Applicant Summary

Review Process for Projects Involving Puritan Tiger Beetles in Calvert County portions of the Chesapeake Bay

Chesapeake Bay Field Office

U.S. Fish and Wildlife Service

In consultation with

Maryland Department of Natural Resources

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Purpose of this document

The Puritan tiger beetle (*Cicindela puritana*) is protected by both the Federal Endangered Species Act (ESA) and the Maryland Nongame and Endangered Species Conservation Act (§10-2A-05.1), as amended in 2010. Similar to the federal ESA, Maryland State law requires projects that will take Puritan tiger beetles to obtain an Incidental Take Permit (COMAR 08.03.08.14). The permit application requires a conservation plan that describes how the project proponents will avoid, minimize and mitigate the impacts of the project for Puritan tiger beetles. In addition, a recent Population Viability Analysis (PVA) of this species (Gowan and Knisley 2010) indicates that some loss of carrying capacity with off-setting conservation is possible without jeopardizing the survival and recovery of this species.

The following document describes the U.S. Fish and Wildlife Service's approach to reviewing projects involving Puritan tiger beetles, using an approach that is consistent with State and Federal law while incorporating the most current information on this species. It is the intent of the Service and the Maryland Department of Natural Resources to make the Federal and State permit/consultation processes and requirements as similar as possible. This document has been created through the thought and discussion of State and Federal biologists and academic experts with this common goal.

Background

The Puritan tiger beetle inhabits the dynamic shorelines of the Chesapeake Bay where there are tall eroding cliffs and adjacent sandy beaches. Listed as a federally threatened species in 1990, the entire range of this species includes two small populations along the Connecticut River, one in Massachusetts and another near Hartford, Connecticut, and two meta-populations in the Chesapeake Bay. The largest Maryland meta-population occurs on the western shore of the Chesapeake Bay in Calvert County, and the second and smaller metapopulation occurs along the eastern shore around the mouth of the Sassafras River in Cecil and Kent County.

In Maryland, these beetles spend their entire life cycle on or near eroding cliffs and adjacent sandy beaches. Adults emerge in mid to late June and are active into early August. Adults forage and mate along the narrow beaches, retreating to the cliff face at high tide. Females move up the cliff face adjacent to the beach and lay their eggs in unvegetated surfaces of the cliff, in strata of moderately compacted and sandy soils. Larvae pass through three instars or growth stages in permanent burrows in the cliff face, typically over two winters, then emerge as adults in June two years after eggs are laid. Bare, eroding cliff faces provide ideal habitat while stabilized cliffs with heavy vegetation cover are not suitable.

The high cliffs along the Chesapeake Bay where Puritan tiger beetles occur are rare geological features that represent less than 3% of the Bay's entire shoreline (approximately 11,600 miles) (VIMS 2006). The high cliffs must also have the sandy strata preferred by the Puritan Tiger Beetle females for ovipositing, thus appropriate habitat is rare (Knisley and Fenster 2009). Cliff erosion occurs at all Puritan tiger beetle sites on the Chesapeake Bay and is considered essential to maintain the unvegetated cliff faces that this species needs. The most famous of the high cliff areas are the cliffs of Calvert County which are noted for fossil shark teeth and other Miocene fossils that can be found along the beaches and are produced from the eroding tall cliffs. The erosion rates of cliffs vary but often are very high and this includes both erosion at the toe of the slope and upper cliff collapses (Leatherman 1986, Clark et al. 2004). The entire Bay has experienced relative sea-level rise, and erosion of islands and shorelines has been occurring for a long time (Leatherman 1986, USGS 1998, NOAA 2006, IPCC 2007). Thus, residential development along the shoreline is vulnerable and, as a result, a variety of shoreline erosion control measures have been implemented and a great deal of the Bay shoreline has already been hardened (VIMS 2006). Shoreline erosion control structures such as bulkheads and revetments replace the beach habitat used by adult tiger beetles and over time, the cliff habitat is also lost. Permitting these structures clearly reduces the total habitat available for this species.

Recovery Criteria for the Puritan Tiger Beetle

This review process must be consistent with the potential recovery of this species. The recovery plan for the Puritan tiger beetle (USFWS 1993) sets specific recovery criteria for the species and these focus on protection of at least six large (500-1000+ adults) populations and their habitats at current sites along both shores of the Chesapeake Bay . In addition, there must be sufficient habitat protected between these larger populations to maintain connectivity. There are currently three large subpopulations that are protected and a few small ones in the Sassafras River metapopulation (Table 1). We will need at least two more large subpopulations protected, through public ownership or conservation easement, in Calvert County to meet recovery goals. We expect to move forward towards these goals through pro-active recovery work and the conservation measures implemented through this review process.

Threats

Residential development on the top of the cliffs where beetles occur is not a threat by itself; however, any subsequent shoreline erosion control measures destroys Puritan tiger beetle habitat by stabilizing the cliff face and altering or eliminating beach habitat. Residential areas planned in the 1950's frequently underestimated erosion and established lots too close to the edge of the cliff. While Calvert County regulations now require or recommend greater setbacks for future development, some of the existing lots are too close to the edge and some homes are already vulnerable to collapse at the top of the cliff. Erosion control measures desired by many landowners are the major immediate threat to the Puritan tiger beetle.

There are several types of erosion control measures, and while they vary in the severity of their impacts to Puritan tiger beetles, all of these measures cause some reduction in the overall suitability of the habitat because they decrease erosion rates, may eliminate beach habitat, stabilize the cliffs and increase vegetation growth. Table 2 provides a description of the main approaches to shoreline erosion control and the relative impacts to tiger beetle habitat. The goal of the following project review process is to balance the needs for some erosion control measures while maintaining enough of the best habitat for Puritan tiger beetle populations to prevent extinction of this species and further its recovery.

Preventing Extinction of Puritan tiger beetles

A Population Viability Analysis (PVA) conducted for this species in 2005 (Gowan and Knisley 2005) concluded that we could not maintain this species only on the State lands where it was already protected and that maintaining the populations on private lands was necessary to prevent extinction. The extinction probabilities calculated in that study also suggested fairly high risks of extinction even if all sites could be maintained, especially for the smaller eastern shore metapopulation. A second PVA was recently conducted (Gowan and Knisley 2010) to include more recent monitoring data and to address a different set of management strategies with a different approach based on new information. The results of this model suggest that some small amount of habitat loss (10-20%), with comparable conservation measures, might still enable PTB to persist and recover. Thus this project review process was established to allow some losses of habitat with appropriate conservation to occur.

Project Review Process

The following is intended to identify the information needed for the USFWS and the State of Maryland regarding a shoreline erosion control project. It is likely that much of this information is already provided in the application to MDE and the COE for the Section 404 permit.

Step 1. The information needed for the USFWS and the Maryland DNR about the project is identified in the Puritan Tiger Beetle Permit Checklist (Appendix A). Much of this information will already be in the permit application submitted to the USCOE. Provide this information and schedule a meeting with the Chesapeake Bay Field Office. (Contact: Julie Slacum, 410-573-4595).

Step 2. The Field Office will schedule a meeting to discuss the impact of the project on Puritan tiger Beetles with the applicant and representative of the State of Maryland. At this meeting, the Service will go through their assessment of the impact of the project and discuss ways to minimize the impacts and/or conservation measures needed to off-set the impacts of this take or loss of habitat. At this meeting, attendees will discuss the following:

Agenda of meeting

a) Quantifying the impacts of the project. The impact of a project depends on the size of the project (e.g. length of shoreline with erosion control structure) and the quality of that shoreline in terms of the productivity of that habitat for beetles. We use

the term carrying capacity to reflect this productivity. Thus losses of shoreline with highly productive beach and cliff habitat have a greater impact than losses of shoreline where the beach and cliff habitat are not as productive. Overall we will assess the impacts of the project and evaluate whether they jeopardize the continued existence and survival of this species (Table 3).

b) Quantifying the losses of carrying capacity: The productivity of sections of shoreline is described in terms of *carrying capacity (also abbreviated as K*). Carrying capacity is the ability of the habitat to produce and sustain Puritan tiger beetles. The average number of beetles counted in the last 5 years (2005-2009) per 100 m of shoreline is used to describe the % of the total carrying capacity that segment of beach provided to the subpopulation. *The Service will quantify the % of carrying capacity lost as a result of the project.*

Puritan tiger beetles need both cliff face habitat and beach habitat. When assessing the potential impacts of the project to the carrying capacity of the Puritan tiger beetle, we consider the loss of the cliff and beach habitats to have equal importance. Thus, the beach and cliff habitats will each account for 50% of the total carrying capacity on the property.

c) As described in the checklist, are there ways to minimize the loss of habitat? Are there any other options besides total losses of habitat such as occur from revetment projects and cliff grading? Alternatives to riprap and revetments include shoreline stabilization techniques such as near-shore or off-shore structures, reef-balls, etc. and these are much less damaging to Puritan tiger beetle habitat than placing rock on the shoreline (Table 2). However, if alternative measures are not possible, then revetment type structures should minimize impacts to beetles by 1) reducing the length of structures to the greatest extent possible, 2) avoiding direct disturbance to the cliff face, 3) using tapered ends on revetments to minimize the adjacent scouring effects, and ,4) excluding construction activities during the adult breeding season of June through August in order to minimize adult tiger beetle mortality.

The absence of any direct disturbance to the larval cliff habitat is likely to allow the cliff to continue to provide suitable larval habitat for several years. Assuming that it continues to offer habitat for the next 10 years of our 100 yr planning time frame for this species, the absence of direct disturbance to the larval habitat is projected to soften the loss to only 90 % of what could be lost on the cliff. For example, if the cliff face is graded and covered in fabric, there is 100% loss of the cliff habitat for the full 100 years. Not grading the cliff face will reduce impacts to PTB. Thus, a project that has complete

coverage of the beach but no grading of the cliff would have impacts calculated as 0.9 times the K on the cliffs and 1.0 times the K on the beach (see Table 4 for example).

d) Developing Off-setting Conservation Measures or Mitigation Measures: If destruction or alteration of the beach or cliff habitat cannot be avoided, then the project must off-set the losses of habitat with mitigation or conservation measures as part of the project plan. Mitigation is a requirement under the state's incidental take permit process. Mitigation measures may include: a) permanent protection of other property having PTB habitat; or b) restoration or permanent protection of PTB by participating financially in the Maryland Department of Natural Resources Puritan tiger beetle Habitat Conservation Program (Appendix B). If the applicant decides to find their own mitigation through a conservation easement that protects at much carrying capacity as was lost from the project, the Service can help with identifying survey segments with comparable or higher carrying capacity. However,

it is up to the applicant to obtain the conservation agreements on the mitigation properties.

Habitat restoration/enhancement (narrow beach supplementation or cliff vegetation control) can be part of the compensation package if it is likely to provide long-term improvement in the habitat. This can be conducted on the properties included in the conservation easement or at other locations.

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Table 1. Puritan Tiger beetle subpopulations indicating those that are currently protected (*) and the average total population from last 5 years of data (2005-2009). Those subpopulation names in bold text are large enough to meet Recovery Plan criteria.

Subpopulations	Average number of PTB in each subpopulation (from 2005–2009)	% of Metapopulation Carrying Capacity in each Subpopulation
Calvert County Metapopulation		
Randle Cliffs *	43	1
Bayside Forest	11	0
Scientists Cliffs	319	5
Warrior Rest * 1430	23	
Western Shores/Calvert Beach	950	15
Calvert Cliffs State Park * 1259	20	
Calvert Cliffs Nuclear Power Plant	372	6
Little Cove Point	1238	20
Cliffs of Calvert	544	9
Total	6166	
Sassafras River Metapopulation		
Gove Point	1016	16
Grove Point WMA *	0	0
Ordinary Point *	101	2
North Still Pond	182	3
West Betterton	91	1
East Betterton	32	1
East Lloyd Creek	523	8
Sassafras NRMA * 576	9	
East Turner	23	0
Total	2544	

* Protected subpopulation

Table 2. Comparison of potential alternatives for shoreline erosion control.

Alternative	Effectiveness For Erosion Control at toe of slope	Predicted Impacts on PTB Habitat (without adaptive mgt.)	Monitor-ing Require-ments	Adaptive Management Requirements
No Action	None	Maintains habitat for adults and larvae	None	None
Reef-Ball Breakwater	Low to Moderate (Little empirical data available)	Probably Minor. Maintains or enhances adult habitat. May increase vegetation growth on larval habitat.	Intensive annual program	Probably minor (No empirical data available), but long-term
Offshore Segmented Breakwater	Moderate to High	Minor to Moderate. Maintains or enhances adult habitat. Probably increases vegetation growth on larval habitat.	Intensive annual program	Probably minor (No empirical data available), but long-term
*** Tombolo – Offshore breakwater with sand back-fill**	Moderate to High	Moderate. Maintains beach habitat – may enhance beach if sand size is correct for beetles. Probably will significantly increase vegetation growth on larval habitat.	Intensive annual program	Probably minor (No empirical data available), but long-term
Near-shore Breakwater	High	Moderate to Severe. Can trap logs and cause woody debris on beach. Has eliminated adult habitat and larval habitat at Grove –Will not work**	Intensive annual monitoring program.	Major long-term commitment to vegetation control program.
Revetment	Highest	Eliminates adult and larval habitat in project area	None	None

Table 3. Puritan Tiger Beetle Take Matrix - Sources and type of take of Puritan tiger beetles from a typical revetment project.

COUNTY and SUBPOPULATION:				
PROJECT NAME: Example from a typical revetment		**DATE:**		
PROJECT TYPE:				
	Direct impacts from actual process of habitat disturbance/destruction		**Indirect (later) impacts from loss of habitat**	
	take or harm - death, injury, or habitat modification that significantly impairs essential behavioral patterns resulting in death or injury	**harass** - significantly disrupt normal behavior patterns	**take or harm** - death, injury, or habitat modification that significantly impairs essential behavioral patterns	**harass** -significantly disrupt normal behavior patterns
Feeding and Sheltering of Young - LARVAE	**Larvae that are in the cliff face can be killed by destruction or alteration of soil layers where larvae occur: this can occur through removing soil from the cliff face, or placing material to cover the cliff face.**	n/a	**Vegetation that is allowed to cover the cliff face prevents adults from laying eggs in the cliff face and prevents reproduction. Vegetation is promoted by placement of rock on beaches below the cliff:**	n/a
Breeding and Feeding - ADULTS	**Adults can be killed by placement of rock or other materials on beaches during the times of year when adults are active.**	n/a	**Placement of rock on beaches at any time of year destroys the habitat used by adults for feeding and breeding. Adults are thus not available to forage or mate on the beach and reproduction in this area stops.**	**Once shoreline control structures are in place, adjacent beach can be lost from scouring, reducing the amount of beach habitat in adjacent areas. In addition, they present a break in the habitat for beetles in adjacent areas. They cause minor or major obstacles for the dispersal of adults.**

Table 4. Example of calculation showing partial losses

If the shoreline segment contained 4.2% K, then there would be 2.1% K in the cliff habitat and 2.1% K in the beach habitat. If the project resulted in a 90% loss of the

Cliff habitat and 50% loss of the Beach habitat, the calculation would be as follows. This is compared to the calculation of total loss of K.

		Partial Losses (% K * the proportional loss)	Total Losses (% K * the proportional loss)
CLIFF	50% of K in Segment	2.1% K * 0.9 = 1.89 % K	2.1% K * 1 = 2.1% K
BEACH	50% of K in Segment	2.1% K * 0.5 = 1.05 % K	2.1% K * 1 = 2.1% K
TOTAL		Total losses = 2.94 % K	Total losses = 4.2% K