

September 13, 2006

Colonel Peter W. Mueller, P.E.
District Engineer
Baltimore District, Corps of Engineers
Post Office Box 1715
Baltimore, Maryland 21203

**Reference: Section 7 Consultation
CENAB-OP-RMS (CHEAPEAKE RANCH ESTATES/ "PHASE V"/BREAKWATER) 04-
65008-4**

Dear Colonel Mueller:

This document transmits the U.S. Fish and Wildlife Service's (Service) biological opinion based on our review of the above-referenced nearshore breakwater project located near Little Cove Point in Calvert County, Maryland, and its 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 reinitiate formal consultation on the revised project on August 21, 2006.

This biological opinion is based on information provided in the permit application, telephone conversations, field investigations, biological reports, 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

- | | |
|----------|---|
| 9/09/05 | The Service met on-site with the applicants, Corps of Engineers (Corps), Maryland Wildlife and Heritage |
| 10/11/05 | The Service received the Corps' request to initiate formal consultation. |
| 11/03/05 | The Service sent e-mail to the Corps requesting additional information concerning the proposed project. |
| 11/03/05 | The Corps responded with e-mail providing initial answers to our 11/03 request. |
| 11/08/05 | The Corps provided remaining answers to our 11/03 request via two e-mail messages. |
| 01/09/06 | The Service sent a request to the Corps for a 60-day extension to the consultation period. |

- 01/13/06 The Corps sent a response to the Service, granting the 60-day extension.
- 03/01/06 John Wolflin of CBFO discussed the Service's recommended alternatives to the proposed revetment with applicants Joe Speer and Walter Bohorfoush.
- 04/03/06 John Wolflin discussed alternatives to the proposed revetment with applicants Phyllis Bonfield and Marcia Seifert.
- 04/26/06 John Wolflin made a site visit and discussed alternatives, including moving the Bonfield/Seifert house and septic tank, with applicants.
- 08/16/06 CBFO biologists Moser and Ruddy field inspected the recently built nearshore breakwater in Cecil County.
- 08/18/06 Electronic mail from Andy Moser of CBFO to Maryland Shoreline Erosion Control Program (Casanova and Brower) describing 8/16/06 observations of nearshore breakwater and recommendations for possible modifications at future sites.
- 08/21/06 Electronic mail response from Tom Brower to Moser's 8/18 email.
- 08/21/06 The Service received the Corps' request to reinstate formal consultation on the revised project (nearshore breakwater).
- 08/22/06 Electronic mail reply from Andy Moser to Brower's 8/21 email, responding to his statements and questions.
- 08/22/06 Electronic mail to Kathy Anderson and Walter Washington of Baltimore Corps describing the need for agreements to carry out the vegetation monitoring and management program at Chesapeake Ranch Estates, Phase 5.
- 08/23/06 Electronic mail from Kathy Anderson passing on applicant Phyllis Bonfield's request for a copy of existing vegetation monitoring and management agreements.
- 08/23/06 Electronic mail to Kathy Anderson and applicants Phyllis Bonfield and Walter Bohorfoush containing the language of the existing agreements between the Cecil County permittees and Eastern Shore RC&D.
- 08/28/06 John Wolflin discussed revised project and the need for a vegetation monitoring and management plan with applicant Marcia Seifert.
- 09/01/06 The Service received a FAX from Tom Brower with drawings showing proposed modification of the nearshore breakwater, including a twenty-foot distance between the base of the cliff and the footer of the flankwall.

II. BIOLOGICAL OPINION

DESCRIPTION OF PROPOSED ACTION

The Corps is considering permitting, under the Rivers and Harbors Act, a nearshore stone breakwater project on the shore of the Chesapeake Bay, approximately one mile south of Little Cove Point, for three properties at Chesapeake Ranch Estates in Calvert County, Maryland. The applicants are proposing to construct a 457 foot long stone breakwater extending a maximum of 60 feet channelward of the mean high water line with flankwalls at either end. It is our understanding that the drawings provided by the Maryland Shoreline Erosion Control Program and used in the permit application are conceptual designs (Tom Brower, Maryland Erosion Control Program, pers. comm) and that precise location of structures will depend on results of professional surveys. The purpose of the proposed breakwater is to protect three properties on the top of the cliff: the Bonfield/Seifert property is only 12 feet from the cliff edge; the Bohorfoush house is 45 feet from the cliff edge, and the Speer house is 40 feet from the cliff edge. Figures 1 and 2 show the plan view and cross-section of the proposed breakwater.

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 breakwater plus 180 linear feet of shoreline and adjacent cliff habitat to the north and south of the revetment. The future impacts of the revetment 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) as a result of breakwater construction (L. Casanova, Maryland Shore Erosion Control, pers. comm., 2005).¹ An additional 1,068 linear feet of beach to the north of the project area will be affected by equipment access and stockpiling of construction materials. Thus, a total of 1,885 linear feet of shoreline and adjacent cliff habitat are in the action area (see Figure 3). The entire action area is within the geographic limits of the Little Cove Point subpopulation of the Puritan tiger beetle.

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, with bronze wing covers and fine marginal buff-colored markings.

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

¹ The Service calculated the 180-foot extent of the breakwater’s indirect impacts by multiplying the 60-foot distance between the cliff base and the channelward edge of the breakwater by three, a methodology recommended by L. Casanova.

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). 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). No critical habitat is designated for this species.

Life History - The Puritan tiger beetle has very specific habitat requirements, which differ between populations located in Maryland and those in New England. (USFWS 1993). In Maryland, adults and larvae undergo their entire life cycle on and near eroding cliffs and adjacent sandy beaches 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. 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). Adults 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 typically undergo a 2-year larval period before emergence as adults. After the adult beetles emerge, they have only a single reproductive opportunity over a very short period. Because each cohort is subject to 2 years of environmental perturbation during larval development, when they also have very limited mobility, Puritan tiger beetle populations are particularly sensitive to changes to their habitat (USFWS 1993). Vulnerability of subpopulations to depressed larval survival may be easily compounded if environmental conditions (e.g., beach width and substrate, prey availability, weather) for adults are unfavorable for survival and/or reproduction.

The Puritan tiger beetles occupy a narrow niche between cliffs with 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. The Chesapeake Bay populations are most abundant where bluffs are long and high, with little or no vegetation and composed of yellow or red sandy soil. Larvae are found principally in these sandy layers within the bluff (Knisley 1987, Hill and Knisley 1991). There is a strong correlation between the length of high bluffs and the abundance of Puritan tiger beetles (Knisley 1987).

Areas along the shores of the Chesapeake Bay that have the required topography and stratigraphy to provide Puritan tiger beetle habitat are very limited. It is these physical attributes that determine Puritan tiger beetle distribution around the Chesapeake Bay. Within these potential habitat areas, only those cliffs that have recently received sufficient erosive action to maintain unvegetated cliffs are actually used by the species at any given time. Storm frequency and duration are thought to be the main natural factors controlling erosion and vegetative

succession on the cliffs, and thus the amount of habitat actually available to the beetles.

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 in eleven areas in three states along the Connecticut River, only two of which (the Connecticut metapopulation and the Massachusetts remnant) are now extant. 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 (See Figure 4). The Sassafras River metapopulation in Kent and Cecil Counties on the Eastern Shore is comprised of eight subpopulations. Ten subpopulations (including the Little Cove Point subpopulation) made up the second metapopulation in Calvert County on the western shore of the Chesapeake Bay (Gowan and Knisley 2005). This number has now been reduced to nine subpopulations, because the Camp Roosevelt population has become extirpated in recent years, with no beetles observed there since 2001 (Knisley 2005b).

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 subpopulations 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). However, even consistently small populations are important to maintaining connectivity for dispersing beetles and for maintaining a stable metapopulation structure (USFWS 1993, Gowan and Knisley 2005).

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).

The small New England populations continue to be imperiled by recreational use of the Connecticut River shoreline, including beach recreation, camping, and off-road vehicles. In

addition, flooding and habitat alteration resulting from residential construction threaten these populations (USFWS 1993).

The recovery plan identifies shoreline development and shoreline stabilization as the most serious threats to the Puritan tiger beetle in Maryland because these activities prevent maintenance and creation of the nearly vertical eroding cliffs and beach habitat that the beetles use (USFWS 1993). Shoreline stabilization structures include revetments, breakwaters, and groins, which are designed to minimize wave-induced erosion at the base of the bluff. Over time, slopes stabilized in this manner eventually become less steep and vegetated, making them unsuitable for Puritan tiger beetle larval habitat (USFWS 1993). However, of all the types of shoreline stabilization structures currently available, revetments are considered to be the most damaging because they cover the adult habitat with fill and rock, permanently eliminating this habitat. Reef-ball breakwaters, offshore segmented breakwaters, or nearshore breakwaters accomplish some shoreline protection without burying the beach with fill and rock.

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. The species recovery plan (USFWS 1993) accurately predicted that based on known erosion rates, shoreline stabilization projects were likely to be proposed at all of these sites in the foreseeable future. Due to natural processes eroding the cliffs and the passage of time, we are at a point now where many of the houses near the top of the bluff are at risk. 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).

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, 4, and 5 are planned in the near future (Phase 5 overlaps the project which is the subject of this consultation). If all 5 phases of the reef-ball project are completed, much of the Little Cove Point tiger beetle subpopulation will be behind reef-ball structures. While reef-ball breakwaters are considered to be relatively benign compared to other shoreline erosion control structures, all those permitted have been required to include extensive monitoring and adaptive management programs because of uncertainties concerning long-term effects on Puritan tiger beetle habitat.

In Cecil County, consultation with the Corps was completed on March 28, 2006 concerning three shoreline stabilization projects proposed at Grove Point, the site of the largest Eastern Shore Puritan tiger beetle subpopulation. The final project design, consisting of a nearshore breakwater and an applicant-funded long-term commitment to monitoring and adaptive vegetation management, is expected to result in some reduction of the carrying capacity for Puritan tiger beetles of the habitat in these project areas, but is considered unlikely to jeopardize the species' continued existence. Nearshore breakwaters do not destroy the beach and still allow some wave action to occur, and the adaptive management component is designed to ensure maintenance of adjacent cliff habitat.

An additional threat, which has only recently become apparent, is the 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 particularly on the Eastern Shore in recent years (Knisley 2005a). This threat increases the risk to the species from any ongoing or additional anthropogenic habitat loss or degradation. Vegetation management can only ameliorate this threat to the extent that it is successfully implemented and sustained where needed.

Analysis of Chesapeake Bay Population Trends

Dr. C. Barry Knisley of Randolph Macon College (Ashland, VA) has led surveys of the Puritan tiger beetle in the Chesapeake Bay since 1986, using consistent methods and objectives from year to year. During the season of peak abundance, usually from late June to mid-July, one or two observers walk slowly along the shoreline at the water edge and count all adults that can be seen. At this time of year, the adults that have recently emerged from the cliffs are generally found on the beach at the base of the cliff.

Surveys are conducted at low to mid-tide. In areas where there is a narrow beach or cliffs near the water, the observer examines the base of the cliffs and counts the visible Puritan tiger beetles. In wider beach areas, the surveyor moves more slowly so that the back portions of the beach can be surveyed. In recent years, GPS units have been used to establish waypoints that were saved and used in subsequent years. According to Knisley (2005b), the survey results for the Puritan tiger beetle represent some of the longest monitoring histories for any insect.

For the Sassafras River sites, the results from 1989 to 2005 are shown in Figure 5. 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 only 14% of the 2,755 adults counted in 1992, the year with the highest count (Knisley 2005a and 2005b).² Counts from 1991 to 1996 were near or over 1,500 in all years except 1994, but after 1996 there was a substantial decline (Knisley 2005a and 2005b).

Sites at Calvert County have consistently produced far more adult Puritan tiger beetles than the Sassafras River metapopulation. However, like the Sassafras River, there has been a substantial decline in the Calvert County metapopulation over the last two decades as shown in Figure 6.

² It should be noted that, due to constraints on detectability, population estimates are indices, rather than complete census counts (Gowan and Knisley 2005). However, qualitative assessment of factors likely to be affecting detectability suggests that some of the likely covariates (e.g., increasing experience of surveyors over time, tendency to undercount populations at higher densities) would lead to a pattern of improved detectability over the period of record, in which case the actual decline may be steeper than the data indicate. Given the consistency of survey methods and surveyors over the last 18+ years, as well as surveyor skill and experience, the Service believes that the survey data (Knisley 2005b) strongly support an assessment of low absolute numbers and overall downward trends.

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) were similar to other low counts for 2003 (1,909 adults) and 2002 (2,027 adults). All of these counts are substantially lower than counts from the 1990s, which averaged more than 4,000 adults (Knisley 2005a and 2005b).

In the last five years (2001 through 2005) Little Cove Point has supported the third largest (on average) of the nine extant Puritan tiger beetle subpopulations within the Calvert County metapopulation (Gowan and Knisley 2005). The Little Cove Point subpopulation is increasing in importance to the future of the Calvert County metapopulation because its percentage of the Calvert County metapopulation has increased over time and it is now the largest subpopulation during some years (2003 and 2005). This increase in relative importance of the Little Cove Point subpopulation is due to the fact that it has remained relatively stable, while other subpopulations in the Calvert County metapopulation have declined.

In summary, the Puritan tiger beetle has experienced a substantial decline over the last two decades. The Sassafras River metapopulation has declined to 14% of its 1992 peak count. The Calvert County metapopulation has declined to approximately 25% of its 1990s average and to approximately 10% of its peak counts, with Little Cove Point now representing the largest Calvert County subpopulation. These declines in the Sassafras River and Calvert County subpopulations are shown graphically in Figures 5 and 6 and are substantiated by statistical analysis conducted by Pinkney (2006).

Population Dynamics and Extinction Risk

Metapopulation Structure and Dynamics. Because the Puritan tiger beetle depends on a dynamic, discontinuous habitat, and given the large fluctuations in abundance of its subpopulations³, persistence of this species is highly dependent on maintenance of a stable metapopulation structure. Puritan tiger beetle metapopulations are more secure than single populations, because of their larger size (metapopulations contain more individuals than are found in any one population) and larger areal extent (metapopulations cover a larger landscape area). This greater probability of persistence of metapopulations is also illustrated by the results of population viability analysis (PVA) conducted by Gowan and Knisley (2005).

Similarly, the long-term persistence of Puritan tiger beetle metapopulations depends on maintenance of robust subpopulations. Each subpopulation has potential to play a critical role in producing the larvae that will carry a cohort through a period when environmental factors at other subpopulation locations are unfavorable. If prior habitat loss compromises reproduction at a site, production of beetles to supplement or recolonize other subpopulations will be affected. However, the rescue potential of a subpopulation diminishes with any increase in dispersal distance.

³ The large inter-year fluctuations in abundance are consistent with this species' life history and data from related species. These fluctuations constitute a major risk factor given current low numbers in all extant metapopulations.

Furthermore, the different subpopulations within a large metapopulation may experience varying environmental conditions (e.g., habitat suitability, weather), and growth in one subpopulation may balance losses in another. Dispersal among subpopulations is essential to this stability, and it, in turn, is a function of distance between subpopulations, abundance of beetles in the donor subpopulations, and availability of suitable habitat in the receiving subpopulations.

Dispersal distances for Puritan tiger beetles have been estimated by analyzing dispersal data for *Cicindela dorsalis dorsalis*, a congener with many similar life history characteristics that occurs in the same geographic area (Gowan and Knisley 2005). Little dispersal occurred between populations over 6 kilometers (3.7 miles) apart and dispersal declined exponentially with distance. While complete isolation of subpopulations beyond the dispersal range of the species creates a very high probability of permanent subpopulation extirpation (Gowan and Knisley 2005), even small increases in distances between subpopulations can increase extinction risk. The risk of extinction is compounded if subpopulation size is also diminished by habitat loss. Puritan tiger beetle subpopulation growth rates are density-dependent (Gowan and Knisley 2005), which means a loss of habitat will diminish population abundance. Thus, habitat loss that increases distance between populations will depress both the dispersal probability of an individual beetle and the abundance of dispersing beetles.

The Calvert County metapopulation is a string of 9 subpopulations along the shoreline and the Little Cove Point population is the second most southern subpopulation (Figure 4). The recent pattern of declines in the three northernmost subpopulations of the Calvert County metapopulation, including the extirpation since 2001 of the Camp Roosevelt subpopulation, illustrate the potential for declines in individual subpopulations to affect their neighbors (Table 2a, Figure 4). The Randle subpopulation, the farthest to the north and very isolated from relatively abundant populations from Scientists Cliffs south, now faces a high probability of continuing its recent downward slide. This, in turn, would further diminish potential for recolonization at Camp Roosevelt and increase risk of extirpation at Bayside Forest because dispersal could come only from subpopulations to the south. However, losses from the Little Cove Point subpopulation would limit the number of individuals available for dispersal to the Cliffs of Calvert population to the south and to Calvert Cliffs State Park to the north. During periods when environmental conditions in the middle portion are less favorable than in the northern part of the metapopulation range, low numbers or absence of beetles at Randle, Camp Roosevelt, and Bayside Forest offer little rescue potential, which may substantially increase risk of entire metapopulation extinction. As illustrated by 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).

While varying environmental conditions, dispersal, and population abundance are major factors affecting the persistence of Puritan tiger beetle metapopulations, additional factors are likely to exacerbate declines as subpopulations approach low numbers. Examples include loss of genetic diversity (inbreeding depression) in small, isolated subpopulations; Allee effects (impaired breeding due to low density, for example, when a small number of beetles emerging and/or

dispersing to a site fail to locate mates); low effective population size and demographic or environmental stochastic events (e.g., a small number of beetles emerging at or dispersing to a site are all of the same sex, emergence or mating/egg laying period falls within extended adverse weather conditions one year, or more problematic, for two+ years in a row).

Puritan tiger beetle populations and their habitats will fluctuate over time, but the species will only survive if there is enough habitat in close enough proximity overall to sustain populations through both good and bad years. The metapopulation structure (dispersal and recolonization) is this species' key mechanism for surviving bad periods, especially given that individuals only have a single reproductive opportunity every two years. Thus, maintaining a functioning metapopulation with sufficient habitat to support interconnected subpopulations is crucial to survival and recovery of the Puritan tiger beetle.

Significance and Interactions of Metapopulations. 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 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 Knisely 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 (as evidenced by the genetic differences which have arisen due to long-standing reproductive isolation, discussed below).

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 likely to be an irretrievable loss, significantly increasing the species' risk of extinction.

As one of just three metapopulations for the entire species, the Calvert County metapopulation is essential to the future existence and recovery of the Puritan tiger beetle. 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 higher 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.

Recovery Goals and Accomplishments

Recovery for the Puritan tiger beetle depends to a large extent on protecting as much extant habitat as feasible, and the processes that maintain that habitat, 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. 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 confirm 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. None of these sites currently supports over 500 beetles, as called for in criterion 1. Two of these sites (Parker Marsh South and Calvert Cliffs State Park) on the Western Shore have supported an average of more than 500 beetles in the recent past, and it is hoped they will do so again in the future. Meeting this delisting criterion has become increasingly problematic because of the distinct downward trends in Puritan tiger beetle populations (in 2005, none of the subpopulations exceeded 500 beetles).

We are also far short of meeting the recovery goals for the New England populations. Full

recovery requires establishing additional Connecticut River 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). As the five-year status review for the species gets underway, later this year, this issue will be considered in depth.

ENVIRONMENTAL BASELINE

Status of the Species Within the Action Area – The action area includes approximately 1,885 linear feet of shoreline and adjacent cliff habitat. The action area includes the 457 foot long project, as well as 180 feet of shoreline immediately to the south and north of the project site which will be indirectly affected following project construction and approximately 1,068 feet of additional beach habitat to the north of the project site which will be used for equipment access and stockpiling of materials.

Recent data (Knisley 2001b, 2002, 2003, 2004, and 2005b) indicate that the area behind the proposed 457-foot breakwater, which would be adversely affected by the proposed action, annually supports from 9 to 23% of the Little Cove Point Puritan tiger beetle population. Indirect effects in the 180 feet of shoreline to the north and south of the revetment are expected to include decreased sand deposition and increased beach erosion, which is expected to decrease its value as adult foraging and mating habitat and may result in a decreased ability of Puritan tiger beetles to travel and disperse through these shoreline sections. The 1,068 feet of shoreline to be used for equipment access provides a dispersal corridor for adult tiger beetles, but provides no habitat for larval Puritan tiger beetles because it lacks high cliffs. It should be emphasized that within the 1,885 foot long action area, Puritan tiger beetle habitat (including larval cliffs and adjacent beaches used by adults) is limited almost entirely to the 817 feet of shoreline most affected by the project (shown as red and green areas on Figure 3).

Over the period of record (1988 to 2005), the size of the Little Cove Point subpopulation has ranged from a low of 85 beetles in 1989 to a high of 927 beetles in 1996. Its percentage of the total Calvert County metapopulation has averaged 10 percent (range 2.4 to 31 percent) for all years where data are available (Knisley 2005b). That percentage has increased over time (to 20% on average in the past 5 years) indicating the Little Cove Point population's increasing importance to the future of the Calvert County metapopulation. This increased importance of the Little Cove Point population is further illustrated by the fact that for the first time since records have been kept, in 2003 it was the largest subpopulation in Calvert County; this happened again in 2005 (Knisley 2005b). During these two years, the Little Cove Point population made up 31% and 27%, respectively, of the total Calvert County metapopulation.

Factors Affecting Species Habitat Within the Action Area –Vegetation growing on the cliff face affects the availability of habitat for larval tiger beetles. Since the year 2000 portions of the Little Cove Point site had become a less suitable habitat for tiger beetles either because the cliffs

became too vegetated or the beach became too narrow (Knisley 2004, 2005a, and 2005b). However, this site experienced a significant increase in erosion and localized decreases in cliff vegetation in late 2003 during and immediately following tropical storm Isabel.

Increased surface runoff flowing toward the cliff edge following home construction 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.

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 breakwater would minimize or eliminate toe erosion along 457 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 degrading larval Puritan tiger beetle habitat there. Over time, it is expected that larval Puritan tiger beetle habitat on the 457 feet of shoreline behind the breakwater will be greatly reduced in value as cliff erosion is reduced and vegetation of the cliff increases. Thus, a decrease in the carrying capacity of the Little Cove Point site is expected to result from the implementation of this project.

Additional indirect impacts may occur along the shoreline extending 180 feet north and south of the breakwater. These impacts resulting from increased scour and decreased sediment may include the narrowing of beaches, which is expected to reduce their value as adult foraging and mating habitat and may result in a decreased ability of Puritan tiger beetles to disperse through these shoreline sections. The magnitude of these impacts on adult tiger beetle habitat has been significantly reduced by 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 resulting runoff 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 nearshore stone breakwater, and the cumulative effects, it is the Service's biological opinion that the issuance of Department of the Army permits for this 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.

This breakwater project is expected to have an adverse effect on larval and adult Puritan tiger beetle habitat which has supported 9 to 23% of the Puritan tiger beetle population at the Little Cove Point site. Over time, this project is expected to result in loss of much of the larval Puritan tiger beetle habitat in the project area as a result of vegetative encroachment. However, the significance of impacts on adult Puritan tiger beetle habitat is expected to be relatively small because of the continued movement of water and sediment in the beach zone permitted by the nearshore breakwater. This project is also expected to result in direct take of a large portion of a single year's adult tiger beetle population in the immediate project area (in the absence of the time-of-year restriction required in the Reasonable and Prudent Measure), but it is expected that the affected areas can be repopulated from adjacent sites (and by larvae remaining in the cliffs at the project site) so long as habitat is maintained. Therefore, the proposed project is 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.

While not likely to jeopardize the species, this project would contribute to the inexorable incremental degradation of Puritan tiger beetle habitat and the natural coastal erosion processes that are essential to its formation and maintenance. Furthermore, each successive loss of habitat value reduces (and may soon foreclose) the range of reasonable and prudent alternatives that might otherwise be available to address future needs involving federal activities, authorizations, or funding.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and Federal regulation under section 4(d) of the Act prohibit the take of endangered and 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 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 applicants 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 457 feet of shoreline on the applicants' properties contains appropriate beach and cliff habitat for the Puritan tiger beetle. We anticipate that direct take of adult tiger beetles would 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 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 larval and adult Puritan tiger beetle population in the affected areas by at least 75 percent.

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.
- To ensure that adult tiger beetle habitat is maintained behind the breakwater, the project must be precisely located with relation to the mean lower low water line and designed and constructed so as to maintain some wave energy shoreward of the breakwater.
- A vegetation monitoring and management program, must be implemented by the applicants.

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, fourth, and fifth conditions is necessary to insure that structures are built at appropriate elevations and allow adequate water movement. Adherence to the sixth and seventh 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) A survey by a professional surveyor shall be conducted at the project site to determine the location of the mean high water line (MHW), mean low water line (MLW), and mean lower low water line (MLLW). The location of the MHW line and the MLLW line shall be marked with stakes prior to the start of construction.

(4) The shoreward footer of the breakwater shall be a minimum of five (5) linear feet channelward of the MLLW.

(5) The shoreward end (footer) of the flankwall shall be a minimum of 20 feet from the cliff and at an elevation no higher than MHW line.

(6) Prior to project construction, each of the applicants/permittees shall enter into a legally binding contract or agreement with a third party, developed in consultation with the U.S. Fish and Wildlife Service, to implement the vegetation monitoring and management plan described in Appendix 1.

(7) 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

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to use their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

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/sloughing 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. We understand that all of the above recommendations have already been followed for the Bonfield/Seifert property.

It is also recommended that the Corps Regulatory Branch and the Corps Planning Division work in cooperation with the Service and the Maryland Department of Natural Resources to develop a comprehensive approach to deal with shoreline erosion issues in Puritan tiger beetle habitat.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the conservation recommendations carried out.

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

References

LITERATURE CITED

- Davis, C. 2004. Population augmentation of the Puritan tiger beetle, *Cicindela puritana* through translocation of larvae to Rainbow Beach, Northhampton, MA. Report submitted to Silvio O. Conte National Fish and Wildlife Refuge, Service, Turners Falls, MA. 7pp.
- Gowan, C. and C.B. Knisley. 2005. A population viability analysis for the Puritan tiger beetle in the Chesapeake Bay Region. Randolph-Macon College, Ashland, VA. 21pp.
- Hardaway, C.S. and R.J. Byrne. 1999. Shoreline Management in the Chesapeake Bay. Virginia Institute of Marine Science (VSG-99-11), College of William and Mary, Williamsburg, VA.
- Hill, J.M. and C.B. Knisley. 1991. Current status survey and biological studies of *Cicindela dorsalis* and *C. puritana* in Maryland, 1990. Interim report to Maryland DNR, Natural Heritage Program, Annapolis, MD, and U.S. Fish and Wildlife Service, Annapolis Field Office. 69pp.
- Knisley, C.B. 1987. Status survey of two candidate species of tiger beetles, *Cicindela puritana* G. Horn and *C. dorsalis* Say. Final Report to U.S. Fish and Wildlife Service, Newton Corner, MA. 37pp.
- Knisley, C.B. 2001a. Monitoring of the northeastern beach tiger beetle (*Cicindela dorsalis dorsalis*) at the Hills Bay site (Mathews County, VA) and a study of potential effects of offshore breakwaters. Final Report to U.S. Fish and Wildlife Service, Gloucester, VA, 5pp.
- Knisley, C.B. 2001b. Studies of rare tiger beetles (*Cicindela dorsalis dorsalis* and *C. puritana*) in the Chesapeake Bay region of Maryland, 2000. Report to Forest, Wildlife and Heritage Service, Maryland DNR, Annapolis, MD 23pp.
- Knisley, C.B. 2002. Studies of rare tiger beetles (*Cicindela dorsalis dorsalis* and *C. puritana*) in the Chesapeake Bay region of Maryland, 2001. Report to Forest, Wildlife and Heritage Service, Maryland DNR, Annapolis, MD. 12 pp.
- Knisley, C.B. 2003. Studies of *Cicindela puritana* and *C. dorsalis dorsalis* in Maryland, 2002. Final Report to the Forest, Wildlife, and Heritage Service, Maryland DNR, Annapolis, MD. 30pp.
- Knisley, C.B. 2004. Studies of *Cicindela puritana* and *C. dorsalis dorsalis* in Maryland, 2003. Final Report to the Forest, Wildlife, and Heritage Service, Maryland DNR, Annapolis, MD. 32pp.

- Knisley, C.B. 2005a. Monitoring *Cicindela puritana* and *C. dorsalis dorsalis* in Maryland, 2004. Final Report to the Forest, Wildlife, and Heritage Service, Maryland DNR, Annapolis, MD. 45pp.
- Knisley, C.B. 2005b. Distribution and Abundance of *Cicindela puritana* and *C. dorsalis dorsalis* in Maryland, 2005. Final Report to Forest, Wildlife, and Heritage Service, Maryland DNR, Annapolis, MD. 34pp.
- Meffe, G.K. and C.R. Carroll, editors. 1997. Principles of Conservation Biology, second edition. Sinauer Associates, Sunderland, MA.
- Pinkney, A. 2006. Statistical Analysis of Knisley data. Note to files, Chesapeake Bay Field Office, USFWS, Annapolis, MD, June 4, 2006.
- Sokal, R.R. and F.J. Rohlf. 1981. Biometrics, Second Edition. W.H. Freeman, New York.
- Templeton, A. R. 1986. Chapter 6 – Coordination and outbreeding depression. Pp. 105-116 in M.E. Soule, ed. Conservation biology – the science of scarcity and diversity, Sinauer Associates, Inc. Sunderland, MA.
- U.S. Fish and Wildlife Service. 1990. Endangered and threatened wildlife and plants; determination of threatened status for the Puritan tiger beetle and the northeastern beach tiger beetle. *Federal Register* 55: 32088-32094.
- U.S. Fish and Wildlife Service. 1993. Puritan tiger beetle (*Cicindela puritana* G. Horn) Recovery Plan. Hadley, Massachusetts. 45pp.
- Vogler, A.P., C.B. Knisley, S.B. Glueck, J.M. Hill, and R. Desalle. 1993. Using molecular and ecological data to diagnose endangered populations of the Puritan tiger beetle *Cicindela puritana*. *Molecular Ecology*, 2, 375-383.

APPENDIX I.

VEGETATION MONITORING AND MANAGEMENT PLAN

1. The consultant (or each landowner under the consultant's direction) will take a digital photograph in July, 2007 of the beach and bluff in front of the permittees properties. 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 east of the cliff at a right angle to the shoreline. Each photo shall provide a view of the cliff from top to bottom and the beach. 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 and property ownership.
2. The consultant 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. The consultant will then calculate the percentage of vegetation in front of each property. This will be known as the baseline (2007) percentage of vegetation.
3. In the following July photos will be taken under the same conditions, 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 the consultant. If the percentage of vegetation in front of a given property has increased more than twenty (20) percentage points from the baseline (square footage), the consultant or contractor 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. A report including the photographs and the results of that year's monitoring will be provided annually by the end of August.
4. The consultant will assess these photos for an initial period of seven (7) years, at which time the need for this effort will be reevaluated by the consultant, 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 minimize take 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 consultant and the U.S. Fish and Wildlife Service.