strategy:** The recovery strategy for whorled sunflower is to ensure the long-term viability of the species through cooperative habitat conservation, restoration, and management where extant occurrences are present; research to assess reproductive biology and ecological factors regulating population growth and stressors; surveys to locate additional populations; *ex situ* (off-site) conservation and, if necessary, population augmentation and introduction; and increased public awareness and engagement. Recovery will require partnerships and collaboration among various stakeholders. Conservation and management agreements with federal and state departments of transportation, local road departments, railroad authorities, and utility companies and authorities are needed to ensure protection and necessary management of populations within rights-of-way. Collaboration among federal and state conservation agencies, non-governmental conservation organizations, and private landowners and land managers is needed to protect populations on private lands and manage habitat on conservation lands.

Recovery of whorled sunflower, a species currently known from only eight extant occurrences and one extirpated population, is founded upon the ecological principles of resilience, representation, and redundancy (Shaffer and Stein 2000, Wolf et al. 2015). In the case of whorled sunflower, representation necessitates that populations throughout the entire range of this species are a priority for conservation; thus, the entirety of the species' range is important for its recovery, as is a broad range of the species' genetic variability (within each population and across its geographic range). Redundancy requires that multiple populations should be conserved within each region in which the species occurs. Accordingly, multiple populations need to be conserved in each of the four ecoregions where the species occurs. The Northern Hilly Gulf Coastal Plain and Southern Shale Valleys ecoregions are each home to two populations while three small populations have been documented from the Loess Plains ecoregion and one population occurs in the Southern Crystalline Ridges and Mountains ecoregion. Without continued discoveries of new populations, the limited population redundancy in these ecoregions may require secure *ex situ* safeguarding and cultivation and *in situ* population establishment and augmentation to achieve recovery. However, reliance on ex situ conservation without concomitant conservation of existing populations and habitats in situ may lead to effective extinction of the species in the wild.

Research is needed to improve scientific knowledge of biological and ecological factors that influence population growth of whorled sunflower and affect long-term population viability, to develop effective adaptive management strategies. Standardized monitoring protocols need to be developed to determine the effectiveness of conservation efforts at promoting and maintaining resilient populations. Resilience is contingent upon promoting habitat conditions that facilitate population growth to buffer against genetic, demographic, and environmental stochasticity (Wolf et al. 2015). Habitat management alone may not be adequate to promote resilience at the smallest sites (e.g., those with fewer than 100 individuals) and may require augmentation with additional

plants to increase population size, genetic diversity, and reproductive fitness. An effective recovery strategy for whorled sunflower is contingent upon habitat management and disturbance regimes that promote open canopies, native plant community integrity, and population growth.

**Recovery Objectives:** The recovery objectives are to protect, restore, and manage habitat to provide conditions necessary to recover and ultimately remove whorled sunflower from the *List of Endangered and Threatened Plants* (50 CFR 17.12). This will require researching optimal disturbance regimes and habitat conditions for whorled sunflower, cooperatively protecting existing populations, developing a range-wide monitoring framework and protocols, implementing science-based management of the species' habitat, and surveying for new populations. Where populations are unable to respond to habitat management due to small population size, augmentation using seeds or propagated plants might be necessary. Likewise, if surveys are unable to locate adequate numbers of additional populations to achieve recovery, establishment of populations on conservation lands using seeds or propagated plants may be necessary. Long-term monitoring (at least 10 years and encompassing multiple generations) of extant natural and/or established populations will be required to assess population stability, and to determine whether criteria for delisting have been met. Criteria will be reevaluated as new information becomes available and revised, as necessary.

### **Recovery Criteria**

Whorled sunflower may be considered for reclassification to threatened when the following criteria are met:

CRITERION 1. At least 20 geographically distinct populations—separated by at least 1 mile (1.6 kilometer)—of at least moderate size (at least 100 individuals) are distributed across the species' range, with each of the 4 known ecoregions (Loess Plains, Northern Hilly Gulf Coastal Plain, Southern Crystalline Ridges and Mountains, and Southern Shale Valleys)<sup>1</sup> supporting at least 3 such populations, including 1 population within each of the 4 designated critical habitat units. (Addresses Factors A and E.)

CRITERION 2. At least 3 large populations (at least 500 individuals), protected by long-term conservation mechanisms, occur in each of the 4 known ecoregions, for a total of 12 protected populations, and are managed to promote open-canopied habitat, native plant community integrity, and support resilient populations<sup>2</sup> of whorled sunflower. (Addresses Factors A, D, and E.)

CRITERION 3. Monitoring demonstrates that these populations (described in Criteria 1 and 2) are viable, as evidenced by natural recruitment and having stable to increasing populations for at least 10 years (approximately 10 generations). (Addresses Factor E.)

Whorled sunflower may be considered for delisting when the above criteria are met and when:

CRITERION 4. At least 20 additional geographically distinct populations of at least moderate size occur within the species' known range for a total of at least 40 extant populations. (Addresses Factors A and E.)

<sup>&</sup>lt;sup>1</sup> Level IV ecoregions described in USEPA 2013.

<sup>&</sup>lt;sup>2</sup> Larger populations are considered to be more resilient to most likely stochastic and/or catastrophic events, and therefore, are likely to remain viable into the foreseeable future.

CRITERION 5. At least 2 additional large populations are protected and managed as described in Criterion 2 within 3 of the 4 known ecoregions, for a total of at least 18 protected populations. (Addresses Factors A, D, and E.)

CRITERION 6. Monitoring demonstrates that these populations (described in Criteria 1, 2, 4, and 5) are viable, as evidenced by natural recruitment and having stable to increasing populations for at least 10 years (approximately 10 generations). (Addresses Factor E.)

*Actions Needed*: Recovery actions identified in the table below are those that, based on the best available science, we believe are necessary to accomplish the recovery of whorled sunflower. We have included a priority number<sup>3</sup> and estimated cost to complete each action.

Recovery Action Number	Recovery Action Description	Estimated Cost	Priority
1	Work with rights-of-way stakeholders to develop and implement management agreements.	\$35,000	1
2	Work with federal and state agencies, non-governmental conservation organizations, and private landowners to obtain protection for populations on privately owned lands.	\$235,000	1
3	Work with partners and stakeholders to develop and implement management plans for all populations.	\$852,500	1
4	Work with partners and stakeholders to develop and implement a monitoring strategy for all populations.	\$158,800	1
5	Increase the representation and genetic diversity of <i>ex situ</i> (off- site) safeguarding collections of whorled sunflower.	\$30,750	1
6	Facilitate and support surveys to identify new whorled sunflower populations.	\$84,000	2
7	Population augmentation and establishment.	\$322,000	2
8	Conduct research that enhances knowledge of whorled sunflower biology and ecology to facilitate the development of scientifically sound management plans, population viability models, and species/habitat distribution models.	\$218,000	3
9	Coordinate with federal, state, county, and local agencies, and other stakeholders to promote whorled sunflower recovery and identify innovative ways to increase public awareness of the need to protect this species and its habitats.	\$96,000	3
	Total Estimated Cost	\$2,032,050	

<sup>&</sup>lt;sup>3</sup> Recovery actions are assigned numerical priorities to highlight the relative contribution they may make toward species recovery (48 FR 43098):

**Priority 1** – An action that must be taken to prevent extinction or to prevent the species from declining irreversibly.

**Priority 2** – An action that must be taken to prevent a significant decline in species population/habitat quality or some other significant negative impact short of extinction.

**Priority 3** – All other actions necessary to provide for full recovery of the species.

*Estimated Cost to Delist:* The cost to recover and, ultimately, delist whorled sunflower is estimated to be \$2,032,050. Costs are likely to change over time and some costs are not determinable at this time and therefore the total cost of recovery may differ from this estimate.

*Date of Delisting*: If all actions are fully funded and implemented as outlined, including full cooperation of all partners needed to achieve recovery, we anticipate that recovery criteria for delisting could be met by 2069 (37 years).

### **Literature Cited**

- Shaffer, M.L., and B.A. Stein. 2000. Safeguarding our precious heritage. In: B.A. Stein, L.S. Kutner, and J.S. Adams, eds. Precious heritage: the status of biodiversity in the United States. Oxford University Press, Oxford, United Kingdom, pp. 301–321.
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