

U. S. Fish and Wildlife Service

Recovery Implementation Strategy for Short's Bladderpod (*Physaria globosa*)

Prepared by:

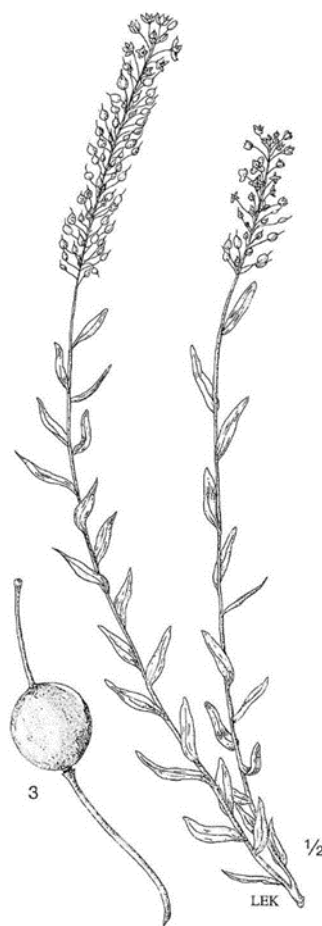
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This Recovery Implementation Strategy describes the activities to implement the recovery actions in the Draft Recovery Plan for Short's Bladderpod (*Physaria globosa*) (Service 2017). The strategy provides the expanded narrative and the implementation schedule for the Short's bladderpod recovery activities. The implementation schedule estimates the cost for recovery of the species (delisting). The Species Status Assessment for Short's Bladderpod (*Physaria globosa*), which provides information on the species' biology and status and a discussion of factors limiting its populations, is available at <http://www.fws.gov/cookeville>. The Recovery Implementation Strategy and Species Status Assessment are finalized separately from the Recovery Plan and will be updated on a routine basis.

Recovery Strategy

The recovery strategy for Short's bladderpod is to ensure the long-term viability of the species through habitat conservation, restoration, and management where extant occurrences are present; research to assess reproductive biology, life history, and ecological factors regulating population growth; surveys to identify new populations; *ex situ* conservation and population augmentation; and increased public awareness. This effort will require collaboration with key stakeholders. Specifically, this recovery strategy calls for the development of an adaptive conservation strategy for populations occurring on lands managed by the US Army Corps of Engineers (Corps) and State and local governments. In addition, agreements with departments of transportation, local highway departments, railroad authorities, and utility companies are required to ensure protection and suitable management of populations near rights-of-way. Collaboration between State conservation agencies and private landowners is needed to protect populations on private lands and manage habitat on conservation lands.

Recovery of Short's bladderpod, a species currently known from only 31 extant occurrences, is founded upon the ecological principles of representation, resiliency, and redundancy (Wolf et al. 2015). In the case of Short's bladderpod, representation necessitates that populations throughout the entire range of this species are a priority for conservation; thus, the entirety of the species range is significant for its recovery. Redundancy requires that multiple populations should be conserved within each region in which the species occurs. Accordingly, multiple populations must be conserved in both the Cumberland and Kentucky River watersheds. Only one population has ever been documented from Indiana, and this population is important for recovery; however, absent discovery of new populations, redundancy in this geographic region is best achieved through secure *ex situ* storage in multiple seedbank accessions. Resilience is contingent upon promoting habitat conditions that facilitate population growth to buffer against genetic, demographic, and environmental stochasticity (Wolf et al. 2015). An effective recovery strategy for Short's bladderpod is contingent upon habitat management and disturbance regimes that promote population stability and growth.

Effective conservation of Short's bladderpod will require improved scientific knowledge of the species and its habitat requirements. Basic information about the life history, breeding system, pollinators, dispersal, and germination requirements of Short's bladderpod is needed in order to develop management strategies to provide suitable habitat for the species. Research must be conducted to understand the influence of ecological factors including light, soil moisture and nutrients, and temperature on germination, recruitment, growth, and reproduction of Short's bladderpod. Knowledge gained through such research will be used to identify disturbance regimes and management strategies that provide favorable habitat conditions for sustaining

resilient populations. In addition to examining disturbance regimes for habitat management, it is important to better understand tolerance of potentially harmful disturbances such as prolonged drought and inundation. In some instances where population sizes are too small to respond to habitat management, *ex situ* measures to support population augmentation might be necessary. Examination of genetic diversity within and among populations will provide valuable information for both *in situ* and *ex situ* conservation measures. In order to understand the influence of habitat management, guide adaptive management of conservation agreements, and assess the recovery of the species, it is necessary to establish and implement standardized methods for monitoring populations and habitat conditions range-wide.

Recovery Objectives

Short's bladderpod is assigned a recovery priority number of 8, indicating a species with moderate degree of threat and high recovery potential. The recovery objectives are to protect, restore, and manage habitat to provide conditions necessary to recover and ultimately remove Short's bladderpod from the *List of Endangered and Threatened Plants* (50 CFR 17.12). This will require an immediate emphasis on researching optimal disturbance regimes and habitat conditions for Short's bladderpod, developing a range wide monitoring protocol, and implementing science-based management of the species' habitat. Where populations are unable to respond to habitat management due to low population size, augmentation using seeds or propagated plants might be necessary. Long-term monitoring of extant and newly discovered and/or reintroduced 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.

Criteria for Delisting

1. Agreements have been reached with key stakeholders to conserve, restore, and manage habitat to provide ecological conditions, as described in the Species Status Assessment for Short's bladderpod, that promote growth of individuals and support resilient populations (addresses Factor A).
2. Monitoring (Action 4) demonstrates stable or increasing population growth rates ($\lambda \geq 1$) and/or an average population size that is equal to or above the minimum viable population size for at least 25 protected populations. A minimum of 6 of these populations must be located in the Kentucky River watershed and 15 populations in the Cumberland River watershed, in addition to the population in the Wabash River watershed, in order to ensure adequate regional representation and intra-regional redundancy of resilient populations. (Addresses Factors A and E.)
3. In lieu of satisfying criteria 1 and 2, the species could be considered for delisting if 50 resilient occurrences (as described in the SSA for Short's bladderpod), protected or unprotected, are distributed among the physiographic regions where the species occurs (addresses Factors A and E).

Recovery Actions Narrative with Stepped-down Activities

1. Work with the Corps to develop and implement a conservation strategy for Short's bladderpod on lands that the Corps owns or controls. In Tennessee, there are 18 occurrences that are entirely or partially located on lands owned or leased by the Corps adjacent to the Cumberland River. Some of these occurrences may be threatened by prolonged inundation and soil erosion along reaches of the Cumberland River that are impounded by Corps dam projects used for flood control and navigation. Given that the long-term viability of these populations is essential to the recovery of Short's bladderpod, management strategies must be developed to restore and/or maintain favorable habitat conditions. Assessment of the impacts of prolonged inundation, both in natural populations (task 1.2) and through *ex situ* experiments (task 5.5), will be an important consideration for the development of adaptive management strategies. The Corps has been an active partner in pre-listing conservation efforts, providing boat access for surveys and monitoring efforts that produced much of the distribution data that were used in designating critical habitat for Short's bladderpod, and has expressed interest in working with the U.S. Fish and Wildlife Service (Service) to develop management plans for Short's bladderpod populations and critical habitat units located on lands owned or managed by the Corps. The development of a conservation strategy, including an adaptive management framework, must incorporate monitoring to measure the effectiveness of habitat conservation efforts.

1.1 Develop and implement an adaptive management framework to manage populations on Corps managed lands. This adaptive management framework should incorporate the findings of research and monitoring that examine the response of Short's bladderpod to canopy thinning and disturbance regimes such as prescribed fire (task 5.1), in addition to prolonged inundation (task 5.5). This framework should explicitly prioritize and develop management strategies to moderate threats from invasive species to Short's bladderpod populations.

1.2 Implement annual monitoring of populations on Corps managed lands. Monitoring, including collecting baseline information prior to the initiation of any active management and/or restoration efforts, will be essential in order to determine the response of populations to management and environmental factors such as canopy closure, drought, and prolonged inundation. The response of natural populations to these environmental stressors, in conjunction with the findings of *ex situ* experiments that evaluate shade, drought, and inundation tolerance of Short's bladderpod (tasks 5.1 and 5.5), should be used to inform management of Corps populations (task 1.1). Monitoring should be conducted using standardized range-wide protocols (task 4)

2. Develop and implement management agreements with departments of transportation, local highway departments, railroad authorities, and utility companies to ensure protection of populations near right-of-ways.

2.1 Determine which populations are potentially impacted by right-of-way maintenance. Although the proposed listing (78 FR 47109; August 2, 2013) specifies that 10 known extant occurrences are located along roadsides and another seven extant occurrences are located along the Old Tennessee Central Railroad right-of-way, the number of populations potentially impacted by utility (power line, gas line,

etc.) right-of ways has not been as well documented. A comprehensive list of all occurrences that are located in rights-of-way that may potentially impact populations is needed.

2.2 Assess potential impacts of rights-of-way maintenance on specific Short's bladderpod occurrences. As noted in the Species Status Assessment (Service 2017) and proposed listing (78 FR 47109; August 2, 2013), in many roadside locations, Short's bladderpod occurs on steep slopes or bluffs, where roadside maintenance would be unlikely to affect the species unless the road was widened, requiring alteration or removal of the slope or bluff. However, poorly timed mowing or indiscriminate herbicide application could damage populations that occur in habitats partly or entirely within roadside or other right-of-ways. Accordingly, the actual threats affecting each of the occurrences documented in task 2.1 should be used as a framework to document the nature of potential threats from rights-of-way for each occurrence.

2.3 Work with right-of-way stakeholders to develop and implement management agreements. Based on the assessment developed in task 2.2, work to develop agreements with right-of-way stakeholders to assure that right-of-way management does not adversely affect Short's bladderpod and provides habitat conditions that will support stable or increasing populations. The greatest threat to populations near right-of-ways is the outright destruction of suitable habitat by road-widening and other construction activities. As noted above, poorly timed mowing or indiscriminate herbicide application could damage populations that occur in part or entirely within roadside habitats. However, well-timed and carefully executed right-of-way maintenance intended to control vegetation encroachment could benefit Short's bladderpod by reducing shading and competition.

3. Work with state agencies and private landowners in Kentucky and Tennessee to obtain protection for populations on privately owned lands and to develop and implement adaptive management strategies for protected sites. Potential mechanisms include fee simple purchase, conservation easement, or establishing a conservation agreement to ensure habitat receives necessary management and is protected from incompatible land uses.

4. Establish standardized methods for monitoring populations and habitat conditions, and initiate regular stage-specific monitoring at occurrences range-wide. Currently, range-wide, monitoring of populations is inconsistent, hampering assessment of long-term population trends.

4.1 Develop a standardized rangewide population monitoring protocol. A standardized rangewide population monitoring protocol should be developed to quantitatively track population trends over time, observe life-history components that are most important for population growth (growth and reproduction) in biennials and short-lived perennials of open habitats, and compare population viability metrics across different sites. This standardized protocol should explicitly be designed to

document threats (e.g., invasive species) and changes to environmental conditions of Short's bladderpod habitat over time.

4.2 Initiate regular stage-specific monitoring at occurrences range-wide. Once a standardized monitoring protocol has been established (task 4.1), occurrences should be monitored annually to enhance knowledge of population trends and responses to climatic events.

5. Conduct research that enhances knowledge of Short's Bladderpod to facilitate the development of scientifically sound management plans and models for conducting population viability analyses.

5.1 Conduct research to identify ecological conditions needed for germination, establishment, and reproduction of Short's bladderpod. To facilitate management and restoration of habitat, the influence of ecological factors, including light availability, soil nutrients, temperature, and precipitation must be investigated. The influence of soil nutrient availability on growth and reproduction of Short's bladderpod and how it varies among occupied sites are unknown. Effects of canopy thinning and disturbance regimes such as prescribed fire on both ecological factors and Short's bladderpod demographic processes must be researched. Range-wide observations indicate that reproduction of Short's bladderpod is greater in high-light conditions, including powerline right-of-ways. These observations suggest that stable populations of this species are dependent upon disturbance and early-successional habitat. However, the use of canopy thinning and/or prescribed fire to manage understory light availability has not been studied. Furthermore, optimal light availability, temperature, soil moisture, and soil nutrient status for seedling establishment and other life-history stages are currently unknown, which is an important area of research for guiding habitat management. In addition to researching disturbance regimes in natural populations, *ex situ* common garden experiments can provide valuable insights into a species' preferred light environment (see Albrecht et al. 2016). For Short's bladderpod, *ex situ* common garden studies should be conducted to determine the species' response to the extent and seasonality (evergreen vs. deciduous) of canopy shading.

5.2 Conduct research to examine life history, seed bank longevity, breeding system, pollination, and dispersal for Short's bladderpod. As discussed in greater detail in the Species Status Assessment, scientific knowledge about Short's bladderpod is very limited and largely anecdotal. In order to effectively conserve and recover this species, it is essential that research be conducted to better understand its life history and reproductive biology. Remarkably, it remains uncertain whether this species is a biennial, short-lived perennial, or whether the species life-history strategy is dependent upon environmental conditions and/or varies throughout its range. Furthermore, only limited or anecdotal information is available regarding the breeding system, pollinators, and dispersal of Short's bladderpod. This information is critical for the recovery of this species. Although anecdotal evidence clearly suggests that Short's bladderpod is capable of forming a seedbank, it is not known how long

seeds can persist in the soil seedbank. An understanding of seedbank longevity is essential for assessing long-term population stability.

5.3 Determine germination and propagation requirements of Short's bladderpod.

Although preliminary studies have been conducted, the dormancy-breaking requirements of Short's bladderpod are not well-understood. An understanding of germination requirements will further aid in understanding the conditions that are needed to provide favorable habitat for all demographic stages (Task 5.1). Understanding interactions among light availability, temperature, and moisture in relation to seed germination will aid in propagation and augmentation programs as well as developing models to predict population responses in the face of predicted environmental change. Development of germination and propagation protocols is also essential for facilitating any future reintroduction and/or augmentation efforts for the species.

5.4 Determine genetic diversity within populations and the genetic structure and distance between range-wide populations.

No genetic research has been conducted for Short's bladderpod. This information is important for understanding relationships among populations in different regions. Knowledge of genetic diversity within and among populations is informative for both *in situ* and *ex situ* conservation measures. Given the need for species recovery criteria to account for representation, redundancy, and resilience (Wolf et al. 2015), knowledge of genetic variation and structure is important when planning conservation actions at multiple scales in order to achieve recovery criteria for Short's bladderpod, a species with only 31 extant occurrences. Specifically, representation requires conservation of populations throughout the entire range of this species, helping to maintain genetic diversity; redundancy requires that multiple populations should be conserved within each region in which the species occurs even if they are genetically similar, and resilience is contingent upon promoting habitat conditions that facilitate population growth to buffer against genetic, demographic, and environmental stochasticity (Wolf et al. 2015).

5.5 Determine the tolerance of Short's bladderpod to prolonged drought and inundation.

Impoundments and artificial water level manipulation have been noted as threats to several Short's bladderpod occurrences (Shea 1993, TDEC 2009), and a better understanding of the influence of prolonged inundation is essential for developing adaptive management guidelines for occurrences that are potentially impacted by water level manipulation (Task 1.1). Although periodic inundation of the Posey County, Indiana populations is caused by natural floodwaters, studying the impacts of prolonged inundation would nonetheless aid in the interpretation of long-term monitoring and population trends at this site. Similarly, drought cannot be controlled; however, understanding the impact of drought on Short's bladderpod will aid in the interpretation of population trends and response to management. Since drought and inundation cannot be experimentally manipulated in natural habitats, *ex situ* common garden and/or greenhouse studies should be conducted to determine the tolerance of Short's bladderpod to these environmental stressors.

5.6 Incorporate results from monitoring and research projects into development of models for estimating minimum viable size and demographic structure of populations and for evaluating extinction risk under various management scenarios. Through monitoring and research discussed above, data will be collected from multiple populations to track abundance and variation (temporal and spatial) in vital rates, extent and severity of threats, and influence of various ecological and genetic factors on vital rates. Incorporation of these data into appropriate models will be needed to evaluate predicted outcomes of alternative management strategies and to estimate minimum viable sizes needed to ensure likelihood of survival for at least 10 generations.

6. Facilitate and support surveys to identify new populations.

6.1 Develop a geospatial database to determine priority areas for surveys. Survey efforts should place priority on locations within the Cumberland and Kentucky River watersheds that contain the primary constituent elements (PCEs) for Short's bladderpod. PCEs are those specific elements of the physical or biological features that provide for a species' life-history processes and are essential to the conservation of the species. PCEs for Short's bladderpod are discussed in detail in the Status Assessment and the final designation of critical habitat (79 FR 50990; August 26, 2014). Predictive distribution models incorporating data on PCEs and other relevant environmental factors should be developed and Geographic Information System software used to map locations for focusing survey efforts.

6.2 Conduct surveys to identify additional populations of Short's bladderpod. State Natural Heritage Program botanists and others in Indiana, Kentucky, and Tennessee should conduct additional surveys based on priority locations identified in Task 6.1, in addition to revisiting extirpated and historical occurrences in which primary constituent elements remain intact.

7. Increase the representation and genetic diversity of *ex situ* collections of Short's bladderpod in seedbanks. Although some populations of Short's bladderpod have been seed-banked repeatedly, only 10 populations are currently known to be secured in *ex situ* storage. Increased representation and redundancy of *ex situ* collections provides an important safeguard against population extirpation and species-level extinction by providing germplasm for population augmentation and/or reintroduction. Furthermore, *ex situ* collections provide essential germplasm for research to understand germination and propagation requirements (Task 5.3).

8. Using seeds or propagated plants, augment populations that are unable to grow in response to habitat management due to low population size, or introduce populations into suitable, but unoccupied, managed habitat on conservation lands. Because some populations are very small, they may lack the demographic or genetic structure needed to grow in response to habitat management. Small populations should, as needed, be augmented with seeds or propagated plants to increase population size and restore demographic and genetic structure needed for population growth. Establishing or reintroducing populations

will be considered in high quality, but unoccupied, habitats located on suitably managed conservation lands within the range of Short’s bladderpod.

9. Continue to coordinate with Federal, State, County and City agencies to promote plant recovery and find innovative ways to increase public awareness of the need to protect this species and its habitats.

9.1 Develop a Short’s bladderpod working group. This voluntary group should be comprised of state Natural Heritage Program botanists, Service recovery leads and representatives from ecological services offices in Indiana, Kentucky, and Tennessee, a representative of the Corps, Center for Plant Conservation representatives from the Missouri Botanical Garden, academic scientists engaged in research and recovery of the species, and other interested parties representing federal, state, county and city lands on which Short’s bladderpod occurs. This working group will serve as a platform for the dissemination of information about Short’s bladderpod and the discussion of species recovery.

Summary of Threats, Criteria, Actions, and Activities

Listing Factor	Threat	Criteria	Action	Activity
A	Right-of-way construction and maintenance	1	2, 9	2.1 – 2.3, 9
	Flooding and water level fluctuation	1	1, 5, 9	1.1, 1.2, 5.5, 9
	Overstory shading	1	1, 3, 5, 9	1.1, 1.2, 2.3, 3, 5.1, 9
	Competition with non-native plant species	1	1, 3, 9	1.1, 1.2, 2.3, 3, 5.1, 9
	Climate change	1	1, 2, 3, 5, 7	1.1, 1.2, 2.3, 3, 5.1, 5.5, 7
E	Small, fragmented populations	2, 3	1, 2, 3, 4, 5, 6, 7, 8, 9	1.2, 2.3, 3, 4.1, 4.2, 5.2, 5.3, 5.4, 5.6, 6.1, 6.2, 7, 8, 9

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IMPLEMENTATION SCHEDULE

Recovery plans are intended to assist the Service and other stakeholders in planning and implementing actions to recover and/or protect endangered and threatened species. The following Implementation Schedule indicates recovery tasks, task priorities, task descriptions, task duration; potential stakeholders and responsible agencies; and estimated costs. It is a guide for planning and meeting the objectives discussed in Part II of this plan. The Implementation Schedule outlines recovery actions and their estimated costs for this recovery program. The cost estimates provided in the Schedule identify foreseeable expenditures that could be made to implement the specific recovery tasks during a five-year period. Actual expenditures by identified agencies/partners are contingent upon appropriations and other budgetary constraints.

While the ESA assigns a strong leadership role to the Service for the recovery of listed species, it also recognizes the importance of other Federal agencies, States, and other stakeholders in the recovery process. The “Responsible Agency” column of the Implementation Schedule identifies partners who can make significant contributions to specific recovery tasks. **The identification of agencies and other stakeholders within the Implementation Schedule does not constitute any additional legal responsibilities beyond existing authorities (e.g., ESA, CWA, etc.).**

Key to acronyms used in the Implementation Schedule

ES	U.S. Fish and Wildlife Service, Ecological Services
IDNR	Indiana Department of Natural Resources
KSNPC	Kentucky State Nature Preserves Commission
MBG	Missouri Botanical Garden
TDEC	Tennessee Department of Environment and Conservation
Corps	U.S. Army Corps of Engineers

Estimated Cost to Recover and Delist: The cost to recover and ultimately delist Short’s Bladderpod is estimated to be \$3,029,000. Some costs are not determinable at this time, and therefore the total cost of recovery may be higher than 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 2063.

Short's Bladderpod Recovery Plan Implementation Schedule

SHORT'S BLADDERPOD IMPLEMENTATION SCHEDULE						
ACTIVITY #	ACTIVITY DESCRIPTION	DURATION	RESPONSIBLE PARTY		COST ESTIMATES (\$K)	COMMENTS
			R4 FWS	Other		
1.1	Develop and implement an adaptive management framework to manage populations on Corps managed lands.	Continuous	ES	Corps	240	
1.2	Implement annual monitoring of populations on Corps managed lands.	Continuous	ES	Corps	235	Start-up costs for program in FY17
2.1	Determine which populations are potentially impacted by right-of-way maintenance.	Continuous	ES	IDNR, KSNPC, TDEC	29	Establish baseline during Year 1, and update status with 5-year Review cycle.
2.2	Assess potential impacts of right-of-ways on specific Short's bladderpod occurrences.	Continuous	ES	IDNR, KSNPC, TDEC	50	Contingent Establish baseline during Year 1, and update status with 5-year Review cycle.
2.3	Work with right-of-way stakeholders to develop and implement management agreements.	Continuous	ES	KSNPC, TDEC, ES	235	Contingent upon completion of task 2.1 and 2.2.
3	Work with state agencies and private landowners in Kentucky and Tennessee to obtain protection for populations on privately owned lands and to develop and implement adaptive management strategies for protected sites.	Continuous	ES	KSNPC, TDEC	900	Assumes that fee simple purchase would be used to protect at least two properties (per Scenario 2 of Draft SSA, v. 1.0, December 2017). Annual costs considered an average, with actual costs incurred sporadically in response to opportunities to protect and manage habitat with willing landowners.

SHORT'S BLADDERPOD IMPLEMENTATION SCHEDULE						
ACTIVITY #	ACTIVITY DESCRIPTION	DURATION	RESPONSIBLE PARTY		COST ESTIMATES (\$K)	COMMENTS
			R4 FWS	Other		
4.1	Develop a standardized rangewide population monitoring protocol.	3 years	ES	IDNR, KSNPC, TDEC,	45	Costs include protocol development and testing
4.2	Initiate regular stage-specific monitoring at occurrences range-wide.	Continuous	ES	IDNR, KSNPC, TDEC	505	Contingent upon completion of task 4.1
5.1	Conduct research to identify ecological conditions needed for germination, establishment, and reproduction of Short's bladderpod.	5 years	ES	MBG, IDNR, KSNPC, TDEC Academia	85	
5.2	Conduct research to examine life history, seed bank longevity, breeding system, pollination, and dispersal for Short's bladderpod.	5-10 years	ES	MBG, Academia	85	
5.3	Determine germination and propagation requirements of Short's bladderpod	3 years	ES	MBG	30	
5.4	Determine genetic diversity within populations and the genetic structure and distance between range-wide populations.	2 years	ES	Academia	45	

SHORT'S BLADDERPOD IMPLEMENTATION SCHEDULE						
ACTIVITY #	ACTIVITY DESCRIPTION	DURATION	RESPONSIBLE PARTY		COST ESTIMATES (\$K)	COMMENTS
			R4 FWS	Other		
5.5	Determine the tolerance of Short's bladderpod to prolonged drought and inundation.	3 years	ES	Corps, Academia	45	
5.6	Develop models to estimate population viability and minimum viable population sizes under various scenarios.	1 year	ES	Corps, MBG, Academia	70	Framework for integrating results from monitoring and research; requires ≥5 years monitoring data.
6.1	Develop a geospatial database to determine priority areas for additional surveys.	2 years	ES	IDNR, KSNPC, TDEC	20	
6.2	Conduct surveys to identify additional populations of Short's bladderpod.	Continuous	ES	IDNR, KSNPC, TDEC	70	Facilitated by completion of task 6.1, with surveys conducted periodically over years of recovery effort.
7	Increase the representation and genetic diversity of <i>ex situ</i> collections of Short's bladderpod in seedbanks.	Continuing	ES	MBG	30	Two years to complete representation in <i>ex situ</i> collections, with periodic need to replenish over time.
8	Augment protected populations that are unable to grow in response to habitat management due to low population size or introduce populations into suitable, but unoccupied, managed habitat on conservation lands.	As Needed	ES	MBG, IDNR, KSNPS, TDEC	200	Estimate based on Scenario 2 from SSA, which calls for augmenting one population in each of four physiographic sections. Work would not be initiated until propagation methods developed and sites selected based on monitoring data - at least 5 years into recovery effort. Annual cost represents an average/year for total cost of augmenting 4 occurrences, distributed among years 5 through 25, with annual costs varying according to work accomplished.

SHORT'S BLADDERPOD IMPLEMENTATION SCHEDULE						
ACTIVITY #	ACTIVITY DESCRIPTION	DURATION	RESPONSIBLE PARTY		COST ESTIMATES (\$K)	COMMENTS
			R4 FWS	Other		
9	Continue to coordinate with Federal, State, County and City agencies to promote plant recovery and find innovative ways to increase public awareness of the need to protect this species and its habitats.	Continuous	ES	Corps, IDNR, KSNPC, TDEC,	110	Working group meetings should occur no less frequently than biennially.

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