Final Recovery Planning Outline with Listing Status Review Triggers for the Illinois Threatened Storax (Styrax americana)

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Approved by the Illinois Endangered Species Protection Board at the February 20, 2014 Special Meeting.

Common Name: Storax
Scientific Name: *Styrax americana* (Lam.)
Family: *Styracaceae*
Synonyms: American Snowbell, Downy Snowbell, Mock Orange

Status

Storax (*Styrax americana*) is listed as threatened in Illinois (17 Ill. Adm. Code 1050). It was first listed in 1980 as a threatened species due to restricted habitats or low populations in Illinois (Mankowski 2012).

The species is not listed as federally endangered or threatened.

NatureServe gives the species a global rank of G5 (secure) and it is not ranked at a national scale. It is ranked as S2 (imperiled) in Illinois. Other state rankings include an S1 rank (critically imperiled) for the species in Oklahoma and an S3 rank (vulnerable) Indiana, Virginia, North Carolina, and Kentucky. It is not ranked in the remaining states with its distribution (NatureServe 2013; Figure 1).

Total Range

Storax ranges across the southeastern United States from Virginia south to Florida and west to Texas, north to Missouri, Illinois, and Indiana (Figure 1).

Illinois Distribution

In Illinois, the species is historically known from primarily southern and southeastern Illinois, with one northern population in Kankakee County (Herkert and Ebinger 2002). There are historic museum and/or the Illinois Natural Heritage (Biotics 4) Database (Database) element occurrence records (EOs) from 11 counties (EOs have been established from 8 of the 11 counties) and 5 Natural Division Sections (EOs have been established in 3 of the 5 Sections) (Herkert and Ebinger 2002, INHD 2013; Tables 1 and 2, Figure 2).

Currently, there are a total of 23 EOs (across 11 counties) in the Database for Storax. At the time of initial listing, location information was brought forth to establish 5 EOs (across 2 counties and within a single Natural Division Section) and since then 18 EOs (across 9 counties and 2 additional Natural Division Sections) have been added for the species: 6 in the 1980s, 6 in the 1990s, 3 in the 2000s, and 3 since 2010. While new EOs have been added every decade since listing, not every EO is surveyed each year or regularly (7 EOs have no reports since 2002 and 4 additional EOs have no reports since 1992), so the number of EOs with observations in any given year or 5-year interval may not reflect the true status of the species (see Figure 3). There have been recent observations (since 2002) at 11 EOs across 6 counties; representing 4 of the 10 counties and 2 of the 5 Natural Division Sections with known historic distribution. Five EOs

occur on properties that are formally protected by dedication as an Illinois Nature Preserve or registration as an Illinois Land and Water Reserve (INHD 2013; Tables 1, 2, and 3; Figure 2).

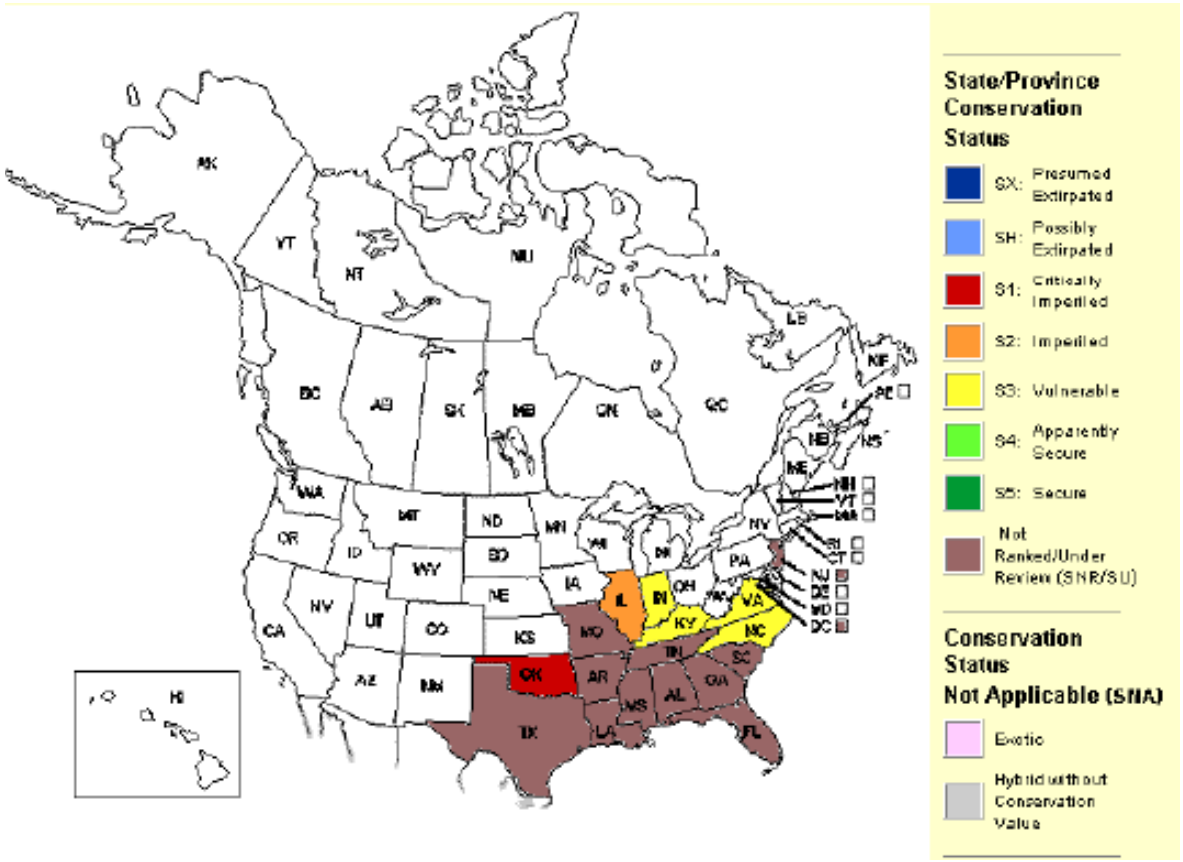

Figure 1. Distribution and NatureServe status of *Styrax americana*, by state and province (NatureServe 2013).

Table 1. Illinois county distribution of *Styrax americana*

	Historic (with no EO)	EO with historic obs	EO w/ recent (since 2002) obs
Alexander		x	x
Clinton	x		
Crawford			x
Hamilton		x	
Jackson	x		
Johnson		x	x
Kankakee		x	
Lawrence		x	
Massac		x	x
Pope		x	
Pulaski		x	x
Union			x
Wayne		x	

Table 2. Illinois Natural Division and Section distribution of *Styrax americana*

DIVISION	SECTION	Historic (with no EO)	EOs with historic obs	EOs with recent (since 2002) obs
Wisconsin Driftless				
Rock River Hill Country	Freeport			
	Oregon			
Northeastern Morainal	Morainal			
	Lake Michigan Dunes			
	Chicago Lake Plain			
	Winnebago Drift			
Grand Prairie	Grand Prairie			
	Springfield			
	Western			
	Green River Lowland			
	Kankakee Sand Area		1	
Upper Mississippi River and Illinois River Bottomlands	Illinois River			
	Mississippi River			
Western Forest-Prairie	Galesburg			
	Carlinville			
Middle Mississippi Border	Glaciated			
	Driftless			
Southern Till Plain	Effingham Plain	?		
	Mt. Vernon Hill Country			
Wabash Border	Bottomlands		4	1
	Southern Uplands			
	Vermilion River			
Ozark Division	Northern			
	Central			
	Southern			
Lower Mississippi River Bottomlands	Northern			
	Southern	?		
Shawnee Hills	Greater Shawnee Hills			
	Lesser Shawnee Hills			
Coastal Plain	Cretaceous Hills			
	Bottomlands		7	10

Note: "Historic with no EO" location information is not precise and assignment to Natural Division Section is based on a combination of known county occurrence, habitat association, and other Natural Division Section occurrences.

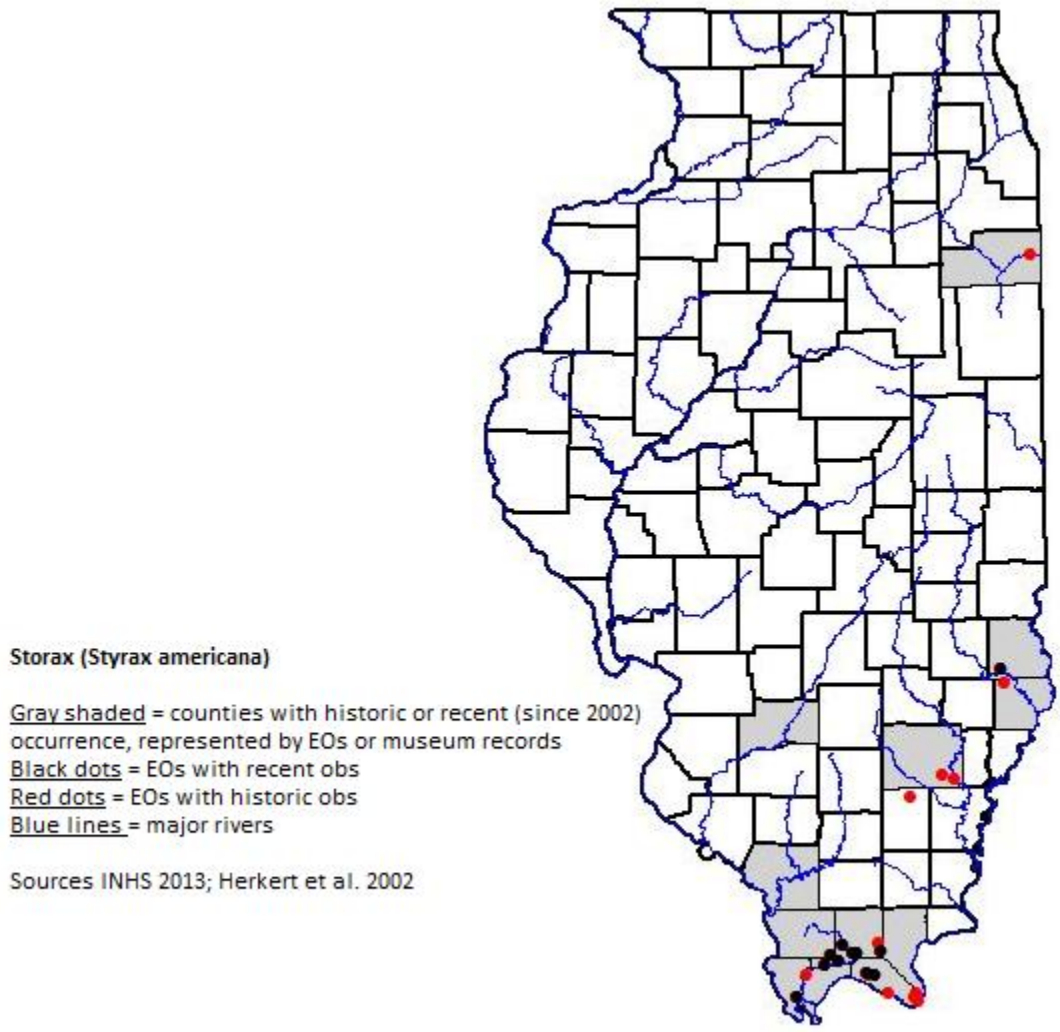

Figure 2. Historic and current distribution of *Styrax americana* in Illinois.

Table 3. Select Illinois Natural Heritage (Biotics 4) Database information for *Styrax americana*: Last observation date; total number of element occurrences (EOs); number of EOs observed since 2002; number of EOs protected as Illinois Nature Preserves or Illinois Land and Water Reserves; number of topographic quadrangles captured by total EOs; number of counties captured by total EOs; and, number of counties captured by EOs observed since 2002.

Last Observation	Total # EOs	# EOs observed since Jan 2002	# of EOs protected as NP/LWR	# topo quads	# Counties	# Counties since 2002
9/26/2011	23	11	5	19	11	6

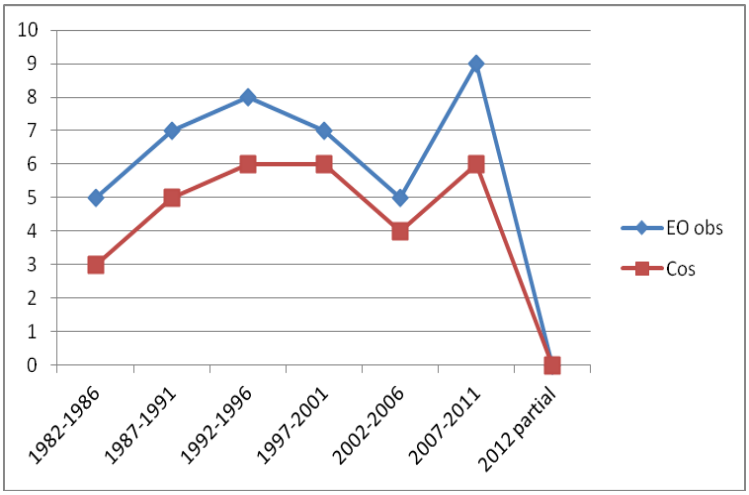

Figure 3. The number of *Styrax americana* EOs in Illinois with observation during respective 5-year intervals and for 2012 (partial).

Description, Biology, and Habitat

Description

Storax is a deciduous shrub or small tree up to 3 meters tall (Herkert and Ebinger 2002). Its widely branched crown can reach a width of up to 3.5 meters. Mature stems are smooth, grey to brown in color and can reach 7.5 cm in diameter. Young branches range in color from green to grey to red-brown. Branchlets are pubescent and have lepidote (small, scurfy) scales during the first year. Buds are narrowly ovoid, 1-2 mm long, mostly pubescent. Leaf arrangement is alternate with slender lepidote petioles up to 7 mm long. The leaves are simple, 3 to 7 cm long, up to half as broad as long, ovate to elliptic with pinnate venation, glabrous above and paler and pubescent on the lower surface with entire to finely serrate margins (Bailey and Bailey 1976, Krüssmann 1986). The leaf apex is acute to acuminate. The fragrant white flowers are perfect, bell-shaped, 1.5 cm long with five reflexed petals and lobes longer than the tube (Gleason and Cronquist 1963). The slender white pistil is exserted beyond the 10 stamens (Johnson and Hoagland 1999). Flowers are solitary or in pairs in the leaf axils or occur in short, terminal pendulous racemes or fascicles with clusters of 1 to 4 flowers. Flowering occurs in April and May (Mohlenbrock 2002). The fruit is a 1-seeded drupe that is globose, puberulent, 6 to 8 mm in diameter and subtended at the base by the persistent calyx that matures from July to October (Johnson and Hoagland 1999).

Species Biology

Storax requires moist soils and prefers shade, it can be seriously threatened by drainage and removal of the forest canopy (Connor no date). Known pollinators include the honey bee (*Apis mellifera* L.), bumble bee (*Bombus* spp.), and monarch butterfly (*Danaus plexippus* L.) (Lenahan 2009). Storax fruits are utilized by rodents, deer and wild turkeys and its leaves are a preferred food of the caterpillar of *Callosamia promethea* (promethea moth) (Cullina 2002).

Storax relies primarily on seed dispersal for natural regeneration, but sprouts will sometimes develop near the base of existing stems and slowly expand to form colonies, especially in heavy shade (Cullina 2002). Seeds are hydrophilic, meaning they are intolerant of dry storage. Seeds will germinate upon being exposed to temperature of 70° F after 60-140 days of cold moist stratification and will germinate better if removed from the husk prior to stratification (Creech no date, Cullina 2002). Seeds maturing in the fall will germinate the following spring. For restorations, seedlings can be obtained either from seed or from cuttings. For introductions, seeds should be collected when they have turned a glossy brown and the capsule has begun to dry and before they have fallen, usually this occurs when leaves begin to yellow. Seeds may be direct-seeded in the fall or stored in sealed, refrigerated containers with damp vermiculite and stratified for 60-90 days at 41 degrees if they are to be grown in a greenhouse. Stratified seed should be sown in the

greenhouse in January or February. A spring seedling can grow two feet or more the first growing season. Plants can also be propagated by June cuttings. Storax usually blooms after 3-4 years of growth.

Habitat

Storax occurs primarily in rich, poorly-drained, acidic soils in dappled sunlight of floodplain forests and edges of swamps in Illinois (Herkert and Ebinger 2002, Lenahan 2009). Where storax occurs, associated tree species include pin oak (*Quercus palustris*), green ash (*Fraxinus pennsylvanica*) , silver maple (*Acer saccharinum*), swamp cottonwood (Populus heterophylla), pumpkin ash (*Fraxinus profunda*), bald cypress (*Taxodium distichum*), overcup oak (*Quercus lyrata*), and tupelo (*Nyssa aquatic*) (INHD 2013).

Reasons for Status and Threats

Storax is at its northern range limit in Illinois and occurs in restricted habitat of floodplain forest and swamp margins. Threats include conversion of habitat, alteration of hydrology (including draining or inundation), woody encroachment, and alteration of canopy that may cause excessive shading or sun. It should be communicated to local land managers that local hydrology should not be altered or subjected to extreme fluctuation and that saturated soils should also not be drained in areas where *S. americana* occurs.

Low population numbers may also be a threat to *Styrax americana* in Illinois. There are 23 EOs for this species, however 10 EOs have not had observations since at least 1997. Of the remaining 13 EOs, most recent observation reports are as follows: "observed" or "several shrubs" at 4 EOs; 1 shrub at 4 EOs; and, 2 shrubs, 6 plants, 9 plants, 15+ individuals, 17 juvenile shrubs and 3 flowering shrubs, and 25 plants, respectively, at the remaining 7 EOs.

Recovery Objectives and Criteria

The Illinois Endangered Species Protection Board is required by law to review, and revise as necessary, the Illinois List of Endangered and Threatened Species at least every five years. We propose that measures of population size and distribution, as documented in the Illinois Department of Natural Resources (Biotics 4) Database, be used to trigger a detailed review of the species' status by the Illinois Endangered Species Protection Board. The measures were developed relative to the status and distribution of the species at the time of original listing and the definitions of "endangered" and "threatened". Achieving the levels of population size and distribution proposed in this outline shall not prompt an "automatic" change in the status of the species in Illinois, and the Endangered Species Protection Board may review the status or status review criteria of the species at any time. Other factors, including known threats, productivity, and extent and condition of protected habitat, should be considered with population size and distribution data to judge whether a change in status is warranted.

Definitions of "endangered" and "threatened" under the Illinois Endangered Species Protection Act.

Endangered in Illinois – in danger of extinction in the wild in Illinois due to one or more causes including but not limited to, the destruction, diminution or disturbance of habitat, overexploitation, predation, pollution, disease, or other natural or manmade factors affecting its prospects of survival.

Threatened in Illinois – likely to become endangered in the wild in Illinois within the foreseeable future.

Listing Status Review Triggers

Endangered – Over the last 5-years, the Natural Heritage (Biotics 4) Database has element occurrence reports for the species that fall below the levels identified in the "Threatened" Listing Status Review Trigger.

Threatened – Over the last 5 years, the Natural Heritage (Biotics 4) Database has element occurrence reports for the species of at least 5 EOs with observations that demonstrate natural recruitment across 2 counties and within one Natural Division Section known for historic distribution and at least 3 of the 5 EOs should have observations in more than one year during the last 10 years. At least 5 EOs must be protected. For EOs that have undergone population manipulation, they must have been liberated from population interventions for at least 3 years and meet the above criteria.

Secure – Remove from the IL List – Over the last 5 years, the Natural Heritage (Biotics 4) Database has element occurrence reports for the species of at least 15 EOs with observations that demonstrate natural recruitment across 8 counties and within three Natural Division Sections known for historic distribution and at least 5 of the 15 EOs should have observations in more than one year during the last 10 years. At least 10 EOs must be protected. For EOs that have undergone population manipulation, they must have been liberated from population interventions for at least 3 years and meet the above criteria.

Recommended Recovery Strategies

Recommended recovery strategies include a combination of monitoring, management, and protection for known populations and a prescription for testing a translocation program for the species to establish new populations. Translocations will be compliant with the INPC/IESPB/IDNR Plant Translocation and Restoration Policy (current version) and will be conducted according to site-specific prescriptions that will include a schedule of review to evaluate the success or failure of individual translocations, the need for prescription adjustments, and whether they should be continued. Translocations will need to be successful and liberated from population manipulation as described above in the Listing Status Review Triggers before they will be considered "wild" occurrences in the statewide population.

Recovery Strategy 1: Assess current status and distribution

a. Conduct surveys at 1/5 of known EOs annually to confirm presence/absence and population numbers of all EOs, within each 5-year cycle. Surveys should cover information necessary to complete an Element Occurrence Reporting form and include the following specific information: the total number of individuals at a location (indicate count or estimate); the number or percent of individuals from younger age classes that demonstrate natural recruitment (indicate count or estimate); the area surveyed and what % of proximate suitable habitat the survey area represents (include a map); and, search effort (person hours).
b. Conduct surveys at two historic locales with no EOs to confirm presence/absence and population numbers (if present), within a 5-year period.
c. Survey for additional suitable habitat and new occurrences in counties/Natural Division Sections known for historic and current populations where EOs have been established.
d. Report results annually to the Illinois Natural Heritage (Biotics 4) Database.
e. At the end of the initial 5-year period, assess whether additional surveys are warranted for areas identified in (b) and (c) or if these locales should be considered low priority areas in allocating future resources.

Recovery Strategy 2: Promote management and protection of known populations.

a. Work with landowners to gain commitment for developing management plans to promote compatible land uses and minimize threats for properties with extant populations.
b. Work with landowners to promote enrollment of properties with extant populations into land protection programs such as dedication as an Illinois Nature Preserve, registration as an Illinois Land and Water Reserve, or a similar conservation easement program.

Recovery Strategy 3: Assess need and potential for augmenting existing populations and/or establishing reintroduced/introduced populations within appropriate habitat.

a. Review status and distribution against Listing Status Review Triggers to determine if augmenting existing populations and/or reestablishing/establishing new populations is necessary.
b. Determine whether local ecotype stock is available for collection of seed and either direct dispersal to receiving sites or for propagation and later planting of propagules to receiving sites. If local ecotype stock is not available, conduct genetic analysis of proposed translocation stock to determine genetic health and compatibility. If propagation of stock is prescribed, methods with demonstrated success should be used – at this time, methods should follow those used for propagation and planting of *Silene regia* by Edgin (Edgin 2012).
c. Perform an assessment of potential translocation areas based on results from Recovery Strategy 1 and relative to Recovery Strategy 3a and assess for potential impacts to other listed species in the proposed receiving sites.
d. Relative to determinations about origin of proposed translocation stock from 3b, and consistent with the INPC/IESPB/IDNR Plant Translocation and Restoration Policy, conduct translocations at sites that have formal protection agreements in place.
e. Translocated occurrences will be monitored annually for at least the first 3 years. Results of the first 3 years monitoring will be reviewed to determine survivorship at the receiving site and success of translocation methods and whether translocation efforts should be continued, ceased, or otherwise adjusted.
f. Report results annually to the Illinois Natural Heritage (Biotics 4) Database.

Recovery Outline Review & Revision

This outline will be reviewed annually by the authors and staff involved with implementation. The need for revisions may be identified at any time. All substantive revisions to this outline, including but not limited to recovery objectives and recovery strategies, should be considered a new recovery plan and follow the protocol described in "The Illinois Department of Natural Resources' Recovery Planning in the Office of Resource Conservation" (current version). As such, recovery planning may be initiated by any staff and follows an established process to ensure proper review and potential conflicts are identified. Updated information – such as new data on distribution and abundance, research results relevant to recovery considerations, changes in taxonomy or nomenclature, and corrections to factual errors in this document – may be posted as addendums to the recovery outline without changing the original document.

Estimated Timing of Strategies

Implementation may take 10 or more years: Strategies will be somewhat implemented in phases and results from the first 5-year interval will greatly inform the overall estimate. Many activities such as landowner contacts, site-specific habitat management plan development, contract administration, etc., will be ongoing throughout the year. A basic schedule of some key implementation activities is presented below.

January	Conduct annual review of recovery outline strategies to confirm priority activities for calendar year. Recovery activities of INPC and IDNR staff are included in respective annual plan of work processes.
February	
March	Confirm information and resources are in place to conduct annual field work.
April	Primary window for spring plantings for translocations (April-May). Primary window for surveys of element occurrence and potential habitat (flowering April-May). If fall plantings are prescribed for translocations, September is the target window.
May	
June	
July	
August	

September	
October	Ensure element occurrence survey reports have been submitted to the Biotics 4 Database. Compile information on annual surveys, translocation activities, and habitat protection.
November	
December	Complete and post biennial progress reports on *Styrax americana* recovery.

Estimated Costs of Strategies

Estimated total cost for establishing 300 plants on 10 protected sites (what is currently estimated as necessary to achieve the population threshold for the Listing Status Review Trigger for "Secure – Remove from the IL List") is between $7,000 and $10,000 plus labor for transplanting. The estimate for staff time for monitoring, habitat searches, and reporting is approximately 0.75 day/occurrence.

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