

March 28, 2006

Colonel Robert J. Davis, Jr., P.E.
District Engineer
Baltimore District, Corps of Engineers
Post Office Box 1715
Baltimore, Maryland 21203

Reference: Section 7 Consultation

CENAB-OP-RMN (CHESAPEAKE HAVEN CIVIC ASSOC., INC.) 2004-64799

CENAB-OP-RMN (JAMES TAYLOR) 2004-64923

CENAB-OP-RMN (MURL CLARK) 2004-64867

Dear Colonel Davis:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the three above-referenced nearshore breakwater projects located at Grove Point in Cecil County, Maryland, and their effects on the Puritan tiger beetle (*Cicindela puritana*), in accordance with section 7 of the Endangered Species Act (ESA) of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*). The Service received your request to reinstate formal consultation on these revised projects on February 7, 2006.

This Biological Opinion (BO) is based on information provided in the permit applications, telephone conversations, field investigations and biological reports, information in the exhibits provided by the applicants, and other sources of information. A complete administrative record of this consultation is on file in the Chesapeake Bay Field Office (CBFO) of the Service.

I. CONSULTATION HISTORY

- 11/04/04 The Service received the U.S. Army Corps of Engineers (Corps) request to initiate formal consultation regarding three proposed shoreline revetment projects on the applicants' properties.

- 11/15/04 The Service met with James Doyle, Attorney for the one of the applicants, the Chesapeake Haven Civic Association, Inc. (Chesapeake Haven).

- 11/24/04 The Service received a letter from James Doyle requesting copies of two biological opinions (dated 2/11/92 and 2/7/95) the Service had issued for the

Grove Point Girl Scout Camp.

- 12/21/04 The Service received a letter from James Doyle describing his analysis of the two Grove Point Girl Scout Camp opinions and his argument that “no jeopardy” biological opinion for the Chesapeake Haven project would be consistent with these earlier opinions.
- 01/20/05 The Service met with Maryland Shoreline Erosion Control Program +and Maryland Wildlife and Heritage for an update of their past involvement with these projects.
- 02/07/05 The Service received the February 2005 report on “A Population Viability Analysis for the Puritan Tiger Beetle in the Chesapeake Bay Region” (Gowan and Knisley 2005).
- 02/22/05 The Service received the January 2005 report on “Monitoring *Cicindela puritana* and *C. dorsalis dorsalis* in Maryland, 2004” (Knisley 2005).
- 02/24/05 Andrew Moser, of CBFO, indicated during separate telephone conversations with James Doyle, representing Chesapeake Haven, and John Roop, with the Baltimore District Corps of Engineers, that CBFO would likely recommend to the Regional Office that the Service conclude the proposed shoreline revetment projects would jeopardize the continued existence of the Puritan tiger beetle, and propose as a reasonable and prudent alternative (RPA) an offshore breakwater, as recommended by the Maryland Shoreline Erosion Control Program.
- 03/25/05 The Service and the Baltimore District Corps of Engineers conducted a field inspection of the project sites. (Note: Prior to initiation of consultation, Service biologists had become familiar with this shoreline area during Puritan tiger beetle surveys).
- 04/08/05 Phone conversation between applicant James Taylor and CBFO supervisor John Wolflin regarding the RPA.
- 04/26/05 Electronic mail sent from CBFO to Corps indicating they would receive the draft biological opinion within 30 days.
- 04/29/05 Phone conversation between applicant James Taylor and John Wolflin regarding the RPA.
- 04/29/05 Phone conversation between Chesapeake Haven landowners Jim and Elizabeth Twohy and John Wolflin regarding the history of the landscape, the RPA.
- 04/29/05 Phone conversation between Walter Washington of the Baltimore Corps Regulatory Branch and John Wolflin regarding the RPA and reasonable and

prudent measures for the subject permits.

- 05/02/05 Phone conversation between applicant Murl Clark and John Wolflin regarding the RPA and reasonable and prudent measures.
- 05/03/05 Phone conversation between Chesapeake Haven landowner Barbara Wall and John Wolflin regarding the RPA, reasonable and prudent measures, and history of the landscape.
- 05/03/05 Electronic mail sent to John Wolflin of CBFO by Barbara Wall describing her willingness to work with CBFO and expressing concerns about the effectiveness of an off-shore breakwater for property protection.
- 05/04/05 Meeting between Baltimore Corps District Engineer and John Wolflin including discussion of this consultation, tiger beetle biology, RPA, and reasonable and prudent measures.
- 05/04/05 Meeting between Baltimore Corps Chief of Operations, Chris Correl, and Chief of Regulatory Branch, Janet Vine, and John Wolflin including discussion of this consultation.
- 06/02/05 CBFO conducted an additional field review of the project sites involving endangered species biologist Andrew Moser and soil scientist Al Rizzo.
- 06/09/05 Meeting at CBFFO with Baltimore Corps (Regulatory and Planning), Maryland Shore Erosion Control Program, Maryland Wildlife and Heritage, and Dr. Barry Knisley (Randolph Macon College) to discuss more comprehensive approaches to Puritan tiger beetle conservation and Section 7 consultation.
- 06/14/05 Draft Jeopardy Biological Opinion transmitted by Region 5 to Corps.
- 07/19/05 Field Review of entire Grove Point tiger beetle site by Dr. Barry Knisley, Dr. Mary Ratnaswamy, Andrew Moser, and Al Rizzo
- 07/22/05 Meeting at CBFO with the Baltimore Corps, Maryland Shore Erosion Control Program, Maryland Wildlife and Heritage, the applicants and their lawyer to discuss draft jeopardy opinion and the reasonable and prudent alternatives.
- 08/10/05 Len Casanova of MD Shore Erosion Control Program met with the applicants to explain and discuss the concept of a nearshore breakwater (a concept suggested at our 07/22/05 meeting).
- 09/06/05 Baltimore Corps received revised permit applications for nearshore breakwaters from each of the applicants.

- 09/30/05 Baltimore Corps forwarded the revised permit applications to CBFO and began a process of informal consultation with the Service.
- 10/07/05 CBFO sent the Corps preliminary draft conditions to avoid jeopardy from the nearshore breakwater alternative.
- 10/14/05 CBFO sent the Corps revised recommendations for conditions/project elements to be included in the nearshore breakwater alternative.
- 12/23/05 Phil Cwiek and Vance Hobbs of Baltimore Corps and Andrew Moser of CBFO met with the applicants to discuss proposed project modifications and CBFO recommendations, including the monitoring and vegetation control program.
- 02/07/06 The Corps reinitiated formal consultation with CBFO on the nearshore breakwater, including further project revisions and reduced scope (from six properties to two at Chesapeake Haven).

II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Corps is considering permitting, under the Rivers and Harbors Act, three stone nearshore breakwater projects at Grove Point on the eastern shore of the Chesapeake Bay. Chesapeake Haven, representing two properties owned by Twohy and Carpenter, is requesting authorization to construct a 175-foot long nearshore breakwater, extending a maximum of 61 feet channelward of the mean high water line with flanks (wingwalls) at either end, approaching to within 15 feet of the base of the cliff. Mr. Murl Clark is requesting authorization to construct a 150-foot long nearshore breakwater of the same design and a flank (wingwall) on the north end only. Mr. James Taylor is requesting authorization to construct a 105-foot long nearshore breakwater of the same design and a flank (wingwall) on the south end only. The ends of the flanks on each of the three projects will be a minimum of 15 feet channelward of the base of the cliff. The proposed projects represent a significant revision of the original application which called for a 750-foot revetment at Chesapeake Haven involving 6 properties and revetments for 185 feet and 105 feet of shoreline at the Clark and Taylor properties, respectively. The proposed Taylor and Clark breakwaters are located on the Grove Point shoreline a short distance south of the Chesapeake Haven Civic Association project. All three proposed projects include a monitoring and adaptive management program to control vegetation which develops on the property owners' cliffs following project construction (described in detail in Appendix 1). Appendix 2 contains the contract with Eastern Shore RC&D for monitoring and vegetation control to be signed by each of the applicants (three of the four applicants have already signed). Figures 1 through 3 show the plan views of the Chesapeake Haven, Clark, and Taylor breakwaters. Figure 4 shows the typical section for all three breakwaters. Figure 5 shows the plan view and cross-section for the flanks on all three projects.

The "action area" is defined as all areas to be affected directly or indirectly by the Federal action

and not merely the immediate area involved in the action. The Service has determined that the action area for this project is the cliff and the associated beach zone within and shoreward of the area to be directly affected by the breakwaters (430 linear feet), plus 180 linear feet of shoreline and adjacent cliff habitat to the north and south of the Chesapeake Haven breakwater, 180 linear feet of shoreline and adjacent cliff habitat to the north of the Clark revetment and 180 linear feet of shoreline to the south of the Taylor revetment. This is a total of 1,150 linear feet of shoreline and adjacent cliff habitat in the action area. The future impacts of the breakwater are estimated to extend 180 feet beyond each end of the breakwater to account for future scour and loss of sediment (sand, gravel, and cobble) from the eroding cliff as a result of breakwater construction (L. Casanova, Maryland Shore Erosion Control, pers. comm., 2005).

STATUS OF THE SPECIES/CRITICAL HABITAT

Species/Critical Habitat Description - The Puritan tiger beetle has been listed as a threatened species under the ESA since August 7, 1990, 50 C.F.R. § 17.11. It is a medium-sized (approximately 1.2 cm in length) beetle of the family Cicindelidae. The wing covers are bronze-brown, with fine marginal transverse buff-colored markings. Because of their diversity and great variety of unique color patterns, tiger beetles are popular insects for professional and amateur entomologists, as exemplified by the journal, "Cicindela," devoted entirely to tiger beetles.

The Puritan tiger beetle has a disjunct range that includes the Connecticut River in New England and the Chesapeake Bay in Maryland. There is currently one extant metapopulation on the Connecticut River, while the Chesapeake Bay contains two metapopulations. A metapopulation is a network of semi-isolated populations with some level of regular or intermittent migration and gene flow among them, in which individual populations may go extinct but can then be recolonized from other populations (Meffe and Carroll 1997). There are no confirmed records (historic or current) connecting the Connecticut River and Chesapeake Bay Puritan tiger beetles (Knisley 1987). Significant differences in genetic characteristics and larval ecology of the Connecticut River and the Chesapeake Bay populations are likely due to thousands of years of separation (USFWS 1993, Vogler et al. 1993). No critical habitat is designated for this species.

Life History - The Puritan tiger beetle has very specific habitat requirements, which have been found to differ between the Chesapeake Bay and Connecticut River populations (USFWS 1993). In Maryland, the adults and larvae undergo their entire life cycle on and near cliffs composed of sand and clay along the Chesapeake Bay and the mouths of its tributary rivers. Adult Puritan tiger beetles begin to emerge in June and remain active through August. They forage and mate along the narrow sandy beaches at the base of the cliffs, and the females lay eggs during the summer months on the unvegetated portions of the cliff faces. The larvae, which hatch in late July or August, dig deep burrows horizontally into the sandy deposits of the cliffs. They pass through three instars (developmental stages) before metamorphosis to adults. They typically undergo a 2-year larval period before emergence. The 2-year life cycle of the species results in large demographic fluctuations, which contribute to its vulnerability. Because each cohort is subject to 2 years of environmental perturbation prior to reaching reproductive age, Puritan tiger beetle populations are particularly sensitive to changes to their habitat (USFWS 1993). Like other tiger beetles, both adult and larval Puritan tiger beetles are voracious predators, capturing and consuming small invertebrates along the shoreline or on the cliff face (USFWS 1993).

The survival of the Puritan tiger beetle requires the presence of gradually eroding sand and clay cliffs and adjacent undisturbed sandy beaches (USFWS 1993). These beetles have evolved to occupy a narrow niche between too much erosion, which might wash the larvae out of the cliffs, and too little erosion, which allows the cliffs to become vegetated and unsuitable as larval habitat. Knisley (1987) and Hill and Knisley (1991) found Chesapeake Bay populations to be most abundant where bluffs are long and high, with little or no vegetation and composed of yellow or red sandy soil, at least in part; larvae are found principally in these sandy layers within the bluff. At Grove Point, red/yellow sandy layers are located generally near the top of the bluff. There is a strong correlation between the length of high bluffs and the abundance of Puritan tiger beetles (Knisley 1987).

While primarily designed to compare management strategies, the recently completed population viability analysis (PVA) for the Chesapeake Bay Puritan tiger beetle populations (Gowan and Knisley 2005) also illustrates the vulnerability of both these metapopulations to extinction and the need for multiple metapopulations to buffer against risks from demographic and environmental stochasticity. The two Chesapeake Bay metapopulations are composed of a few large and many small subpopulations. The largest populations are critical to the survival of the species because some portion of the site is likely to provide good habitat in any given year, and thus can provide a ready source for recolonization for other sites that may be severely eroded by storms or are temporarily of low value because of vegetative encroachment (Knisley, pers. comm. 2005). The ecological and evolutionary significance of the small subpopulations is not fully understood, but adult populations are known to fluctuate widely from year to year (Knisley 2005). As a result, small populations can become large later in time, primarily as a result of habitat improvements. Even consistently small populations, however, are important to maintaining connectivity for dispersing beetles and for maintaining a stable metapopulation structure (USFWS 1993, Gowan and Knisley 2005).

In contrast to these observations in the Chesapeake Bay, Nothnagle (1987, 1989, 1990) found that larvae at the extant populations on the Connecticut River generally do not use the low bluffs. Instead, the Connecticut River Puritan tiger beetle burrows are found among sparse herbaceous vegetation at the upper portions of sandy beaches and occasionally near the water's edge (USFWS 1993). Adults are typically found along open beaches (Nothnagle 1987, 1989; Omland 2002). Based on the genetic and ecological differences between the Chesapeake Bay and Connecticut River beetles, it is likely that translocations of beetles between the two geographical areas would pose substantial risks from outbreeding depression (Templeton, 1986).

Status and Distribution - Extant *C. puritana* populations in New England are limited to four sites along the Connecticut River (one site in Hampshire County, Massachusetts, and three sites in Middlesex County, Connecticut). The three Connecticut sites constitute a single metapopulation. The Massachusetts population is very small, averaging 34 beetles over the 17 years during which censuses were conducted (Davis 2004). This remnant population appears to be isolated from the other Connecticut River populations, but is much too small to constitute a metapopulation. The Connecticut metapopulation has an average size of 683 beetles over 14 years of available data. Historically, the Puritan tiger beetle was known to occur along the Connecticut River in Vermont and New Hampshire. The construction of seventeen dams on the Connecticut River, along with

resulting changes to the river's hydrologic cycles, river bank stabilization, and pollution in the Connecticut River have contributed to the species' decline in New England (USFWS 1993).

The “stronghold” of Puritan tiger beetle distribution is the Chesapeake Bay, where two metapopulations are found. The Sassafras River metapopulation in Kent and Cecil Counties on the Eastern Shore is comprised of eight subpopulations (including the subpopulation at Grove Point). Ten subpopulations make up the second metapopulation in Calvert County on the western shore of the Chesapeake Bay (Gowan and Knisley 2005). One of these ten subpopulations (Camp Roosevelt) appears to have been extirpated in recent years.

Although numbers of Puritan tiger beetles fluctuate significantly from year to year, there has been a clear downward trend since the mid-1990s in both the western and eastern shore populations of the Puritan tiger beetle (Knisley 2005a). The results of the 2005 survey produced a total count of 386 adults at all Sassafras River (i.e., Eastern Shore) sites, the lowest count ever and significantly less than the 630 adults counted in 2003 and slightly less than the previous low counts of 411 in 1999 and 400 in 2002 and 398 in 2004 (data from 2000 and 2001 is not available) (Knisley 2005a and 2005b).¹ According to Knisley, this most recent survey confirms the significant decline in the Sassafras River metapopulation since 1996, and a decline of all individual populations. Counts from 1991 to 1996 were near or over 1,500 in all years except 1994, but after 1996 there was a significant decline (Knisley 2005b). Most of the decline in the Sassafras River metapopulation in recent years has been accounted for by the decline at Grove Point, which typically had more adults than all other Sassafras subpopulation sites combined (Knisley 2005a, p.8).

Sites at Calvert County (i.e., Western Shore) have consistently produced far more adult Puritan tiger beetles than the Sassafras River metapopulation. However, like the Sassafras River, there has been a significant decline in the Calvert County metapopulation over the last two decades. The 2005 surveys produced a total count of 1,101 adult Puritan tiger beetles at all Calvert County sites (Knisley 2005b)—the lowest count ever. The 2004 survey results (2,167 adults) are similar to other low counts for 2003 (1,909 adults) and 2002 (2,027 adults). All of these counts are significantly lower than counts from the 1990s, which averaged more than 4,000 adults (Knisley 2005a and 2005b).

Subpopulations within a metapopulation are subject to local extinctions, and can be rejuvenated through recolonization from other subpopulations. The balance of these events determines the persistence of the collective metapopulation. Metapopulations tend to be more stable than a single subpopulation, given higher overall carrying capacity and geographic extent. The loss of a metapopulation is concomitantly severe for a vulnerable species such as the Puritan tiger beetle, because the dispersal ability of this species severely constrains the potential for their recolonization. Approximately 50 miles separate the Calvert County sites from the Sassafras River sites; far in excess of the 3.7 mile (6 kilometer) estimated limit on dispersal used by

¹ It should be noted that, due to constraints on detectability and variability in survey conditions, population estimates are indices, rather than complete census counts (Gowan and Knisley 2005). However, given the consistency of survey methods and surveyors over the last 11+ years, as well as surveyor skill and experience, the Service believes that the survey data (Knisley 2005a and 2005b) fully support an assessment of low absolute numbers, large inter-year fluctuations, and overall downward trends.

Gowan and Knisley (2005) to model metapopulation dynamics. Because most dispersal of Puritan tiger beetles is expected to occur between sites that are less than 3.7 miles apart (Gowan and Knisley 2005), sufficient dispersal to support recolonization between the Calvert County and Sassafras River metapopulations is highly improbable and recolonization between the Connecticut River and the Chesapeake Bay is nearly impossible.

The potential for rescue of Puritan tiger beetles via translocations between metapopulations is low. Analysis of both genetic (mtDNA) and ecological parameters across the species' range found a high degree of separation between the Connecticut River and Chesapeake Bay populations (Vogler et al. 1993). Puritan tiger beetles from the eastern and western Chesapeake Bay metapopulations also exhibited genetic differences, though not as substantial as those between the Chesapeake Bay and the Connecticut River (Vogler et al. 1993). The possibility of translocations should not be completely discounted, and translocations between the eastern and western Chesapeake Bay metapopulations may be more appropriate biologically than between the Chesapeake Bay and the Connecticut River. Given documented genetic and ecological differences, however, risks from outbreeding depression (loss of adaptations to the local environment that are essential to fitness) must be weighed against potential benefits of any future translocations. Thus, the extirpation of any one of the three metapopulations is very likely to represent an irretrievable loss that would very significantly increase the species' risk of extinction.

As one of just three metapopulations for the entire species, the Sassafras River metapopulation is essential to the future existence and recovery of the Puritan tiger beetle. Because the Sassafras River metapopulation is smaller than the Calvert County metapopulation, it has a significantly higher probability of extinction than Calvert County. Nonetheless, according to the PVA, both Chesapeake Bay metapopulations "face serious risk even under the best of circumstances, and a well-designed program of beach protection (i.e., protection of natural shoreline conditions) is required to have any hope of avoiding extinction in the Chesapeake Bay region" (Gowan and Knisley 2005, p. 13). Furthermore, empirical data shows steeply declining trends in abundance of both metapopulations. Because of the high correlation of environmental parameters (and consequent subpopulation fluctuations) within each of the Chesapeake Bay metapopulations, maintaining both the Sassafras River and Calvert County metapopulations is essential for the long-term survival of the Puritan tiger beetle.

Similarly, the Grove Point subpopulation is essential to the future survival of the Sassafras metapopulation. As explained further below, Grove Point consistently has been the largest subpopulation within the metapopulation. Without a healthy, viable Grove Point subpopulation, it is doubtful that the remaining subpopulations could survive temporary or long-term adverse pressures, such as poor weather or habitat changes. Moreover, the recently completed PVA (Gowan and Knisley 2005) compared eight strategies for protecting different combinations of sites within each metapopulation. Five of the eight strategies evaluated included the Grove Point subpopulation. The three scenarios with the highest average probability of persistence for the Sassafras River metapopulation when tested across a range of models required the Grove Point subpopulation.

Population Dynamics and Extinction Risk - The isolated populations (and metapopulations) of

Puritan tiger beetles function in a manner similar to isolated taxa on “habitat islands.” In fact, their life history requirements, namely, larval use of eroding cliff faces at a very specific stage of physical composition, indicate that this species is a habitat specialist constrained to habitat islands. The primary factors leading to the extinction of habitat specialists in isolated areas are habitat fragmentation, negative population growth, and dependency on irregular resources. As a result, a significant loss of beetle habitat at Grove Point, which would reduce and fragment habitat for the Sassafras River metapopulation, combined with the loss of individual beetles for an already declining subpopulation, substantially increases the risk of stochastic events leading to its extinction.

For any species, the processes leading to population extinction are complex, but four factors have been identified: demographic stochasticity, genetic stochasticity, environmental stochasticity, and catastrophes (Shaffer 1981). Thus, the risk of extinction for any population (or species) can depend on more than one factor, such as population size or level of genetic variation. Furthermore, these factors can combine into “extinction vortices,” greatly increasing the risk of extinction (Gilpin and Soule 1986). According to Gilpin and Soule (1986), there are four extinction vortices or biological/environmental feedback loops that can drive a population or species out of existence. The demographic vortex arises when population size is reduced for any reason, and population growth rates are highly variable. The combination of reduced population size and highly variable population growth rates already affects the Puritan tiger beetle, placing this species generally, and the Grove Point subpopulation particularly, at risk of a demographic extinction vortex.

As previously discussed, even though the distribution of the Puritan tiger beetle contains three metapopulations, the Connecticut River metapopulation is geographically, genetically, and ecologically distinct from the two Chesapeake Bay metapopulations. Additionally, the dispersal ability of this species severely constrains the rate at which recolonization can occur even between the Calvert County and Sassafras River metapopulations within the Chesapeake Bay and translocations have had limited success. Thus, if the relatively large Grove Point subpopulation is severely impacted, or lost, the stability of the Sassafras River metapopulation would be greatly decreased, because large scale immigration of new individuals into the Grove Point subpopulation is uncertain to occur. Furthermore, loss of habitat and consequent reduction in the Puritan tiger beetle carrying capacity of Grove Point would very significantly and permanently reduce the number of potential dispersers from that site to smaller sites within the Sassafras metapopulation.

Threats to the Species - In 1990, the Service cited two main concerns supporting the species’ listing as threatened under the ESA: (1) Only two populations remained within the species’ former range in New England (the two populations referred to are the metapopulation in Connecticut and the small population in Massachusetts), and (2) the majority of Chesapeake Bay subpopulations were considered to be in imminent danger of decline or extirpation as a result of anthropogenic habitat alteration (USFWS 1990).

Shoreline development and shoreline stabilization are the most serious threats to the Puritan tiger beetle in Maryland. Shoreline stabilization structures, including revetments, breakwaters, and

groins, interfere with the natural erosion and beach migration processes that create and maintain Puritan tiger beetle habitat. These structures are designed to minimize wave-induced erosion at the base of the bluff such that over time the slope of the bluff will decrease, eventually reaching a stable angle of repose. Slopes stabilized in this manner eventually become vegetated, making them unsuitable for Puritan tiger beetle larval habitat (USFWS 1993).

As of 1993 (when the Puritan tiger beetle recovery plan was completed), Calvert County, which contains the largest of the two Chesapeake Bay metapopulations, was the fastest growing county in Maryland, with a human population increase of over 300 percent since 1950 (USFWS 1993). Most of the significant Puritan tiger beetle sites in Calvert County, including Scientists Cliffs, Calvert Beach, Little Cove Point, and Cliffs of Calvert, have been subdivided, and houses have been constructed a short distance from the top of the bluff. Based on known erosion rates, all of these sites can be expected to require major shoreline stabilization in the foreseeable future (USFWS 1993). Since the completion of the Puritan tiger beetle recovery plan in 1993, a revetment has been constructed at Scientists Cliffs, Phase 1 of a shoreline erosion control project involving reef-balls has been built, at Chesapeake Ranch Estates near Little Cove Point, and Phase 2 of the latter project has been permitted; Phases 3, and 4 are planned in the near future. In 2004, Calvert County remained one of the two fastest growing counties in Maryland; the other was Cecil County (Wheeler 2005). We are currently consulting with the Corps of Engineers on an additional proposed project involving a 430-foot revetment in Puritan tiger beetle habitat at Chesapeake Ranch Estates. All of the above projects will affect tiger beetle populations, but effects of the reef-ball projects are considered unlikely to be adverse, in part because of the adaptive management measures included in the latter projects. In addition a number of small projects, some involving state permits only and others built illegally (without permits) have contributed to the incremental degradation of Puritan tiger beetle habitat (K. McCarthy, Maryland DNR, pers. comm. 2006).

An additional threat has come to light in recent years and is reflected in the downward trends in the Sassafras River Puritan tiger beetle metapopulation, discussed above, on the Eastern Shore. That is a significant increase in vegetation on cliffs and back beaches as a result of apparently natural processes (without the construction of shoreline erosion control structures). This threat appears to be the result of a relative lack of erosive storm activity on the Eastern Shore, including Grove Point, in recent years (Knisley 2005a). Notwithstanding its apparently natural genesis, this threat exacerbates the risk to the species from any additional anthropogenic habitat loss or degradation.

Recovery Goals and Accomplishments - Recovery for the Puritan tiger beetle depends to a large extent on protecting as much extant habitat, and the processes that maintain it, as feasible along the shorelines of the Chesapeake Bay and the Connecticut River. Vegetation management may be necessary to maintain open habitat at the extant Connecticut and Massachusetts sites, as well as at some of the Chesapeake Bay sites. Full recovery requires establishing additional Connecticut River populations. Delisting criteria articulated in the Puritan tiger beetle recovery plan (USFWS 1993) include:

1. A minimum of six large (500 to 1000 plus adults) populations and their habitat are protected in perpetuity at current (i.e., existing in 1993) sites along both shores of the

Chesapeake Bay.

2. Sufficient habitat between these populations is protected to support smaller populations, thereby providing an avenue for genetic interchange among large populations and ensuring a stable metapopulation structure.
3. A minimum of three metapopulations, at least two of which are large (500 to 1000 plus adults), are maintained (at extant sites) or established within the species' historical range along the Connecticut River, and the habitat they occupy is permanently protected.
4. There exists an effective long-term program for site-specific management that is based on an adequate understanding of life history parameters, human impacts, and factors causing decline, population genetics, and taxonomy.

Despite efforts to protect existing population sites, survey data confirms that the species numbers have continued to decline in the Chesapeake Bay. None of the four delisting goals have been met.

With respect to the first delisting criterion above, to date three subpopulation sites -- two on the Western Shore and one on the Eastern Shore -- have been protected through acquisition. Of those three sites, however, only the two sites on the Western Shore have supported an average of more than 500 beetles in recent years (2000-2004); the Eastern Shore site is much smaller. Thus, only two of the six required sites have been protected on the Western Shore and none of the six sites have been protected on the Eastern Shore, as required by the recovery plan. Currently there are just four subpopulation sites in existence along the Chesapeake Bay that have a 5-year average abundance (for years 2000-2004) over 500 beetles and all of these are located on the Western Shore. Although the Grove Point subpopulation supported more than 500 beetles at the time the recovery plan was developed, that is no longer the case; all other Eastern Shore subpopulations are much smaller.

We are also far short of meeting the recovery goals for the New England populations. Thus far, only one of the three metapopulations required by the third delisting criterion exists, but it is not protected. Because of the overall declining trends for this species, agency biologists and species experts have suggested that the species should be reclassified as endangered (Knisley, pers. comm. 2004; von Oettingen, New England Field Office, pers. comm. 2004; McCann, MD DNR, pers. comm. 2004).

ENVIRONMENTAL BASELINE

Status of the Species Within the Action Area – The action area includes 1,150 linear feet of shoreline and adjacent cliff habitat, all of which falls within the habitat area delineated by the Maryland Wildlife and Heritage Program for the tiger beetle (now incorporated as a Critical Area Site by the Maryland Critical Area Program) (Tyndall et al. 1989). The action area includes approximately 24 percent of the Grove Point habitat area. The area behind the proposed breakwaters, which would be adversely affected by the proposed action, constitutes approximately 9 percent of the Grove Point habitat area and has supported, on average 6.5 (range= 0-11%) percent of the Grove Point Puritan tiger beetle population over the past 4 years

(Knisley 2005a, Knisley 2005b, and Knisley 2005c). The entire action area supported an average of 19 percent (range = 10-25%) of the Grove Point population for the same period.

Over the last 15 years (1991 through 2005), the size of the Grove Point subpopulation has ranged from a high of 1,667 beetles in 1992 to a low of 78 beetles in 2002. Overall, there has been a clear downward trend in the subpopulation (and Sassafras River metapopulation) over the last 10 years. With the exception of one year (2002) it has been the largest Eastern Shore subpopulation. Its percentage of the total Sassafras River metapopulation has averaged 54 percent (range 20 to 90 percent) for all years where data are available (Knisley 2005a and 2005b). Methods used by Gowan and Knisley (2005) to estimate carrying capacity for the purpose of population viability modeling (double the average of the last five population estimates), attributed 43 percent of the total carrying capacity of the Sassafras River metapopulation to the Grove Point site.

Factors Affecting Species Habitat Within the Action Area –Vegetation growing on the cliff face affects the availability of habitat for larval tiger beetles. Overall, in the last several years the Grove Point site has become a less suitable habitat for tiger beetles either because the beach is too narrow or too rocky, and/or the cliffs are too vegetated or lack available sandy substrate (Knisley 2005a). However, based on observations during our March 25, 2005, field inspection, it appears that some localized sections of the cliff habitat in the action area have improved somewhat, due to recent erosion.

It is possible that increased surface runoff flowing toward the cliff edge as homes are constructed on adjacent lots has accelerated erosion rates of the upper portion of the cliffs. In addition, subsurface flows associated with the construction/utilization of septic drainage fields adjacent to the cliffs may have decreased the stability of the upper cliffs. Accelerated erosion rates and the decreased stability of the upper cliffs may increase the demand for erosion control measures to protect homes and septic drain fields; it also may decrease larval tiger beetle survival rates if erosion is too rapid.

EFFECTS OF THE ACTION

Direct Effects - Direct impacts to the tiger beetle will result from the crushing of adult beetles and subsequent injury or death during construction from use/placement/stockpiling of equipment and materials on the beach and foot traffic within the construction area. (This impact will be

eliminated or minimized by the time-of -year restrictions on construction, provided in the reasonable and prudent measures.)

Indirect Effects - Indirect effects are defined as those that are caused by the proposed action and are later in time, but still are reasonably certain to occur (50 CFR 402.02). The completed breakwaters would minimize or eliminate toe erosion along 430 feet of shoreline, allowing the cliff, over time, to achieve a stable slope. Without management, the project would be expected to stimulate vegetation growth on the cliffs, thus eliminating larval Puritan tiger beetle habitat there. To minimize this impact, a monitoring and vegetation management program has been incorporated in these projects. Over time, it is expected that some larval Puritan tiger beetle

habitat on the 430 feet of shoreline behind the breakwater will be reduced in value as cliff erosion is reduced and vegetation of the cliff increases. Measures taken to control vegetation on the cliff face, to the extent required by the monitoring and adaptive management program, are expected to maintain Puritan tiger beetle populations in the project areas at a minimum of 75 percent of what would have been present without the project. Thus, a small decrease in the carrying capacity of the Grove Point site is expected to result from the implementation of these projects.

Additional indirect impacts may occur along the shoreline extending 180 feet north and south of the Chesapeake Haven project, 180 feet north of the Clark breakwater, and 180 feet south of the Taylor project (a total of 720 feet of shoreline). These impacts resulting from increased scour and decreased sediment may include the narrowing of beaches used as adult tiger beetle habitat. The magnitude of these impacts on adult tiger beetle habitat has been significantly reduced by the reduced extent of the Chesapeake Haven project and the utilization of a near-shore breakwater, rather than a revetment, as originally proposed. Unlike the revetment, the nearshore breakwater will allow some long-shore movement of water and sand to continue along the beaches in the project areas (Len Casanova, pers. comm. 2006). Larval tiger beetle habitat is not expected to be adversely affected in this area.

Interrelated and Interdependent Actions - An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. At this time, there are no known activities interrelated to and interdependent with the proposed actions.

Cumulative Effects – Cumulative effects include the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

The Service is not aware of any future State or private activities that are reasonably certain to occur within the action area, which would have cumulative effects with the proposed projects. However, should they occur, activities at, or adjacent to the top of the cliff, such as clearing of vegetation, grading and runoff, and septic drain fields associated with the construction of new houses, would be expected to negatively impact Puritan tiger beetle habitat in the action area.

CONCLUSION

After reviewing the current status of the Puritan tiger beetle throughout its range and in the action area, the environmental baseline for the action area, the effects of construction of the stone breakwaters, and the cumulative effects, it is the Service's biological opinion that the issuance of Department of the Army permits for these projects, as proposed, is not likely to jeopardize the continued existence of the Puritan tiger beetle. No Critical habitat has been designated for this species; therefore, none will be affected.

These three breakwater projects are expected to have some adverse effect on 9 percent of the larval Puritan tiger beetle habitat and 15% of the adult Puritan tiger beetle habitat comprising the

Grove Point site. However, the significance of the impacts on larval habitat has been greatly reduced by the incorporation of the monitoring and adaptive management program in the proposed projects. The significance of impacts on adult Puritan tiger beetle habitat is expected to be relatively small because of the limited extent of the project and continued movement of water and sediment in the beach zone permitted by the nearshore breakwater. These projects are also expected to result in direct take of a large portion of a single year's adult tiger beetle population in the immediate project areas (in the absence of the time-of-year restriction required in the Reasonable and Prudent Measure), but because of the relatively small extent of each of the proposed projects, it is expected that the affected areas can be repopulated relatively quickly from adjacent sites so long as habitat is maintained. Therefore, the proposed projects are not expected to reduce appreciably the likelihood of both survival and recovery of the Puritan tiger beetle in the wild by reducing its numbers, distribution, or reproduction.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation under section 4(d) of the Act prohibit the take of endangered or threatened species, respectively, without special exemption 16 U.S.C. §§ 1533(d), 1538(a) (1) (B), (G), 50 C.F.R. §§ 17.21(a), 17.31. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. 16 U.S.C. § 1532(19). Harm is further defined to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering. 50 C.F.R. § 17.3. Harass is defined as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns, which include, but are not limited to, breeding, feeding, or sheltering. 50 C.F.R. § 17.3. Incidental taking is defined as any taking that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 50 C.F.R. § 17.3. section 7 of the ESA does not prohibit a taking that is incidental to and not intended as part of the agency action, provided that such taking is in compliance with the terms and conditions of an incidental take statement. 16 U.S.C. §§ 1536(b)(4), 1536(o)(2).

The measures described below are nondiscretionary and must be adopted by the Corps as binding conditions of any permit issued to the applicants in order to be exempt from a prohibited taking under section 7. The Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the Corps either (1) fails to assume and implement the terms and conditions, or (2) fails to require the applicant to adhere to the terms and conditions of the incidental take statement through enforceable terms that are incorporated into the permit or grant document, the protective coverage of section 7(o)(2) shall lapse. To monitor the impact of incidental take, the applicants must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement.

Amount or Extent of Take - The Service anticipates that incidental take of Puritan tiger beetles will be difficult to quantify and detect because of the beetles' coloring, small body size, and the tendency for larvae to remain beneath the surface. However, the following level of take of this species can be anticipated by the areal extent of the habitat affected.

The 430 feet of shoreline on the applicant's properties contains appropriate beach and cliff

habitat for the Puritan tiger beetle. These shoreline sections contain a beach that is approximately 10 feet wide at the mean high water line. We anticipate that direct take of adult tiger beetles will result from construction activities and the stock-piling of materials on the beach along the affected shoreline (this impact can be avoided or minimized by implementation of the time-of-year condition provided below). No direct take of larval Puritan tiger beetles is anticipated.

Over time, it is expected that some larval Puritan tiger beetle habitat behind the breakwater will be reduced in value as cliff erosion is reduced and vegetation of the cliff increases. It is estimated that the proposed projects will reduce the Puritan tiger beetle population in the affected areas by no more than 25 percent. Due to the confounding effect of inter-year population fluctuations, we believe that increased vegetative cover is the most meaningful and measurable proxy for reductions in the Puritan tiger beetle population. If vegetation increases are constrained by the adaptive management program to a less than a 20 percent increase in areal extent over pre-project baseline conditions, then we believe that the decline in the Puritan tiger beetle population will not exceed 25 percent of the population that would have been present without the project. Measures taken to control vegetation on the cliff face, to the extent required by the monitoring and adaptive management program, are expected to maintain Puritan tiger beetle populations in the project areas at a minimum of 75 percent of what would have been present without the project.

Reasonable and Prudent Measures - The Service believes the following reasonable and prudent measures are necessary and appropriate to minimize take of the Puritan tiger beetle:

- In order to avoid direct take of adult Puritan tiger beetles, construction activities on the beach must be conducted when adult beetles are not present.
- In order to maintain permeability to water movement, the breakwater must be built of large armor stone, without any smaller sized core material.
- The monitoring and vegetation management program, incorporated in the project by the applicants, must continue to be implemented until the U. S. Fish and Wildlife Service determines it is no longer needed.

Terms and Conditions - To be exempt from the prohibitions of the ESA, the Corps and the applicants must comply with the following terms and conditions, which implement the reasonable and prudent measures described above. Adherence to the first condition below is expected to avoid direct take of adult Puritan tiger beetles. Adherence to the second condition will allow the free flow of tidal water necessary to maintain an unvegetated beach. Adherence to the third and fourth conditions is expected to minimize take of larval tiger beetles. These terms and conditions are nondiscretionary.

(1) No construction, earth-moving, staging of equipment and materials, or related activities shall occur on the beach between June 1 and August 31 of any year.

(2) With the exception of an 8-inch base of bedding stone (3-8" stone) layered to protect the filter cloth underneath, the breakwater shall be built entirely of armor stone with a minimum size

of 800 to 1600 lbs. per stone (i.e., without any core material other than armor stone) and shall be permeable to water movement.

(3) The applicants/permittees shall implement the terms and conditions of the attached contracts for monitoring and management of vegetation with the Maryland Eastern Shore RC&D Council, Inc. If ESRC&D is unable to continue the role of vegetation monitoring and management at the site, the applicants/permittees shall be responsible for developing a new contract or other mechanism, in consultation with the U.S. Fish and Wildlife Service, to continue the vegetation monitoring and management program.

(4) The vegetation monitoring and management program agreed to by the applicants, and currently under contract with ESRC&D, shall continue until the U.S. Fish and Wildlife Service determines that it is no longer needed.

(5) The applicants shall notify the Service before initiation of construction and upon completion of their project at the address given below. All additional information to be sent to the Service should be sent to the following address:

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
177 Admiral Cochrane Drive
Annapolis, Maryland 21401
Phone - 410-573-4537
Fax – 410-269-0832

IV. CONSERVATION RECOMMENDATIONS

It is recommended that the applicants or their consultants evaluate the impact of surface runoff and subsurface flows from septic drain fields on erosion at the top of the cliffs. If it is determined that the drain fields are likely to significantly exacerbate erosion/sluffing of the upper cliffs, the applicants should consider moving drain fields away from the cliff-edge at any location where it is feasible. In addition, it is recommended that the Corps encourage owners of shorelines supporting Puritan tiger beetles to move their houses back from the shoreline (where feasible) rather than constructing shoreline erosion control structures.

V. REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the request. As provided in 50 C.F.R. § 402.16, reinitiation of formal consultation is required where discretionary Federal

agency involvement or control over the actions has been retained (or is authorized by law) and if: (1) The amount or extent of incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The Service appreciates this opportunity to work with the Corps in fulfilling our mutual responsibilities under the ESA. If you have any questions, please contact Mr. Andrew Moser at 410-573-4537, or Dr. Mary Ratnaswamy at 410-573-4541.

Sincerely,

John Wolflin
Field Supervisor

Attachment

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APPENDIX I.

In order to ensure that the Puritan tiger beetle population is not dramatically reduced behind

these structures, a vegetation monitoring and management program is required. This program would require the following:

- (1) For the purposes of photo-documentation, the shoreline of each of the three permit sites (Chesapeake Haven, Clark, and Taylor) shall be photographed, as follows. For each site, a single true color photograph shall be taken by the applicants or their consultants annually in July (beginning in 2006). Each photo shall provide a view of the cliff from top to bottom and the beach. The photos shall be of sufficient resolution that any herbaceous or woody vegetation on the cliff or beach is clearly visible. For each photo, the applicants or their consultant shall record the date, time, section number, and tide level. These photographs shall be provided annually to the Service and the Corps, with the consultant's analysis to make the evaluation called for under Condition two.
- (2) If, in the Service's opinion, the photos show that the percentage of total cliff area within the permit site covered in vegetation has increased by 20 percentage points or more, the applicants shall fund a management program, developed in coordination with the U.S. Fish and Wildlife Service to remove the vegetation. (For example, if the baseline photo taken in July 2006 shows 5 percent of the cliff is covered in vegetation, then corrective action would be needed when 25 percent of the cliff becomes covered with vegetation).
- (3) Prior to issuance of the Corps permit for each of the projects, each applicant shall enter into a contract with a consultant or other qualified organization to monitor and manage vegetation on their property.
- (4) The applicants shall grant permission to representatives of the Service, Corps, and the Maryland Department of Natural Resources, or their representatives to access their property to collect data regarding the status of the Puritan tiger beetle population and its habitat, or to assist in taking the adaptive management actions necessary to control vegetative encroachment on tiger beetle habitat. Reasonable notice will be provided to applicants prior to any proposed access beyond the intertidal zone.

APPENDIX II.

FIXED-PRICE CONTRACT

RCD-06-03

March 2, 2006

BETWEEN

CONTRACTOR

(Applicant's name and address)

AND

Maryland Eastern Shore RC&D Council, Inc.
8133 Elliott Road, Suite 201
Easton, MD 21601-7133

PROJECT TITLE AND LOCATION

Puritan Tiger Beetle Habitat Preservation by Vegetative Control
Chesapeake Haven Community
Cecil County, Maryland

CONTRACT FOR

Monitoring and management of vegetation by the RC&D Council to preserve the habitat on the bluff for the Puritan Tiger Beetle for the above landowner in accordance with the attached Scope of Work.

CONTRACT AMOUNT

The cost for the annual photo assessment will be \$100.00 per property owner. If vegetation needs to be removed on the bluff in front of a given property owner, the cost for that removal will be an additional \$100.00 to the affected property owner and the cost of materials. Property owners will be billed by RC&D Council.

The landowners may not abandon or curtail this Project, except with the express approval of the U.S. Fish and Wildlife Service. The RC&D Council may not terminate this Agreement, unless it has provided the property owners and the U.S. Fish and Wildlife Service 90 days' written notice. Should the Project be terminated in accordance with paragraph 4 of the Scope of Work, or should the RC&D Council cancel this Agreement after providing 90 days' written notice, the Contractor shall be paid a proportional part of the compensation due and payable to him.

CONTRACTOR

SIGNATURES AND DATE

NAMES AND TITLES

|
(Applicant's names) |
|

MARYLAND EASTERN SHORE RC&D COUNCIL, INC.

SIGNATURES AND DATE

NAMES AND TITLES

|
Conway Gregory, Chairman
|

SCOPE OF WORK
PURITAN TIGER BEETLE HABITAT PRESERVATION BY VEGETATIVE CONTROL

1. Each landowner will provide a digital photograph in July, 2006 of the beach and bluff in front of their properties to RC&D Council. Prior to taking the photograph, property owners will place eight foot lengths of rebar, driven one foot into the sand, along the beach at the toe of the cliff. The rebar will be painted bright orange, and will be placed every twenty feet starting at the toe in front of the North end of their property and ending at the toe in front of the South end of their property. The photos will be taken at low tide from the water forty (40) feet west of the cliff at a right angle to the shoreline, and will be submitted to RC&D Council prior to July 31.
2. RC&D Council will export the photographic images into ArcView3.3x, a computer program that analyzes images. Using the height of the exposed rebar (seven feet) and the width between them (twenty feet), ArcView3.3x can determine the scale and then measure the square footage of the cliff in front of each property, as well as the square footage of the vegetation on the cliff in front of each property. RC&D Council will then calculate the percentage of vegetation in front of each property. This will be known as the baseline (2006) percentage of vegetation.
3. In the following July photos taken under the same conditions will be submitted to RC&D Council, and ArcView3.3x will be used once again to determine the square footage of the vegetation on the cliff in front of each property. Again, the percentage of vegetation will be determined by RC&D Council. If the percentage of vegetation in front of a given property has increased more than twenty (20) percentage points from the baseline (square footage), RC&D Council will employ personnel to reduce the vegetation (invasive species first) to the baseline percentage, or less. Any vegetation growing on the beach in front of a given property will also be removed.
4. RC&D Council will assess these photos for an initial period of seven (7) years, at which time the need for this effort will be reevaluated by RC&D Council, the landowners, and the U.S. Fish & Wildlife Service. Should the U.S. Fish and Wildlife Service remove the Puritan Tiger Beetle from the list of threatened and endangered species, or otherwise determine that the photo analysis and vegetation management program ("Program") is no longer needed, this agreement and the Program will terminate. The U.S. Fish and Wildlife Service may determine the Program is no longer necessary if the population at risk no longer exists, or if there is sufficient evidence to demonstrate that increased vegetation is unlikely to occur. If the U.S. Fish and Wildlife Service determines that the Program is necessary, this agreement will automatically extend for additional seven (7) year periods, until the U.S. Fish and Wildlife Service determines that the Program is no longer necessary, at which time this agreement and the Project will terminate.
5. The purpose of this program is to ensure actions of the landowner to reduce shore erosion on their property do not jeopardize the future existence of the Puritan tiger beetle. As such, this agreement is enforceable by the U.S. Fish and Wildlife Service by resorting to specific performance or legal process. All remedies available hereunder shall be in addition to any and all other remedies at law or in equity, including the Endangered Species Act. Any forbearance, delay or omission to exercise its rights under this agreement in the event of breach of any term shall not be deemed to be a waiver of such terms or any subsequent breach of the same or any other term, or of any of the rights of the Fish and Wildlife Service.
6. This agreement is intended to be binding on the parties, their successors and assigns, unless terminated according to paragraph 4 above.
7. No amendment of this agreement shall be effective unless in writing and signed by an authorized representative of the landowners, the RC&D Council and the U.S. Fish and Wildlife Service.

8. The names and contact information of persons to receive notice or communications are as follows:

Maryland Eastern Shore RC&D Council, Inc.

[Contact person]

8133 Elliot Road, Suite 201

Easton, MD 21601-7133

[telephone no.]

U.S. Fish and Wildlife Service

[Contact Person]

[Address]

[Telephone no.]

[Landowners' Contact information]

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