

GRANT AGREEMENT PERFORMANCE REPORT

TO: U.S. FISH AND WILDLIFE SERVICE
DIVISION OF FEDERAL AID
HADLEY, MA

FROM: MARYLAND DEPARTMENT OF NATURAL RESOURCES
ANNAPOLIS, MD

GRANT AGREEMENT: E-4-18

GRANT TITLE: ENDANGERED SPECIES CONSERVATION

TOTAL COSTS: \$45,228

JOB PERFORMANCE REPORT

State: Maryland

Project Title: Endangered Species Conservation

Job No.: 657

Job Title: Restore and Manage Sandplain Gerardia Habitat

Principal Investigator: Tyndall

Job Objective:

Restore and maintain more than 1,000 acres of sandplain gerardia (*Agalinis acuta*) habitat.

Activities/Findings:

During the period 1 July 2006 - 30 June 2007, about 25 acres of *Agalinis acuta* habitat were cleared of the invasive and rapidly expanding Virginia pine population in Soldiers Delight Natural Environment Area. The annual monitoring survey was completed; the population was estimated to be only 7 % of the peak count recorded in 1993, probably due mainly to a severe summer drought, and most of the flowering plants had been browsed by deer. Prescribed burning was precluded by inclement weather.

Reasons for deviations (if any):

None.

Recommendations:

Enhanced funding is needed for monitoring and managing a rapidly increasing White-tailed deer population and populations of highly invasive non-native plant species such as Tree-of-heaven and Mile-a-minute. Annual population surveys of *Agalinis acuta* should continue to better understand annual size fluctuations and to monitor for adverse effects of deer and invasive species.

JOB PERFORMANCE REPORT

State: Maryland

Project Title: Endangered Species Conservation

Job No.: 659

Job Title: Seabeach Amaranth Reintroduction

Principal Investigator: Tyndall

Job Objective:

To reestablish a viable seabeach amaranth (*Amaranthus pumilus*) population on Assateague Island National Seashore.

Activities/Findings:

During the period 1 July 2006 - 30 June 2007, reintroduction areas were resurveyed, plus the remainder of Assateague Island (including the Virginia portion). In total, 1,543 plants were documented on the Maryland portion of the island, with another 9 plants found in Virginia. This is the highest number of plants found on Assateague Island since the species was rediscovered in 1998. Excessive deer herbivory continues to significantly limit reproductive output and expansion of the population. Plants were not relocated on Tom's Hook in Virginia.

Reasons for deviations (if any):

None.

Recommendations for the continuance of job:

This job should be continued to monitor reintroduction success.

JOB PERFORMANCE REPORT

State: Maryland

Project Title: Endangered Species Conservation

Job No.: 661

Job Title: Survey and Monitor Sensitive Joint-vetch Populations

Principal Investigator: Tyndall

Job Objective:

To determine the status of sensitive joint-vetch (*Aeschynomene virginica*) in Maryland and to identify critical elements to be included in a conservation/recovery strategy, to provide for the long term sustainability of the species in Maryland.

Activities/Findings:

During the period 1 July 2006 - 30 June 2007, the Taylor Branch subpopulation consisted of only 49 plants compared to its annual average of 440 plants. However, the Upper Manokin subpopulation was 2,242 plants, substantially higher than its annual average of 1,666 plants. The difference in subpopulation size was unexpected and not understood.

Reasons for deviations (if any):

None.

Recommendations for the continuation of the job:

Existing subpopulations need to be visited annually to monitor invasive species populations and shoreline development projects, as well as to collect population data to better understand natural fluctuations in size.

JOB PERFORMANCE REPORT

State: Maryland

Project Title: Endangered Species Conservation

Job No.: 687

Job Title: Monitor Puritan and Northeastern Beach Tiger Beetles

Principal Investigator: Therres

Job Objective:

To monitor the highly sensitive populations of Puritan tiger beetle and northeastern beach tiger beetle occurring in Calvert County and on the Eastern Shore of Maryland and identify potential threats and direct habitat/land use conflicts as shoreline development and stabilization continues along the shores of the Chesapeake Bay.

Activities/Findings:

Work was conducted under contract with Dr. Barry Knisley, Randolph-Macon College. Surveys for adult northeastern beach tiger beetles (*Cicindela dorsalis dorsalis*) and Puritan tiger beetles (*C. puritana*) were conducted at Calvert County, Sassafras River, and lower Eastern Shore sites in 2006. The results for Calvert County are given in Table 1 and for the Sassafras River in Table 2. Note that during previous surveys in Calvert County, Western Shores and Calvert Beach were counted as separate areas but were combined as 1 unit this year. Also, the Warrior's Rest section of Scientists Cliffs was counted as a separate unit in Calvert County this year.

The results of *C. d. dorsalis* surveys in Calvert County indicated a total of only 760 adults in 2006, nearly identical to the 750 counted last year. These 2 counts and the 722 documented in 2004 are the 3 lowest ever recorded since the surveys were initiated in 1988. In the early 1990s, total numbers were over 6,000 in most years and over 10,000 in both 1991 and 1992. The numbers in recent years have been largely driven by the numbers at Western Shores, since all other populations have declined to very low levels or totally lost during this period. It is likely that some of the decline in these past 2 years was a result of Hurricane Isabel. There was clear evidence of very significant erosion of the beach and cliff base at Western Shores in summer 2004.

At Janes Island the total number of adult *C. d. dorsalis* was 3,081 in 2006. This was the second highest count (6,094 in 2002) and suggests a build up of the population in the past 2 years after the lowest count ever in 2004 when only 369 individuals were found. The 2006 count suggests the population has rebounded dramatically from 2004 and is indicative of the recruitment and population increase capabilities of this species.

At Cedar Island the total number of adult *C. d. dorsalis* was 2,454 in 2006, nearly twice the number found in 2005 (n=1,298) and over twice the 1,095 individuals found in 2004.

The total number of adult *C. puritana* found in Calvert County in 2006 was 3,684. This count is the highest since the count of 4,703 in 2000 and in significant contrast to the past 5 years (which had 5 of the 6 lowest counts recorded since the surveys began). The count of 1,101 in 2005 was the lowest ever and indicated a significant progressive decline. The large count in 2006 was accounted for by the significant increase at all sites, many of

which were several fold greater than in 2005. The greatest increases were at Warrior Rest, Western Shores/Calvert Beach, and Little Cove Point. The causes of this sudden increase from last year are unknown, but it clearly demonstrates the capacity for rapid population build-up in *C. puritana*. Because this species has a 2-year life cycle, the high count in 2006 is an apparent result of significant recruitment and high survivorship of the 2004 count. Some of the recovery could have been a result of Hurricane Isabel in 2004 which cleared out some of the vegetation which had been increasing along the cliff base and back beach at several sites.

The results of surveys for adult *C. puritana* at all sites at the mouth of the Sassafras River in 2006 were a total of 1,221 adults. This count is in contrast to the 458 in 2005 and 398 in 2004. Other recent counts, also low, were 400 in 2002 and 411 in 1999. The 2006 count was the highest since 1996 when 1,891 beetles were counted and represents a very significant increase from the counts of less than 750 since 1997. The annual count is still much lower than the high of 2,755 in 1992. Most of the 2006 increase was due to the dramatic increases at East Lloyd and West Turner. There were also relatively large increases at Grove Point and North Stillpond. The cause of the increases at these sites is unknown. The increase is clearly a result of factors that produced excellent recruitment in 2004 and survival of the larvae since that time. The cause of the decline in the Sassafras metapopulation over the past 8 years is uncertain, but our observations during these surveys suggest it is probably a result of a decline in habitat suitability.

Table 1. Population census counts of adult *Cicindela dorsalis dorsalis* and *C. puritana* at all Calvert County survey sites during 2006 surveys.

Site	Number of adults	
	<i>C. d. dorsalis</i>	<i>C. puritana</i>
Randle Cliff	0	18
Camp Roosevelt	0	0
Bayside Forest	0	6
Warrior's Rest	0	1,388
Scientists Cliffs	0	213
Western Shores & Calvert Beach	699	886
Flag Ponds	61	0
Calvert Cliffs State Park	0	338
Nuclear Power Plant	0	109
Cove Point	0	0
Little Cove Point	0	615
Cliffs of Calvert	0	111
	760	3,684

Table 2. Population census counts of adult *C. puritana* at Sassafras River survey sites during 2006 surveys.

Site	Number of adults
Grove Point	273
Ordinary Point	30
North Stillpond	143
West Betterton	23
East Betterton	6
East Lloyd	554
West Turner	172
East Turner	20
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	1,221

Reasons for deviations (if any):

None.

Recommendations for the continuance of job:

This job should be continued at least until such time as the tiger beetle populations have been fully recovered. Monitoring of all tiger beetle populations within Maryland is needed to annually assess changes or threats to the tiger beetle populations.

JOB PERFORMANCE REPORT

State: Maryland

Project Title: Endangered Species Conservation

Job No.: 695

Job Title: Monitor Dwarf Wedge Mussel Populations

Principal Investigator: McCann

Job Objective:

To provide more detailed information on the distribution and relative abundance of the dwarf wedge mussel (*Alasmidonta heterodon*) in the Three Bridges Branch watershed, and continue population monitoring at other streams.

Activities/Findings:

Three Bridges Branch Inventory

In 2005, *A. heterodon* was incidentally discovered in Three Bridges Branch, a small tributary of the Corsica River on Maryland's Eastern Shore. This was the first record from the Corsica River watershed, an area dominated by large agricultural fields and small forest tracts with rapidly expanding residential development. In 2006, to document the mussel's distribution, relative abundance and age/size distribution throughout the Corsica River watershed, we conducted surveys at 30 100-m long stream sections spaced systematically at 1 km intervals along all perennial non-tidal streams. These surveys revealed that a relatively small, reproducing *A. heterodon* population occurs in Three Bridges Branch and an unnamed tributary; however, the species is probably absent elsewhere in the Corsica watershed.

In 2007, surveys were confined to the Three Bridges Branch portion of the Corsica watershed in order to (1) obtain more detailed information on *A. heterodon* relative abundance and age/size distribution, and (2) more precisely determine the upstream and downstream extent of the population. We conducted snorkel/bucket surveys at 7 100-m long stream sections. Surveys yielded a total of 475 live native unionids representing 5 species along with 109 dead shells. *A. heterodon* was present at 5 of 7 sites where we detected a total of 8 live individuals and 19 dead shells. At 1 of these sites, only dead shells (n = 6) were found. *Elliptio complanata* was, by far, the most common species. It was present at all 7 sites and comprised 98% (465) of all live unionids found and 80% (87) of the dead shells. Although still quite rare in Three Bridges Branch, *A. heterodon* was the second most common species. It represented just 1.7% and 17.4%, respectively, of the live and dead mussels found. Other unionids found were *Anodonta implicata* (2 live, 1 dead), *Pyganodon cataracta* (1 dead) and *Strophitus undulatus* (1 dead). The latter represents the first record from the Corsica River watershed. *S. undulatus* is the only other listed species, besides *A. heterodon*, that has been documented in this watershed. The rarity of *A. implicata* and *P. cataracta* was not unexpected; both species tend to occur in slack water and still water areas along slow-moving streams and rivers, as well as impounded waters. These conditions are lacking in Three Bridges Branch. However, the apparent absence of *E. fisheriana*, a watch list species, was surprising. During 2006 surveys, it was the second most common species in Three Bridges Branch and elsewhere in the Corsica River watershed although it does have a spotty distribution and only represented 2.5% of all live mussels found.

Our 2007 surveys extended the distribution of *A. heterodon* along Three Bridges Branch by approximately 0.5 km further upstream and 0.2 km downstream, for a total occupied stream length of 2.7 km. The upstream limit occurs about 300 m downstream from the Rt. 301 bridge where a single live specimen was found. The stream channel just below this bridge is heavily scoured, probably due to highway runoff, and consists mostly of deeply gouged pools. The substrate here is probably too unstable and coarse (mostly large gravel, cobble and clay marl) to support *A. heterodon* and, as our surveys indicate, most other mussels. The downstream limit of *A. heterodon* along Three Bridges Branch appears to coincide with the upstream end of a broad, open, active beaver impounded section that extends for 0.5-0.7 km along the stream's floodplain. The stream here is highly braided, shallow, warm and turbid due to beaver activity; no mussels of any species were found. Although beaver activity probably provides some long-term benefits to *A. heterodon* and other stream organisms, especially by trapping sediment runoff from nearby farms and increasing overall habitat stream heterogeneity, it appears to have negatively impacted the mussel fauna along this particular stream section over the short term.

Our surveys also extended by approximately 0.5 km the upstream limit of *A. heterodon* along an unnamed 1st-order tributary of Three Bridges Branch. Here, *A. heterodon* occurs along a total stream length of 2.8 km, which slightly exceeds the length of known occupied habitat along the main stem of Three Bridges Branch. These survey results now put the total range for the entire Three Bridges Branch watershed at 5.5 km. No live individuals were found at the most upstream survey station along this unnamed tributary but we did collect 6 fresh dead shells and it's likely that suitable habitat extends at least 100-300 m further upstream; unfortunately, we were unable to obtain landowner permission to continue surveys further upstream. Along this uppermost survey station, the stream averages just 1.5 m wide (range = 0.3-3 m) and 20 cm in depth (range = 6-60 cm). This tiny tributary represents the smallest stream in which *A. heterodon* has been found in Maryland, and perhaps range wide.

During 2006-07, we found a total of 23 live *A. heterodon*. Each was marked and then returned to its exact capture location to help facilitate long-term population monitoring. We also measured (length, width, height) and aged each individual. Data on age and size distribution along with relative abundance indicate that a relatively small, sparsely distributed but reproducing population resides in the Three Bridges Branch watershed. Mussel age ranged from 3 to 9+ years (mean = 6.2). The average length, width and height was 37.0 mm (range = 22.5-48.6 mm), 16.8 mm (range = 7.4-26.7 mm), and 18.3 mm (range = 8.0-27.1 mm), respectively. These findings reveal multiple age classes including both very young and fairly old individuals, and a preponderance of mature mussels.

Other analyses are in progress, including comparisons of relative abundance, detection rates, total occupied stream length, and age/size distribution with other Maryland streams where similar data has been collected for *A. heterodon*. Such comparisons should provide insights into the relative population size and viability of Maryland's *A. heterodon* populations.

Population monitoring at Browns Branch, Nanjemoy Creek, and McIntosh Run

We planned to continue annual monitoring at Browns Branch, Nanjemoy Creek and McIntosh Run during 2007. However, we decided to forego this part of the project because of the severe, on-going drought in the eastern half of the state. Drought conditions were particularly severe in southern Maryland. We were concerned that surveys might further stress individuals and that survey results might be compromised. Drought conditions appeared less severe

in Three Bridges Branch where numerous seeps seem to provide more stable flow regimes and recent rains just prior to 2007 surveys provided some drought relief, albeit temporary.

Reasons for deviations (if any):

No population monitoring was conducted at three streams due to a severe drought.

Recommendations for the continuation of the job:

Population monitoring should be continued. A systematic inventory should be conducted in the Herring Run watershed in Caroline County where a single fresh dead *A. heterodon* shell was incidentally found in 2007. Additional de novo inventory work is also needed in other streams with potential *A. heterodon* habitat. These efforts provide important information on the status, distribution, population trends and viability of the mussel in each stream, and yield valuable insights into potential threats and conservation needs.

JOB PERFORMANCE REPORT

State: Maryland

Project Title: Endangered Species Conservation

Job No.: 697

Job Title: Puritan Tiger Beetle Habitat Restoration

Principal Investigator: McCann

Job Objective:

To restore suitable cliff habitat for puritan tiger beetles on Sassafras River Natural Resources Management Area by controlling encroaching vegetation.

Activities/Findings:

During 2006, habitat restoration in the form of vegetation control was initiated along two shoreline cliff sites along the Chesapeake Bay, each approximately 200 m in length, using an herbicide (brand name Habitat, active ingredient Imazapyr; EPA labeled for use in and around aquatic habitats and listed as nontoxic to terrestrial and aquatic animal species). Both cliffs occur on Sassafras River Natural Resources Management Area, a state-owned property in Kent County on Maryland's upper Eastern Shore. Each cliff area currently supports a small to moderate-sized puritan tiger beetle population. However, populations at both sites have declined during the past 10-15 years. Vegetation encroachment on these cliffs has significantly reduced habitat suitability for the beetle and is likely responsible, at least in part, for the decline in beetle numbers. Similar habitat changes are occurring at other sites in the Sassafras River area, which currently supports approximately 20% of the world's remaining populations. This first-ever attempt at habitat restoration for the species in the Chesapeake Bay region promises to significantly bolster the long-term viability of the species at these 2 sites and the Sassafras River metapopulation and species as a whole.

Restoration planning and pre-treatment monitoring were funded with Section 6 monies and the vegetation treatments were funded under a separate contract with the U.S. Fish and Wildlife Service's Chesapeake Bay Field Office.

Cliff vegetation was treated with herbicide in late August 2006 by an experienced, licensed (state-issued license to apply herbicides) 2-person crew employed by MD Department of Agriculture and Kent County Weed Control Program. Herbicide was applied using a truck-mounted low-volume spray and 200 m of hose which allowed excellent spray coverage from both the top and bottom of the cliffs. Truck access to the cliff top was achieved by clearing vegetation along an existing old road located within 5-30 m of the cliff top edge and roughly parallel to the cliff. Follow-up inspections of the extent of cliff vegetation die-back during September and October 2006 indicate that most vegetation was affected, as indicated by plant yellowing or chlorosis. Site inspections during spring 2007 further confirmed that most cliff vegetation in spray areas had died. Additional cliff vegetation control may be needed in 2008 and at some yearly interval thereafter to be determined (e.g., perhaps every 3-5 years). Additional site inspections will occur in spring 2008 to determine vegetation control needs. We will also continue to evaluate the need for removing dead vegetation and shoreline debris.

To determine the effectiveness of the herbicide treatment and its effects on puritan tiger beetle populations, we collected baseline or pre-

treatment data in 2006 on adult beetle numbers and cliff vegetation cover and composition at the 2 cliff areas that will be treated with herbicide as well as 4 nearby cliffs where no herbicide use will occur (i.e., control sites). Beetle and cliff vegetation monitoring data will also be collected in 2007 (first year post-treatment). Adult beetles will be monitored during peak adult emergence in mid-July using a series of 4-6 index counts conducted over a 1-day period.

Cliff vegetation was monitored during early-mid August 2006 via offshore digital photos at GPS-referenced locations. The photos will be used to determine the effectiveness of cliff vegetation control efforts and to monitor overall changes on the extent and distribution of cliff vegetation at both control and treatment cliff areas. In August 2006, we also collected baseline data on cliff vegetation composition at a series of 10-m wide vertically oriented, cliff-face plots. In each plot, we recorded species-level cover class data on cliff vegetation. To date, cliff vegetation control appears to have been highly effective, resulting in the removal of most live cliff vegetation in treated areas. Analysis of adult beetle and vegetation monitoring data is in progress.

Reasons for deviations (if any):

None.

Recommendations for the continuation of the job:

Additional herbicide and/or mechanical control of cliff vegetation may be needed in 2008 and in subsequent years, at some yearly interval to be determined. Annual adult beetle and vegetation monitoring should be continued. This project provides important information on the effectiveness of the cliff habitat restoration efforts and its effects on beetle populations. The restoration could significantly increase puritan tiger beetle population size and viability.