Schweinitz's sunflower *(Helianthus schweinitzii)*

5-Year Review:
Summary and Evaluation

U.S. Fish and Wildlife Service
Asheville, North Carolina, Field Office
Asheville, North Carolina

5-YEAR REVIEW
Schweinitz's sunflower/*Helianthus schweinitzii*

I. GENERAL INFORMATION

A. Methodology used to complete the review

Public notice of this 5-year review was given in the Federal Register on September 20, 2005 (70 FR 55157) and a 60 day comment period was opened. During the comment period, we did not receive any additional information about Schweinitz's Sunflower other than responses to specific requests for information from biologists familiar with the species. Information used in this report was gathered from published and unpublished reports. Records were provided by North Carolina and South Carolina Natural Heritage Program offices. Once all data was gathered/obtained, the review was completed by the lead recovery biologist for the species in Asheville, North Carolina. A draft of this review was also circulated to those familiar with the species (Appendix A, Peer Review).

B. Reviewers

Lead Regional– Southeast Region: Kelly Bibb, 404/679-7132

Lead Field Office – Asheville, North Carolina, Ecological Services, Carolyn Wells, 828/258-3939 extension 231

Cooperating Field Office(s) – Charleston, South Carolina, Ecological Services, Lora Zimmerman, 843/727-4707 extension 226 (now with the Service's Washington Office); Raleigh, North Carolina, Ecological Services, Laura Fogo, 910/695-3323 extension 4; and Dale Suiter, 919-856-4520 extension 18.

C. Background

1. FR Notice citation announcing initiation of this review:

September 20, 2005 (70 FR 55157)

2. Species status

Uncertain (FY 2009 Recovery Data Call). The majority of sites are not monitored annually, or in any manner capable of assessing year-to-year fluctuations in status and trends. In recent years, numerous observers have suggested stem counts are down, presumably due to drought. However these observations have occurred at too few sites to be regarded as representative of the entire range. Therefore, the overall status over the past year is reported as "unknown".

3. Recovery achieved

2 (26-50% recovery objectives achieved).

4. Listing history

Original Listing
FR notice: 56 FR 21807-21091
Date listed: May 7, 1991
Entity listed: Species
Classification: Endangered

5. Associated rulemakings

None.

6. Review History

1994 Recovery Plan
Recovery Data Call: 2009, 2008, 2006, 2005, 2004, 2003, 2002, 2001, and 2000

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

5, corresponding to "high" magnitude of threat, "low" recovery potential, and taxonomic status of "species"

8. Recovery Plan

Name of plan: U.S. Fish and Wildlife Service. 1994. Recovery Plan for Schweinitz's sunflower (*Helianthus schweinitzii*).

Date: April 22, 1994.

II. REVIEW ANALYSIS

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

The Act defines species as including any subspecies of fish or wildlife or plants, and any distinct population segment (DPS) of any vertebrate fish or wildlife. Because *Helianthus schweinitzii* is a plant, the DPS policy is not applicable and not addressed further in this review.

B. Recovery Criteria

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

Yes, the species has a final, approved plan. The criteria are generally objective and measurable, however some would benefit from refinement. See below.

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. Although knowledge of the species' biology and applicable threats has not changed appreciably since the recovery plan was written, the species' distribution (and therefore the range of occupied habitat) has expanded beyond that described in the recovery plan. As a result, it would be possible to meet the current set of recovery criteria without ensuring that protected self-sustaining populations are distributed throughout the species' current range.

b. Are all of the 5 listing factors that are relevant to the species addressed in the recovery criteria (and is there no new information to consider regarding existing or new threats)?

No. It would not be possible to fulfill the existing recovery criteria without addressing the three listing factors identified in the listing rule (habitat loss, the inadequacy of existing regulatory mechanisms, and other natural or manmade factors). However, disease/predation was not recognized as a significant factor in the listing rule, and has since been identified as a significant threat at some transplanted populations. Some observers have reported as much as 80-90% of transplants being consistently browsed in recent years (Frazer, 2010).

Overutilization was not regarded as significantly affecting the species, and there is no new information to suggest that this factor has since become a significant threat to the species.

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.

Criteria for reclassification to threatened:

10 geographically distinct, self-sustaining populations are protected in at least 4 counties in North Carolina and one in South Carolina

Criterion not met. Portions of 24 geographically distinct populations (20 in North Carolina and four in South Carolina) are in some form of protective ownership (Appendix B, Tables B.1 and B.2). These populations are distributed across eight counties in North Carolina and one county in South Carolina. However, each of these populations consists of multiple sites, only some of which are in protective ownership. Therefore, significant portions of each population remain vulnerable to identified threats operating against the species. Given the piecemeal nature of protection within these 24 populations, it is currently unlikely that any one of them is self-sustaining. However, a lack of basic life history information (esp. recruitment and mortality rates) continues to hinder objective definition of what constitutes a self-sustaining population in this species.

As a result, this component of this criterion cannot be objectively assessed. Further, without increased monitoring effort, it will be impossible to assess whether populations are self-sustaining even after this criterion can be objectively defined for this species.

Managers have been designated for each population

Criterion not met. Inasmuch as portions of the 24 geographically distinct populations discussed above are owned by natural resource agencies or conservation organizations, some level of management can be inferred from patterns of landownership (Appendix B, Tables B.1 and B.2). However in most cases management roles and responsibilities have not been explicitly articulated or formalized.

Management plans have been developed and implemented

Criterion not met. Draft or final management plans exist for many subpopulations, but few of these have been integrated into management plans for the larger population of which they are a part (Appendix B, Tables B.1 and B.2). Those management plans that do exist typically apply only to portions of the population in protective ownership. Equally varied is the extent to which these plans have been implemented, and in still other cases management has been implemented in the absence of explicit (written) management plans. Across the range of the species, implementation of management is limited by expertise and resources. This recovery criterion is somewhat subjective and should be revised to emphasize the importance of adequate, iterative management in perpetuity.

Populations have been maintained for 5 years

Criterion not met. None of the populations receiving repeat monitoring currently show a steadily increasing trend over a period of five years. For most sites, these trends cannot be assessed either because sufficient data do not exist, or because available data are not comparable (counts or estimates have been reported in different units (stems, clumps, etc.) or apply to different portions of a given site).

Criteria for removal from the Federal list (de-listing):

- 15 geographically distinct, self-sustaining populations are protected in at least 4 counties in North Carolina and one in South Carolina
- Management plans have been implemented
- Populations (as measured by number of adult plants) have been stable or increasing for 10 years
- Permanent conservation ownership and management of at least 10 populations are assured by legally binding agreements

These criteria are not discussed further because they are the same or stricter than the criteria for reclassification to threatened status, which are discussed above and have not been met.

C. Updated Information and Current Species Status

1. Biology and Habitat

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, etc.), or demographic trends:

Abundance

When the species was federally-listed in 1991, there were a total of 13 extant populations (eight in NC and five in SC). The 1991 listing rule apparently treated each known Natural Heritage Program (NHP) element occurrence (EO) for the species as a distinct population.

At the time of this review, there were 165 EO records in the North Carolina NHP database (NC NHP 2006). These aggregate into 78 potential populations of the species. In South Carolina, there are eight geographically distinct areas which approximate populations of the species (Houk 2003; Appendix B, Table B.2). Therefore, the total known range consists of some 86 populations, 78 in North Carolina and eight in South Carolina.

The 1991 listing rule did not indicate the number of plants within the 13 populations known to be extant at that time. However, supporting information suggests that these sites collectively contained some 2,805 stems.[1] As of this review, available data suggests that sites with some potential to provide a role in recovery collectively contain over 40,000 stems (Appendix B, Tables B.1 and B.2).

Trends

All of the 24 populations with the potential to provide permanent protection are monitored (or are expected to be monitored) on a regular basis, although the frequency and type of monitoring varies by site. Regardless, none of these populations currently show a steadily increasing trend over a period of five years. For most sites, comparable (year-to-year) counts or estimates are not available for one or more of the following reasons: either sufficient data do not exist, counts have been reported in different units (e.g., total stems, flowering stems only, or clumps) from one observation to the next, or the count/estimate applies to different portions of a given site.

In terms of the numbers of known populations and individuals, the abundance of this species is greater than it was at the point of listing. However, Houk (2003) has emphasized that stem and/or clump counts in *H. schweinitzii* are "quite variable" from year to year (even in the absence of obvious influence from restoration efforts or mismanagement). Houk arrived at this conclusion after years of sustained monitoring

[1] This is conservative in that it is based upon the lowest count or estimate available for each site as of that time.

efforts conducted across multiple sites in South Carolina. As a result, his observations control for discrepancies that may have otherwise been introduced by different observers.

Unfortunately very few North Carolina sites have been monitored this consistently; therefore assessments of trends in abundance in that portion of the species' range are more difficult to interpret. In nearly all of these instances, one or more persons familiar with the site have questioned the degree to which the observations accurately reflect actual trends as opposed to incomparable counts/estimates. We are working to extract and verify reliable trend data from available reports and other sources; however this information was not available at the time of this review. The Service expects that trends can ultimately be determined for at least some of the sites currently or expected to be under protective ownership/management.

Population demographics

We are aware of only one effort to examine demographic trends in this species. However, the only report in apparent direct reference to this work is an interim report which states that demographic data would be compiled and submitted for publication at a later time (Barden, 2000). We do not have any such subsequent report, and efforts to obtain the raw data have been unsuccessful. Inspection of available data suggests that individual plants were not followed over time, therefore patterns of recruitment and mortality may be difficult to interpret. The primary investigator involved with this effort does not deem the effort worthy of publication, and regards the level of year-to-year variation in stem counts as too great to produce meaningful predictions of extinction risk (Barden, personal communication).

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

Matthews and Howard (1999) reviewed genetic variation in 25 sites occupied by the species, as detected by allozyme loci.[2] Low levels of genetic variation among populations were detected, and genetic differentiation among sites was not correlated with geographic distance. The results support a hypothesis of relative fragmentation of a formerly large, contiguous (panmictic) population into more isolated groups. They hypothesized that restoration and relocation efforts would have relatively low risk of generating outbreeding depression, and that recovery efforts should therefore focus on establishing protected sites which could be subjected to appropriate management.

Savin (2003 and 2006, pers. comm.) used microsatellites, a molecular marker regarded as having a higher probability of detecting genetic differences at the population level. Savin collected material from one site in each of seven counties across the species' range. Her results generally corroborated those of Matthews and Howard (1999), in that populations

[2] The authors referred to their sites as populations, however since the identity of these sites was not revealed, and the geographic distance between them is unknown, we are conservatively referring to these as "sites" rather than "populations" here.

showed small levels of differentiation relative to published accounts from other plant species (Savin, 2006). Savin interprets these results as suggesting that relocation over relatively short distances (e.g., within a county) presents little risk of outbreeding depression.

c. Taxonomic classification or changes in nomenclature:

We are not aware of any published or proposed changes in taxonomy or nomenclature which would influence the classification of this species or affect its legal status as a listed entity under the Act.

d. Spatial distribution, trends in spatial distribution (e.g. increasingly fragmented, increased numbers of corridors, etc.), or historic range (e.g. corrections to the historical range, change in distribution of the species' within its historic range, etc.):

The 1991 listing rule referenced 13 extant populations distributed across five NC counties (Cabarrus, Mecklenburg, Rowan, Stanly and Union) and one SC county (York). As of this review, the species' distribution includes 13 NC counties (the original five plus Anson, Davidson, Gaston, Montgomery, Randolph, Richmond, Stokes, Surry) and two SC counties (Lancaster and York).

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

When the species was federally listed in 1991, 11 of the 13 known extant populations occurred in roadside or power line ROW (right-of-way) (USFWS, 1991). Five of the eight known extant NC populations were located within NCDOT ROW, two were in SCDOT ROW, one occurred on land managed by the Rock Hill (South Carolina) Department of Parks, Recreation and Tourism, and the remaining five occurred on privately owned lands "usually in or near transmission line corridors of various utility companies" (USFWS 1991).

Bates (2003) and Houk (2003) both ranked sites as to whether or not they occurred (in whole or in part) in ROW habitat. Bates assessed a total of 98 sites, 87 (88.7%) of which occurred in ROW. Houk assessed a total of 69 sites, 53 of which (76.8%) occurred in ROW. Therefore, out of 167 sites assessed by these two investigators, 156 (93.4%) occur in ROW where they are inherently in danger of inappropriate management and possible extirpation.

Habitat for the species continues to become increasingly fragmented with the rapid urbanization of the Charlotte, NC metropolitan area. The greater Charlotte-Gastonia-Concord area of North and South Carolina was identified as one of 35 fastest growing large metropolitan areas in the country in a recent report examining the effects of sprawl upon endangered species (Ewing et al. 2005).

f. Other:

No additional information beyond that already presented.

2. Five-Factor Analysis

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

The 1991 final listing rule described the following threats to extant populations: loss of historic levels of natural disturbance from fire and grazing by native herbivores, residential and industrial development, mining, encroachment by invasive species, highway construction and improvement, utility right-of-way maintenance, and herbicide use. Fire suppression and absence of grazing were addressed in detail under listing factor 5, but because these threats also constitute sources of habitat destruction or modification they are discussed here for purposes of this review.

The limited geographic range and scarcity of seed sources, as well as appropriate habitat, were also listed as threats in the 1991 final listing rule. Since that time, the known geographic range has expanded to include eight additional counties in NC and one additional county in SC. Expansion of the known range beyond the greater Charlotte metropolitan area has enhanced the potential for recovery in other portions of the species' range (e.g., the Uwharrie portions of the NC Piedmont). However, threats to the species continue to escalate with rapid urbanization and suburban sprawl in the greater Charlotte area. Throughout the species' range, over 90% of known sites occur in managed ROW, where vegetation management practices occasionally mimic patterns of natural disturbance (from fire or native grazers) now largely absent from the present day landscape. However, these same vegetation management practices pose a threat to these occurrences, in that inappropriately timed mowing (e.g., during the growing season, prior to seed set) or excessive herbicide application have adversely impacted the species at several of these locations. Many of these ROW occurrences are along existing roads which are subject to widening and improvement projects which disturb or eliminate the existing adjacent ROW. The NCDOT has a program in which roadside occurrences of federally listed plant species are posted with signs prohibiting growing season mowing or herbicide application. Despite these efforts, 28 of 63 NCDOT sites containing *H. schweinitzii* were reportedly adversely impacted at least once as of 2003 (Appendix C of Bates' 2003 report contains a spreadsheet of NCDOT roadside occurrences and information on impacts to these sites).

As such, recovery efforts are now focused upon relocating plants from these inherently vulnerable ROW habitats into adjacent areas with the potential for adequate management and the appropriate suite of associated native vegetation thought to comprise the natural plant communities of the Carolina piedmont ecoregion.

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

When the species was federally listed, this was not known to be a significant factor affecting the status of the species. However, the potential for such activities to be encouraged through increased public awareness of and interest in the species was acknowledged in the listing rule. We have no new information to suggest that this is a significant factor affecting the species at this time.

c. Disease or predation:

When the species was federally listed, this was not known to be a significant factor affecting the status of the species. Since that time, there are some indications that deer browse may be significantly affecting the survival of transplanted individuals and some native, resident populations (Frazer, 2010). However, the severity and geographic scope of this threat needs further investigation. This threat may now constitute a significant threat to the species if left unaddressed.

d. Inadequacy of existing regulatory mechanisms:

The overwhelming majority of statutory or regulatory mechanisms capable of affording protection to *Helianthus schweinitzii* stem from the species' Federal status under the Endangered Species Act of 1973, as amended. This statute provides various protections to this species that would not otherwise occur under any other Federal, state, or local statute. I n particular, federally funded activities with the potential to affect this species authorized, funded or otherwise carried out by Federal agencies are subject to section 7 consultation with the Service to ensure that such actions do not jeopardize the continued existence of the species. Section 7(a)(1) of this statute also directs Federal agencies to utilize their authorities to assist the Service in the recovery of species (such as *H. schweinitzii*) listed under this statute.

The North Carolina Plant Protection Act regulates collection and commercial trade (without a permit) of plants listed under the statute. However, this statute does not protect the species or its habitat from destruction in conjunction with development projects or otherwise legal activities.

South Carolina State Code (§50-11-2200) prohibits gathering, damaging or destroying plants (of any species) on lands owned by the South Carolina Department of Natural Resources (SCDNR), except by permit. Because *H. schweinitzii* occurs on two Heritage Preserves owned by SCDNR, the species is afforded some level of protection from damage, collection or destruction on those properties. However, the majority of sites containing the species in that state do not occur on SCDNR lands.

There are no other state, county, or local statues specifically affording protection to *H. schweinitzii* within the states of North and South Carolina. Regulatory mechanisms are inadequate for this species.

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

The 1991 final listing rule addressed low genetic variation and small population size, fire suppression and absence of grazing by large native herbivores under this listing factor. However, for purposes of this review, each of these threats have been addressed under Section II.C.2.a, above.

D. Synthesis

When the species was federally-listed in 1991, there were a total of 13 extant populations (eight in NC and five in SC). As of this review, the total known range consisted of some 86 populations, 78 in NC and eight in SC. However, these populations are typically small and highly fragmented, and 93 % of the sites (meaning spatially discrete portions of populations) containing the species occur in ROW where they are inherently in danger of inappropriate management practices and possible extirpation.

Portions of 24 extant populations (distributed across eight NC counties and two SC counties) have been identified as having a *potential* to meet some of the recovery criteria for the species (Appendix B, Tables B.1 and B.2). Of the 24 extant populations with some protection potential, 22 (distributed across seven NC counties and one SC County) are in some form of ownership and management that could provide permanent protection to the species. Portions of ten of these 22 populations have written management plans with components explicit to Schweinitz's sunflower, however implementation of these plans is a challenge at all locations due to lack of resources. Management plans are in draft for portions of the remaining 12 other populations whose current ownership may provide (or has indicated willingness to provide) permanent protective ownership. All of the 28 populations with the potential to provide permanent protection are monitored (or are expected to be monitored) on a regular basis. However, none of these populations currently show a steadily increasing trend over a period of five years.

Habitat for the species continues to become increasingly fragmented with the rapid urbanization of the Charlotte, NC metropolitan area. The greater Charlotte-Gastonia-Concord area of North and South Carolina was identified as one of 35 fastest growing large metropolitan areas in the country in a recent report examining the effects of sprawl upon endangered species (Ewing et al. 2005). For these reasons, this plant continues to meet the definition of an endangered species under the ESA.

III. RESULTS

A. Recommended Classification:

__x__ No change is needed

B. New Recovery Priority Number:

2C (FY 2009 Recovery Data Call), corresponding to "high" magnitude of threat, "high" recovery potential, taxonomic status of "species", and a potential for conflict with economic development. This number has been changed to reflect that recovery potential appears high due to the combined efforts of numerous partners who are actively working to acquire, manage, and monitor sites. An additional "c" has been added in recognition of the inherent threat to the species from economic development and associated road improvements, etc.

IV. RECOMMENDATIONS FOR FUTURE ACTIONS

- For sites with the potential to contribute toward the species' recovery (Appendix B, Tables B.1 and B.2), work with appropriate owners/managers to implement monitoring capable of producing reliable trend data at each site. Range-wide standardized monitoring protocol are generally not regarded as feasible for this species, due to the widely varying sizes of populations and the resources available to monitor them. However, site-specific protocol could be implemented such that counts or estimates provided at a given site are directly comparable from one monitoring period to the next.
- For sites with the potential to contribute toward the species' recovery (Appendix B, Tables B.1 and B.2), characterize existing vegetation using standardized community classification methods (e.g., NatureServe's community classification systems and Schafale and Weakley (1990)). Use this information to inform restoration objectives and direct future site protection efforts toward the highest quality habitats.
- Devise recovery criteria which balance the availability of suitable habitat with opportunities for restoration, management, and protection as dictated by landowner willingness and resource availability. These criteria should emphasize the role of prescribed fire in site restoration and management, but allow for those instances in which sites cannot be managed with fire.
- Work with Dr. Richard Houk (Winthrop University, retired) to find successors to continue his monitoring efforts in South Carolina.
- Clarify the role of controlled propagation, rescue and relocation, and public demonstration gardens in the species' recovery, so that sites supporting native populations in conjunction with remnants of native plant communities are prioritized for protection (above sites characterized by rescued and introduced plant material).

V. REFERENCES

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U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW of *Helianthus schweinitzii*

Current Classification: Endangered
Recommendation resulting from the 5-Year Review

____ **Downlist to Threatened**
____ **Uplist to Endangered**
____ **Delist**
__x__ **No change is needed**

Appropriate Listing/Reclassification Priority Number, if applicable _____

Review Conducted By: Carolyn Wells

FIELD OFFICE APPROVAL:

Lead Field Supervisor, Fish and Wildlife Service

Approve _____ Date 5/18/10

REGIONAL OFFICE APPROVAL:

Acting
Lead Regional Director, Fish and Wildlife Service

Approve _____ Date 8-24-10

Cooperating Regional Director, Fish and Wildlife Service

_____Concur _____ Do Not Concur

Signature_____Date_____

Appendix A: Peer Review

Summary of peer review for the five-year review of Schweinitz's sunflower (*Helianthus schweinitzii*).

A. Peer Review Method: The Service circulated this review to various individuals with extensive expertise with Schweinitz's sunflower. These individuals included staff of the Service's Raleigh Field Office and Sand Hills sub-office, the North Carolina Natural Heritage Program, the North Carolina Plant Conservation Program, the North Carolina Department of Transportation, the U.S. Forest Service, and Mecklenburg County Parks and Recreation.

B. Peer Review Charge: Peer reviewers were asked to conduct a scientific review of technical information presented. Reviewers were not asked to review the legal status determination.

C. Summary of Peer Review Comments: The majority of comments pertained to the size and/or protection status of particular subpopulations. Reviewers typically did not comment on the narrative content of the review itself, with the exception of one reviewer that provided editorial (typographical) comments.

D. Response to Peer Review: All updated information was incorporated into Appendix B (Tables B.1 and B.2), as the Service had no reason to dispute the updated information. Editorial comments and requests for clarification in the text were incorporated where appropriate.

Appendix B: Tables

Table B.1: North Carolina populations of *Helianthus schweinitzii* with a potential to contribute to the recovery of the species.

Table B.2: All known South Carolina populations of *Helianthus schweinitzii*, grouped into eight distribution centers as recognized in a recent status survey (Houk 2003).

Table B.1 North Carolina populations of *Helianthus schweinitzii* with a potential to contribute to the recovery of the species. Populations are shaded in light gray, followed by subpopulations (not shaded). [1]

Landscape/project	County	NHP EO number [2]	Owner/ Manager[3]	Mgmt plan	Mgmt Initiated	Native, Introduced, Augmented[4]	Monitored	Trend[5]	Latest size estimate (year)
Uwharrie NF: NC 109	**Montgomery**	**44.000**	**Y**	**In prep**	**N**	**Native**	**Y**	**Unknown**	
US NC 109		44.000	USFS	in prep	N	N	Y	stable?	150 stems (2005)
Uwharrie NF: Badin and Machine Branch	**Montgomery**	**110.000**	**Y**	**In prep**	**N**	**Native**	**N**	**Unknown**	
Badin Area: Falls Dam		110.015	USFS	in prep	N	N	informally	unknown	100-200 stems (2006)
Forest Service Road 576		110.024	USFS	in prep	N	N	informally	unknown/stable?	201 stems (2002)
Trail to Falls Dam		110.025	USFS	in prep	N	N	informally	decreasing	2 clumps (1995)
Trail to Falls Dam		110.192	USFS	in prep	N	N	informally	decreasing	3 stems (2006)
Forest Service Road 576		110.193	USFS	in prep	N	N	informally	unknown/ extirpated?	None
Forest Service Road 576		110.194	USFS	in prep	N	N	informally	unknown/ extirpated?	None
Forest Service Road 576		110.195	USFS	in prep	N	N	informally	unknown	> 200 stems (2006)
Uwharrie NF: Roberdo south	**Montgomery**	**111.000**	**Y (in part)**	**In prep**	**N**	**Native**	**N**	**Unknown**	
RR and NC 109 north		111.028	USFS (in part)	in prep	N	N	informally	declining	5 stems (2006)
Bruton-Carpenter Road		111.036	USFS (in part)		N	N	informally	decreasing	40 stems (2006)
Roberdo, LeGrand		111.043	USFS	N	N	N	N	extirpated?	1 plant (?)
W Montgomery HS at NC 109		111.061	USFS	in prep	N	N	informally	increasing	317 stems (2006)
W Montgomery HS at powerline		111.067	USFS	in prep	N	N	informally	decreasing	29 stems (2006)

Table B.1, continued.

Landscape/project	County	NHP EO number [2]	Owner/ Manager[3]	Mgmt Plan	Mgmt Initiated	Native, Introduced, Augmented[4]	Monitored	Trend[5]	Latest size estimate (year)
Uwharrie NF: Roberdo south	**Montgomery**	**111.000**	**Y (in part)**	**In prep**	**N**	**Native**	**N**	**Unknown**	
Kiesler tract and vicinity		111.068	PRV	Y	Y?	N	informally	increasing	581 stems (2006)
NC 24/27		111.069	USFS	in prep	n/a	N	informally	stable?	104 stems (2006)
NC 109 S of 24/27		111.204	USFS	in prep					
NC 109 S of 24/27		111.205	USFS	in prep					
RR Track S of McLeod Rd		111.206	USFS	in prep	N				
RR Track S of McLeod Rd		111.207	USFS	in prep	N				
Uwharrie NF: Roberdo north	**Montgomery**	**181.000**	**Y**	**In part**	**In part**	**Various**	**In part**	**Varied**	
Roy Cooman's RR site		181.027	USFS	in prep	N	N	informally	Increasing	408 stems (2006)
Boon Chesson's		181.122	PRV	Y	Y	I	Y	decreasing	< 100 stems (2006)
Uwharrie NF: Morris Mountain	**Montgomery**	**145.000**	**Y**	**In prep**		**Native**	**Y**	**Stable**	
Morris Mountain		145.000	USFS	in prep	n/a	N	informally	stable	41 stems (2006)
Uwharrie NF: Rabbit Mountain	**Montgomery**	**146.000**	**Y**	**In prep**		**Native**	**Y**	**Stable**	
SR 1146 Mountain		146.000	USFS	in prep	n/a	N	informally	Stable	146 stems (2006)
Uwharrie NF: Walker Mountain	**Montgomery**	**178.000**	**Y**	**In prep**		**Native**	**Y**	**Declining**	
Wood Run Camp (FSR 51)		178.118	USFS	in prep	n/a	N	informally	declining	7 stems (2006)
Wood Run Camp 2		*178.176*	USFS	*N*	*n/a*		*n*	*misidentified?*	*2 stems (2002)*

Table B.1, continued.

Landscape/project	County	NHP EO number [2]	Owner/ Manager[3]	Mgmt Plan	Mgmt Initiated	Native, Introduced, Augmented[4]	Monitored	Trend[5]	Latest size estimate (year)
Uwharrie NF: Barnes Creek/ Poison Fork	**Montgomery /Randolph**	**148.000**	**In part**	**In part**	**In part**	**Various**	**In part**	**Unknown**	
Harvest Field Baptist Church		148.056	NCPCP (in part)	in prep	N	N	informally	unknown	
Thompson tract		148.066	PRV	N	N	N	Y	increasing?	500-1000 stems (2006)
Bennett tract		148.071	PRV	Y	Y	N	Y	increasing	400-700 stems (2006)
Walkers Creek Forests		148.129	USFS (in part)	in prep	N	N + I?	informally	unknown	
Wysner Mountain		148.198	PRV	Y	Y	I	Y	increasing	1,170 stems (2006)
Okewemee Woodland	**Montgomery**	**141.000**	**Y**	**Y**	**Y**	**Various**	**Y**	**Stable/increasing?**	
Okewemee Woodland		141.143	NCPCP	Y	Y	N	Y	stable/increasing?	> 500 stems (1999, RR only)
Okewemee Woodland – interior		141.211	NCPCP	Y	Y				
Okewemee Woodland – interior		141.212	NCPCP	Y	Y				
Caraway Mountain	**Randolph**	**201.00**	**Y**	**Y**	**Y**	**Various**	**Y**	**Declining?**	
Caraway Mountain - roadside		201.029	NC Zoo (in part)	Y	Y	N	Y	increasing	1,190 stems (2002)
Caraway Mountain NC Zoo		201.200	NC Zoo	Y	Y	U			
Caraway Mountain NCDOT		201.223	NCDOT	Y	Y	I	Y	unknown	651 stems (2008)
Purgatory Mountain	**Randolph**	**179.000**	**Y**	**Y**	**Y**	**Introduced**	**Y**	**Unknown**	
Purgatory Mountain		179.000	NC Zoo	Y	Y	I	Y	unknown	331 pots, ea. w/4-5seedlings (1997)

Table B.1, continued.

Landscape/project	County	NHP EO number [2]	Owner/ Manager[3]	Mgmt Plan	Mgmt Initiated	Native, Introduced, Augmented[4]	Monitored	Trend[5]	Latest size estimate (year)
Shuffletown Prairie/ Mountain Island Lake Dam	**Mecklenburg**	**89.000**	**In part**	**In part**	**In part**	**Various**	**Y**	**Increasing**	
Mountain Island Lake Dam		89.032	PRV	N	n/a	N	Y?	increasing	> 1000 flw stems (2002)
Shuffletown Prairie		89.051	County Parks and Rec.	Y	Y	N+I	Y	increasing	2131 stems (2006)
Latta Prairie/McCoy Road/Gar Creek	**Mecklenburg**	**92.000**	**Y**	**Y**	**Y**	**Various**	**Y**	**Stable**	
McCoy Road (Gar Creek Preserve)		92.017	County Parks and Rec.	Y	Y	N	Y	stable	1310 flw stems (2005)
Latta Plantation		92.139	County Parks and Rec.	Y	Y	I	Y	stable	545 flw stems (2005)
McDowell Preserve and vicinity	**Mecklenburg**	**138.000**	**Y**	**In part**	**Y**	**Various**	**Y**	**Varied**	
Winget Road		138.030	County Parks and Rec.	Y	Y	N	Y	stable	334 stems (2006)
Island Point (Shopton)		138.137	County Parks and Rec.	N		N+I	Y	declining?	> 1000 stems (2006)
McDowell Prairie		138.140	County Parks and Rec.	Y	Y	I	Y	declining	1797 stems (2005)
Mineral Springs and vicinity	**Union**	**112.000**	**Y**	**Y**	**Y**	**Native**	**Y**	**Declining?**	
Mineral Springs Barren		112.013	NCPCP	Y	Y	N	Y	declining?	534 stems (2002)
Redlair Preserve	**Gaston**	**95.000**	**Y**	**In prep**	**Y**	**Native**	**Y**	**Increasing**	
Rankin tract		95.000	PRV	in prep	Y	N	Y	increasing	2,189 stems (2005)
Hanging Rock State Park and vicinity	**Stokes**	**99.000**	**Y**	**Y**	**Y**	**Introduced**	**Y**	**Declining?**	
Lackey tract		99.000	PRV	Y	Y	I	Y	unknown	30 clumps (2006)

Table B.1, continued.

Landscape/project	County	NHP EO number [2]	Owner/ Manager[3]	Mgmt Plan	Mgmt Initiated	Native, Introduced, Augmented[4]	Monitored	Trend[5]	Latest size estimate (year)
Surratt Road	**Davidson**	**222..124**	**Y**	**In prep**	**Y**	**Native**	**Y**	**Stable?**	
Surratt Road - roadside		222.124	NCDOT	in prep	Y	N	Y	stable?	839 flw stems (2002)
Surratt Road – interior		222.221	NCDOT	Y					
Cane Creek Park	**Union**	**217.000**	**Y**	**In prep**	**Y**	**Introduced**	**Y**	**Increasing**	
Cane Creek Park		217.000	County Parks and Rec.	in prep	Y	I	Y	increasing?	5,993 stems (2009)
Terry Sharpe Tract	**Richmond**	**229.000**	**Y**	**Y**	**Y**	**Introduced**	**Y**	**Unknown**	
Sharpe Tract			PRV	Y	Y	I	Y	unknown	20 stems (2006)

[1] Principal Natural Heritage Program (NHP) Element Occurrence (EO) records (shaded in light gray) are herein regarded as proxies for populations of the species, whereas sub EOs (no shading) represent site-specific locations within each population where plants have been documented to occur. NOTE: This table only lists those populations (and subpopulations) that show prospect of contributing to the long-term recovery of the species.

[2] NHP Element Occurrence (EO) Numbers use the following format: PrincipalEO.Sub(or stand-alone)EO.

[3] Owner/manager abbreviations: NCDOT = North Carolina Department of Transportation; NC DPR = North Carolina Department of Parks and Recreation; NCPCP = North Carolina Plant Conservation Program; PRV = conserved private; USFS = U.S. Forest Service. No entry indicates sites not in protective ownership.

[4] "N" = native (no introduction or augmentation of plant material known to have occurred at any time in the past); "I" = introduced (plant material, either seeds, rootstock or both, was brought to this site from other location(s)), "A" = augmentation (an existing, native population was enhanced by seeds or rootstock either collected from elsewhere within the same site or from a different site). Combinations of these are possible, and are denoted as appropriate.

[5] Trends have been subjectively determined using counts or estimates, as available from the NC NHP database, and other sources (personal communication with species or site experts). A master spreadsheet containing these counts is on file with the Asheville ES Field Office. In the majority of cases, these trends have been inferred from fewer than five years of monitoring data, and there is some question as to the year-to-year comparability between counts/estimates.

Table B.2 South Carolina populations (shaded in light gray) and subpopulations (not shaded) of *Helianthus schweinitzii*. Data adapted from Houk (2003).

Landscape/project	County	NHP EO number	Site Protection	ROW	Mgmt Plan	Native, Introduced, Augmented	Threat	Recovery	Monitored	Trend	Stem count (2002)
Indian Land	**Lancaster**										
JimWilsonRd		037	n	y	n	N	Med	Low	y	Increasing	292
DaveLyleExtension/HelmsSide		New2001	recommended	y	n	N	Med	Med	y	Increasing	254
DaveLyleExtension/OsceolaSide		New2001	recommended	y	n	N	Med	Low	y	Unknown	365
AnderVincentRd		New2002	n	y	n	N	Med	Low	y	Unknown	185
LaneyRd		New2002	n	n	n	N	High	Low	y	Unknown	28
Rock Hill North	**York**										
Newport		026	n	n	n	N	High	Low	y	Decreasing	13
HandsMill/LittleAllisonCr		041	n	y	n	N	High	Low	y	Decreasing	23
HandsMill/AllisonAcres		043	n	n	n	N	High	Low	y	Stable	181
MtGallant/Homestead		042	n	y	n	N	High	Low	y	Decreasing	62
Rock Hill South	**York**										
AlbrightRd/Blackmon-Heckle		New1997	n	n	n	N	High	Low	y	Unknown	194
AlbrightRd/BlackmonRd		011	n	y	n	N	High	Low	y	Extirpated	0
AlbrightRd/Midvale-Rockdale		New1997	n	n	n	N	High	Low	y	Decreasing	69
AlbrightRd/Plazas hopping		016	n	y	n	N	High	Low	y	Decreasing	36
AlbrightRd/Rockdale-Blackmon		New1997	n	n	n	N	High	Low	y	Decreasing	84
AT&T/Archer to Porter Rd		015	n	y	n	N	Low	Low	y	Increasing	30
AT&T/Northway		012	n	y	n	N	Med	Low	y	Increasing	336
AT&T/Pearson to Sewer		013	n	y	n	N	Low	Low	y	Decreasing	96
AT&T/RockHillTelephone		005	n	y	n	N	High	Low	y	Stable?	103
AT&T/Rolling Ridge		004	n	y	n	N	High	Low	y	Increasing	120
BlackmonSt/CabinetWorks		039	n	n	n	N	High	Low	y	Increasing	498
Duke Power Line		003	n	y	n	N	Med	Low	y	Stable?	194
I-77Exit75/NorthboundOnRamp		New1995	recommended	y	n	N	Med	Med	y	Decreasing	227

Table B.2, continued.

Landscape/project	County	NHP EO number	Site Protection	ROW	Mgmt Plan	Native, Introduced, Augmented	Threat	Recovery	Monitored	Trend	Stem count (2002)
Rock Hill South (continued)	**York**										
I-77Exit75Northbound/SpoilPile		New2001	n	n	n	N	Med	Low	y	Increasing	198
Longmeadow		007	n	n	n	N	NA	NA	y	Extirpated	0
MartinMarietta/HawkfieldRd		020	n	y	n	N	High	Low	y	Stable?	70
PorterRd/Castlewood-Kinghurst		New1999	n	y	n	N	High	Low	y	Increasing	360
PorterRd/Hinsdale		022	n	y	n	N	High	Low	y	Increasing	168
PorterRd/I-77Mile75South		021	n	y	n	N	Med	Low	y	Decreasing	15
RHBlackjacks/AMP		New1996	y	n	y	I	NA	NA	y	Increasing	4561
RHBlackjacks/AT&T		014	y	y	y	N	Low	High	y	Increasing	2019
RHBlackjacks/PineWoods		019	y	n	y	N	Med	Low	y	Stable?	7
RHBlackjacks/SewerROW		017	y	y	y	N	Low	High	y	Increasing	253
RHBlackjacks/UtilityLineROW		018	y	y	y	N	Med	High	y	Increasing	192
Southland Park		006	n	y	n	N	Med	Low	y	Increasing	39
Rock Hill East	**York**										
RockHillRiverPark		New2001	recommended	y	n	I	High	Med	y	Increasing	267
Sturgis/WaterfordPrkwy		New2002	n	y	n	N	High	Low	y	Unknown	7
SpringsteenRd		New2001	n	n	n	N	High	Low	y	Extirpated	0
Rock Hill West	**York**										
Heckle/Hwy5		023	n	y	n	N	High	Low	y	Decreasing?	566
Heckle/HollisLakes		024	recommended	y	n	N	Med	Med	y	Increasing	1021
HollisLake/ConcretePlant		025	n	y	n	N	High	Low	y	Increasing	525
HollisLake/Olewoods		New2001	n	y	n	N	High	Low	y	Increasing	405
Herlong/Eastover		044	n	y	n	N	High	Low	y	Extirpated	0
Heckle/WagonWheel		New2002	recommended	y	n	N	Med	Med	y	Unknown	125
Olewoods/Utility		New2001	n	y	n	N	High	Low	y	Increasing	405

Table B.2, continued.

Landscape/project	County	NHP EO number	Site Protection	ROW	Mgmt Plan	Native, Introduced, Augmented	Threat	Recovery	Monitored	Trend	Stem count (2002)
Fort Mill South	**York**										
Old US21Road		010	n	y	n	N	High	Low	y	Decreasing?	238
US 21BYP ROW		027	n	y	n	N	Med	Low	y	Increasing	638
TruckStopField		028	n	n	n	N	High	Low	y	Decreasing	5
SuttonRd/I-77		029	n	y	n	N	High	Low	y	Increasing	116
Spratt St		030	n	y	n	N	Med	Low	y	Stable?	178
BrickyardRd/RadioTowerRd		031	n	y	n	N	High	Low	y	Stable?	10
BrickyardRd/RadioTower-Church		New2000	n	y	n	N	Med	Low	y	Increasing	81
BrickyardRd/Church		009	n	y	n	N	High	Low	y	Increasing	105
BanksRd/BrickyardRd		032	n	y	n	N	High	Low	y	Increasing	765
BanksRD/DukeTransmission		033	y	y	y	N+A	Low	High	y	Increasing	5680
I-77/Duke Transmission/SCDOT		040	y	y	n	N	Low	High	y	Stable?	43
I77/DukeTransmission/JScottProp.		New2001	n	y	n	N	Med	Med	y	Increasing	99
McColl/Museum/ TransTowers52-53		New1996	recommended	y	n	N	Med	Med	y	Unknown	1715
McColl/Museum/MuseumBluff		New1999	n	y	n	N	High	Low	y	Unknown	1665
McColl/Museum/DistributionROW		New1999	n	y	n	N	Med	Low	y	Unknown	189
BanksRd/PleasantRidge		008	n	y	n	N	High	Low	y	Increasing	214
FtMillParkway		New2002	n	y	n	N	Med	Low	y	Unknown	7
Fort Mill North	**York**										
US21BYP/GoldHillRd		036a	n	y	n	N	Med	Low	y	Stable?	156
GoldHillRd/US21BYP-SteeleCr.		035	n	y	n	N	High	Low	y	Extirpated?	0
SC160/PleasantRd		038a	n	y	n	N	NA	NA	y	Extirpated	0
McManusRd		038b	n	y	n	N	Med	Low	y	Unknown	1242
Gardendale		New2002	n	y	n	N	Med	Low	y	Unknown	159
ASCGPrairieRestorationSite I		New1997	y	n	y	I	Low	Med	y	Extirpated	0
ASCGPrairieRestorationSite II		New1997	y	n	n	I	Low	Med	y	Decreasing	57

Table B.2, continued.

Landscape/project	County	NHP EO number	Site Protection	ROW	Mgmt Plan	Native, Introduced, Augmented	Threat	Recovery	Monitored	Trend	Stem count (2002)
Brattonsville	**York**										
BrattonsvillePrairie		New2001	y	n	y?	I	Low	High	y	Increasing	315