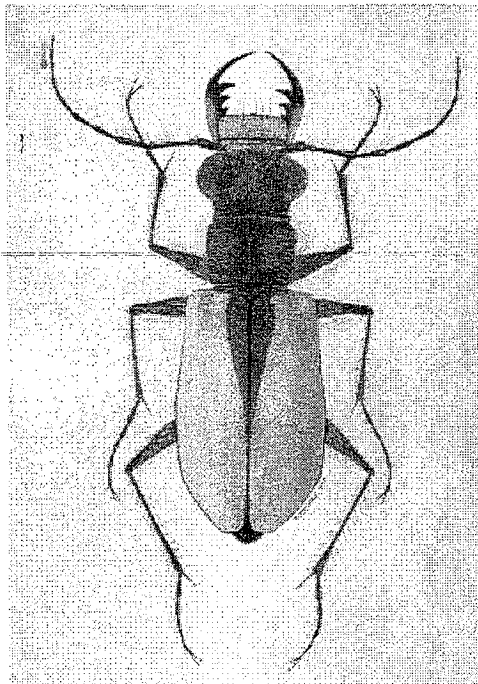


**CONSERVATION AGREEMENT AND
STRATEGY
FOR THE**

**CORAL PINK SAND DUNES TIGER
BEETLE (*CICINDELA ALBISSIMA*)**



**Prepared by the Conservation Committee for the Coral Pink
Sand Dunes Tiger Beetle**

PREFACE

This document consists of two parts. The first is a Conservation Agreement between the Utah Division of Parks and Recreation, Bureau of Land Management, Fish and Wildlife Service, and Kane County, Utah committing each to use their respective authorities and resources to provide for the long term protection of the Coral Pink Sand Dunes tiger beetle and its ecosystem. The Conservation Agreement is a formal signed document involving all parties.

The second part of this document, called a Conservation Strategy, consists of biological information, land and habitat management direction, and specific conservation actions to be implemented for the conservation of the Coral Pink Sand Dunes tiger beetle and its ecosystem.

This document is meant to be flexible and adaptable. As circumstances change, this document may be modified.

CONSERVATION AGREEMENT AND STRATEGY

TABLE OF CONTENTS

| | |
|---------------------------------------------------|-----------|
| PREFACE..... | 2 |
| CONSERVATION AGREEMENT..... | 4 |
| BACKGROUND | 4 |
| GOAL | 4 |
| OTHER SPECIES BENEFITS | 5 |
| INVOLVED PARTIES..... | 5 |
| AUTHORITY | 6 |
| STATUS OF THE SPECIES | 7 |
| CONSERVATION ELEMENTS..... | 8 |
| COORDINATING CONSERVATION ACTIVITIES | 8 |
| FUNDING CONSERVATION ACTIONS | 8 |
| DURATION OF AGREEMENT | 9 |
| NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE..... | 9 |
| FEDERAL AGENCY COMPLIANCE | 9 |
| AGREEMENT MODIFICATION..... | 9 |
| PRINCIPAL CONTACTS | 10 |
| SIGNATURES..... | 11 |
| CONSERVATION STRATEGY..... | 12 |
| INTRODUCTION | 12 |
| SPECIES INFORMATION | 12 |
| <i>Ecology and Life History</i> | 13 |
| <i>Population Dynamics and Status</i> | 14 |
| <i>Threats to the species</i> | 15 |
| <i>Ecosystem Management</i> | 19 |
| GOAL | 20 |
| RESPONSIBLE PARTIES | 21 |
| GLOSSARY..... | 22 |
| LITERATURE CITED | 23 |
| APPENDIX A - CONSERVATION HISTORY..... | 25 |

CONSERVATION AGREEMENT

for

CORAL PINK SAND DUNES TIGER BEETLE (*CICINDELA ALBISSIMA*)

BACKGROUND

The Coral Pink Sand Dunes (CPSD) tiger beetle (*Cicindela albissima*) is a terrestrial, predaceous insect in the family Cicindelidae. The beetle is known to occur only at the Coral Pink Sand Dunes. The CPSD comprise a dune field about eight miles long and a little less than one mile wide. These dunes are located in Kane County about seven miles west of Kanab, Utah. The southern portion of the dunes is within the State of Utah's Coral Pink Sand Dunes State Park, managed by the Utah Division of Parks and Recreation. The northern portion of the dunes is located on land managed by the U.S. Bureau of Land Management (BLM), within the Moquith Mountain Wilderness Study Area.

The CPSD tiger beetle was included in the U.S. Fish and Wildlife Service's (USFWS) first invertebrate candidate review, published in 1984 (49 FR 21664) as a Category 2 species. The species is currently a candidate species for listing under the provisions of the Endangered Species Act of 1973, as amended.

This Conservation Agreement for the CPSD tiger beetle has been developed in order to expedite implementation of conservation measures for the conservation of the species. The measures agreed to are taken in accordance with the Endangered Species Act. Implementation of these measures may eliminate the need for federal listing under the Act.

GOAL

The goal of this agreement and strategy is to ensure the long-term persistence of the CPSD tiger beetle within its historic range and provide a framework for future conservation efforts.

Objectives

The following objectives will be required to attain the goal of this agreement and strategy:

Objective 1: Effectively manage the species habitat, taking into account environmental changes and research results

Objective 2: Monitor demography to ensure populations on both BLM and State Park land are demonstrably self-maintaining (within the broad parameters of their known fluctuation) or expanding for at least 10 years.

Objective 3: Effectively monitor population trends, emerging threats, and the performance of protection strategies

Objective 4: Ensure effective education and outreach efforts to minimize threats associated with recreation use

These objectives will be reached through implementation of the Strategy. The status of CPSD tiger beetle will be evaluated annually to assess program progress and amendments will be added as needed to address recovery issues and ensure program effectiveness.

OTHER SPECIES BENEFITS

The primary focus of this agreement is the conservation of the CPSD tiger beetle and its habitat; however other species occurring within or adjacent to the tiger beetle's occupied habitat may also benefit. Other associate insect and plant species occur within the beetle's occupied habitat. Some may represent undescribed species and may be as vulnerable as the tiger beetle to loss or degradation of habitat. Welsh's milkweed (*Asclepias welshii*) is a plant listed as threatened which also occurs at the CPSD. A recovery plan has been developed for this species and is complemented by the conservation strategy for the CPSD tiger beetle.

INVOLVED PARTIES

United States Department of the Interior Bureau of Land Management

Utah State Office
P.O. Box 45155
Salt Lake City, Utah 84145-0155
440 West 200 South, Suite 500
Salt Lake City, Utah 84101

Kanab Field Office
318 North 100 East
Kanab, UT 84741

United States Department of the Interior Fish and Wildlife Service

Utah Ecological Services Field Office
2369 West Orton Circle Suite 50
West Valley City, UT 24119

Utah Department of Natural Resources Division of Parks and Recreation

1594 W. North Temple
Salt Lake City, Utah 84116

Kane County Commission

AUTHORITY

All parties to this Agreement recognize that each agency has specific statutory responsibilities that cannot be delegated, particularly with respect to the management and conservation of species and the management and development of public land resources. Nothing in this Agreement is intended to abrogate any of the parties' respective responsibilities. This Agreement is also subject to and is intended to be consistent with all applicable Federal and State laws and regulations.

The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. A species listed as threatened or endangered under authority of the ESA receives protection from "take" and is protected from interstate and international trade. In addition, the USFWS, in coordination with Federal, State, Tribal, and local entities, are provided the authority to develop and implement Recovery Plans, purchase important habitats, and ensure Federal aid to State wildlife agencies.

Section 4 of the ESA requires species to be listed as endangered or threatened solely on the basis of their biological status and threats to their existence. When evaluating a species for listing, the USFWS considers five factors: 1) damage to, or destruction of, a species' habitat; 2) overutilization of the species for commercial, recreational, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of existing protection; and 5) other natural or manmade factors that affect the continued existence of the species. When one or more of these factors imperils the survival of a species, the USFWS takes action to protect it.

However, it is easier to conserve species before they need to be listed as endangered or threatened than to try to recover them when they are in danger of extinction or likely to become so. Candidate Conservation agreements (CCAs) are voluntary agreements between landowners—including Federal land management Agencies—and one or more other parties to reduce or remove threats to candidate or other at-risk species. Parties to the CCA work with the USFWS to design conservation measures and monitor the effectiveness of plan implementation.

The Coral Pink Sand Dunes tiger beetle is currently a candidate species. Candidate species are plants and animals for which the USFWS has sufficient information on their biological status and threats to propose them as endangered or threatened under the ESA, but for which development of a proposed listing regulation is precluded by other higher priority listing activities. Candidate species receive no statutory protection under the ESA. However, the USFWS encourages cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA. Conservation of endangered species requires a means of addressing species that have not yet been listed but that face immediate, identifiable threats. Early conservation maximizes management options for landowners and for the species, minimizes the cost of recovery, and reduces the potential for restrictive land use policies that may be necessary in the future. Addressing the needs of species before the regulatory requirements associated with listed species come into play often allows greater management

flexibility to stabilize or restore these species and their habitats. In addition, as threats are reduced and populations are increased or stabilized, priority for listing can be shifted to those species in greatest need of the ESA's protective measures. Ideally, sufficient threats can be removed to eliminate the need for listing.

The USFWS agrees to promote the conservation of candidate, proposed, and listed species and to informally and formally consult/confer as specified in the Interagency Cooperation Regulations 50 CFR 402 on listed and proposed species, and designated and proposed critical habitat during planning: (1) To assure that activities implemented under these plans minimize or avoid adverse impacts to such species and any critical habitat; (2) to assure that such activities implemented under these plans do not preclude future conservation opportunities; (3) to use, where possible, consultation procedures specified in 50 CFR 402 to avoid conflicts between elements contained in plans and the requirements for conservation of proposed species and proposed critical habitat; and (4) to analyze the effects of the plan on candidate species pursuant to agency planning regulations.

Bureau of Land Management Manual 6840 provides guidance for the management and conservation of Federally Listed and other Special Status Species and the habitats on which they depend. Methods and procedures of conservation include, but are not limited to, all activities associated with scientific resources management such as research, census, law enforcement, habitat acquisition and maintenance, propagation, and transportation. As applied to special status species, conservation means to use, and the use of, methods and procedures such that there is no longer any threat to their continued existence or need to continue their status as a special status species. More specifically, the BLM Kanab Field Office 2008 Resource Management Plan and Coral Pink Sand Dunes Management plan provide for management of this species.

The national interagency Memorandum of Understanding (MOU) for the conservation of species tending towards federal listing issued on January 25, 1994 (94- SMU-058) provides the general framework for cooperation and participation among cooperators in conservation of these species. This Agreement is consistent with the provisions of the national interagency MOU.

Statutorily, also considered is the Utah Off-Highway Vehicle Act UCA 41-22-1, where in it is stated that: "It is the policy of this State to promote safety and protection for persons, property and the environment connected with the use, operation and equipment of off-highway vehicles" as well as UCA 63-11-19, wherein it states: "the division... is authorized to enter into... agreements with the Government of the United States... for the purposes of causing state parks... to be improved and maintained for any other lawful purpose."

This agreement is subject to and is intended to be consistent with all applicable Federal and State laws and regulations.

STATUS OF THE SPECIES

In 1994, the USFWS was petitioned to list the Coral Pink Sand Dunes tiger beetle as threatened or endangered. The Service ruled on September 15, 1994 in a 90-day finding that listing was warranted. The species remains a candidate for listing, precluded by higher priority species.

CONSERVATION ELEMENTS

The USFWS assesses existing and potential threats facing the species based on the five criteria as required by Section 4(a) (1) of the ESA. Within each of these criteria, several factors which have contributed to the degradation of CPSD tiger beetle habitat and its populations were identified. Threats include modification of habitat, overcollection, inadequate regulatory mechanisms, and natural factors.

While the majority of the population of tiger beetles is protected in conservation areas, OHV use likely degrades the surrounding habitat by causing soil desiccation and alteration of the natural plant community. This could prevent spread of the population outside of the Conservation Areas. However, the amount of suitable habitat that exists outside the conservation areas is limited.

USFWS considers this species a candidate for listing as endangered or threatened, however, candidate status confers no regulatory protection to this species. This can make a species more vulnerable. In addition, tiger beetles remain a popular collection species. Without regulatory protection amount of collection is unknown.

Natural factors may be the greatest of the threats facing this species. Population numbers are closely tied with rainfall. Populations in 2002 were the highest ever recorded, largely due to very large populations in core habitat swales. One year later in 2003, populations were the lowest ever recorded (Knisley and Gowan, 2005). This decline in the population is likely a result of drought (Knisley, 2002). Studies have indicated that rainfall has a positive effect on both oviposition (recruitment) and survivorship, based on availability of prey food, and reduced mortality from desiccation and starvation (Knisley and Hill 2001). The effects of prolonged drought or climate change may continue to impact the species.

COORDINATING CONSERVATION ACTIVITIES

The CPSD tiger beetle conservation team will consist of a designated representative from each signatory to this agreement, and technical advisors.

The conservation team will meet at least once annually to review the status of the beetle, develop yearly conservation action schedules, review the conservation strategy, and modify the strategy as appropriate. Annual reports will be prepared to ensure that research and monitoring results are evaluated and conservation strategies and actions are implemented and modified, as needed.

Summaries of discussions held by the conservation team will be prepared and available to all interested parties.

FUNDING CONSERVATION ACTIONS

Funding for the conservation agreement will be provided by a variety of sources. Federal sources include, but are not limited to, USFWS and BLM natural resource funds. Private funding sources may include, but will not be limited to conservation and recreation groups.

It is understood that all funding and other agency resource commitments made under this agreement are contingent upon appropriations by the appropriate entities.

DURATION OF AGREEMENT

This Agreement shall be effective as of the date of the last signature and shall remain in force for a period of ten years or until such time as the participating parties agree to terminate this Agreement. The original conservation agreement and strategy was signed in March 1997. A five year review was completed in 2003 and concluded that the agreement was beneficial. This document updates and replaces that original document.

NATIONAL ENVIRONMENTAL POLICY ACT COMPLIANCE

This Conservation Agreement is being developed for planning purposes. Before any on-the-ground actions can occur on federally managed lands, a determination must be made whether or not the conservation actions are consistent with the applicable agency's land use or land management plan and whether or not additional NEPA analysis is required. If conservation actions are determined not to be consistent with a land management plan, then these actions must be incorporated into the applicable agency's land use or land management plan through an amendment or maintenance process before they can be implemented. Actions on lands administered by the State or private lands may not be subject to NEPA analysis. During the performance of this Agreement, participants agree to abide by the terms of Executive order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, sex or national origin. No member or delegate to Congress or resident Commissioner shall be admitted to any share or part of this Agreement, or to any benefit that may arise there from, but this provision shall not be construed to extend to this Agreement if made with a corporation for this its general benefit.

FEDERAL AGENCY COMPLIANCE

During the performance of this agreement, the participants agree to abide by the terms of Executive Order 11246 on non-discrimination and will not discriminate against any person because of race, color, religion, sex, or national origin.

No member of delegate to Congress or resident commissioner shall be admitted to any share or part of this agreement, or to any benefit that may arise there from, but this provision shall not be construed to extend to this agreement if made with a corporation for its general benefit.

AGREEMENT MODIFICATION

Modification of this agreement requires written consent off all involved parties.

If theses measures prove inadequate for species conservation, the USFWS reserves all obligations required by, and options offered by the Endangered Species Act of 1973, as amended, including listing under the provisions of Section 4 of the Act.

PRINCIPAL CONTACTS

Katherine Richardson
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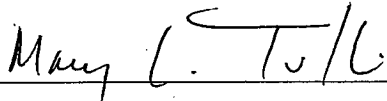
Michael Franklin
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Kane County Commissioner
76 North Main
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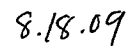
SIGNATURES

In Witness whereof, the parties have caused this Coral Pink Sand Dunes tiger beetle Conservation Agreement to be executed as of the date of last signature below:

APPROVED:



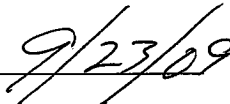
Mary Tullius, Director
Utah Department of Parks and Recreation
Salt Lake City, Utah



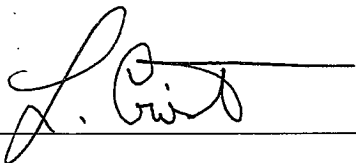
Date



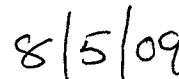
Selma Sierra, State Director
USDOI, Utah State Office, Bureau of Land Management,
Salt Lake City, Utah



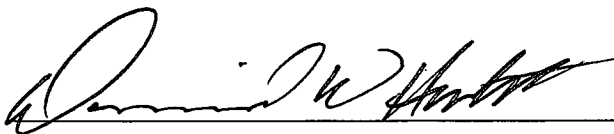
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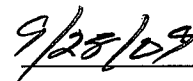
Larry Crist, Field Office Supervisor
USDOI, Utah Field Office, Fish and Wildlife Service
West Valley City, Utah



Date



DANIEL W. Hulet, County Commissioner
Kane County
Kanab, UT



Date

CONSERVATION STRATEGY

INTRODUCTION

The purpose of the 2009 Coral Pink Sand Dunes Tiger Beetle Conservation Strategy (Conservation Strategy) is to expedite conservation actions needed for the continued conservation of the Coral Pink Sand Dunes tiger beetle (*Cicindela albissima*) and to address the management concerns of the Utah Department of Natural Resources, Division of Parks and Recreation, Bureau of Land Management and Kane County. This 2009 Conservation Strategy updates and replaces the 1997 Conservation Strategy. See Appendix A for a review and update of conservation actions identified and implemented by the 1997 Conservation Strategy. The Conservation Strategy will be implemented by the Coral Pink Sand Dunes Tiger Beetle Conservation Team, comprised of representatives from each signatory to the Coral Pink Sand Dunes Tiger Beetle Conservation Agreement.

The following document begins with a summary of Coral Pink Sand Dunes tiger beetle life history, including population distribution, taxonomy, species description, legal status, and threats. Subsequent sections describe Conservation Strategy objectives and conservation actions designed to reduce threats to the species and conserve and expand Coral Pink Sand Dune tiger beetle habitat and populations.

SPECIES INFORMATION

Description and Taxonomy

The Coral Pink Sand Dunes tiger beetle is a terrestrial predaceous insect in the family Cicindelidae. Adult CPSD tiger beetles are 10.5 to 12.0 mm(0.41-0.47") long and 4.4. to 4.7 mm (0.17-0.19") wide. Female CPSD tiger beetles are larger than the males. The thorax and elytral midline are a brown to dull bronze color. The head is bright green to bronze. The elytra exhibit greatly reduced pigmentation and are a dull white color.

Once considered a subspecies of *Cicindela limbata*, DNA molecular analysis has confirmed that *Cicindela albissima* is a unique species (Morgan et al. 2000). *Cicindela albissima* has a localized distribution at Coral Pink Sand Dunes in Kane County, Utah, and no other localities are known despite thorough searches. Ecologists spent portions of five seasons searching all potential dune habitats in the region, including those with *Asclepias welshii*, and are convinced there are no other occupied sites (Hill and Knisley 1991b, Knisley and Hill 1995).

Distribution

The CPSD tiger beetle is known to occur only in dunes located approximately 7 miles west of Kanab, Kane County, in south-central Utah. The Coral Pink Sand Dunes (CPSD) geologic feature covers approximately 3500 acres. The northern 1500 acres is Federal land managed by Kanab Resource Area of the BLM and is within the Moquith Mountain Wilderness Study Area (WSA). The southern 2000 acres of the dunes is within the State of Utah's CPSD State Park.

Species range comprises approximately 20% of the dune field in a patchy distribution. Designated areas to protect beetle habitat from off-road vehicle (ORV) use occur on both State Park and BLM lands. There are 207 acres in CPSD State Park, the core beetle habitat, 370 acres on BLM land that harbor a very small population of tiger beetles and a corridor joining these two sites that is approximately 137 acres. These protected areas were established in 1997 and protect 90% of the beetle population in most years.

At the CPSD State Park the protected area includes a 13-kilometer (8-mile) long dune field at 1,820 meters (6,000 feet) elevation. The occupied habitat is approximately 1,800 by 400 meters (5,900 by 1,000 feet). Over 90 percent of the CPSD tiger beetle's adult and larval populations are restricted to this small site. The second protected area is on BLM managed lands about 4.8 kilometers (3 miles) north of the tiger beetle's main occupied habitat. This site has three known larval beds and a very small group of adults (Conservation Committee 1997). No other sites of tiger beetle occurrence are known despite thorough searches; researchers are confident that no other populations are present at Coral Pink Sand Dunes.

Ecology and Life History

Adult behavior and ecology

Newly eclosed sexually immature adult Coral Pink Sand Dunes tiger beetles may emerge from pupae in late summer and fall, however, most have not completed development by this time and remain in pupal burrows until spring. This activity ends between late September and early October when overwintering begins. Adults re-emerge from hibernation in March and become active along with newly eclosed adults. Adult populations reach peak abundance by mid-April to early May, decline through June and mostly disappear by July. During this period they are active on sunny days along the dunes and swale edges where they are feed, mate, and thermoregulate. Beetles must maintain a high body temperature for maximal predatory activity, and therefore the numbers of adult beetles observed on rainy or cool, cloudy days are very low (Knisley et al. 1990).

The primary food of adults is invertebrates including flies and other dune arthropods. Long, sickle shaped mandibles are used capture and process both fresh and scavenged prey. Adults are often observed scavenging on dead invertebrates blown out from the swales. Therefore scavenging likely contributes to the majority of food resources. When it is sunny adults are usually active early (9 a.m. – 2 p.m.) and again in late afternoon (4 p.m. – 7p.m.) during peak spring and fall activity. They dig burrows during hot mid-afternoons, at night, and when cool or rainy, apparently to avoid unfavorable weather conditions.

Mating, feeding and oviposition behavior have been observed only during the day. Most tiger beetles typically oviposit while the female is positioned upright with the tip of the abdomen pressed into the substrate, placing the egg just below the surface with her ovipositor. It is probable that most eggs are laid near the edge and within interdunal swales. Eggs are laid during spring only.

Larval biology

Active Coral Pink Sand Dunes tiger beetle larvae are located by the presence of their characteristic open burrows in the sand. First instar larvae begin to appear in late spring after hatching from eggs laid by the adult cohort. Development progresses quickly through the first stage, usually reached by late May to June. During mid-summer most of the larvae reach the second instar stage. Larvae continue as second or third instars into fall, and then hibernate. They continue development for the next year and generally become new adults by the end of the second summer or third spring, usually exhibiting a two year life cycle. Lack of proper conditions can lead to delays in development and a three year life cycle.

Activity ceases for most larvae and adults during the hot and dry summer, except after rains, which improve surface conditions for beetle sand their prey. The daily period of activity is highly variable and much influenced by temperature, moisture levels and season. Larvae may be active much of the day during cool or cloudy spring and fall days except during high wind periods. Maximal activity occurs in early mornings before the soil becomes dry and warm from the sun and again in late afternoon and through the night, after the soil has cooled.

The three larval stages are sit-and-wait predators which occupy vertical burrows in the sand. They wait at the burrow mouth to capture small arthropod prey when it passes nearby. Small invertebrates seem to be the major food source for larvae. Burrow depth increases with stage. First instar burrows typically average 6-9 cm, second instar 17-32 cm, and third instars 23- > 35 cm. Earlier instar larvae tend to be more widespread, including higher on the dunes where conditions are drier and prey less common (Knisley and Hill 1995). Most larvae occur within the swale bottoms and up the lower slopes of the dunes, particularly where the soil or subsoil is moist most of the time. In response to rising morning heat levels and surface drying, larvae plug the burrow mouth with sand, and then reopen when temperature levels drop. While the swale area location poses hazards of occasional flooding in certain areas of the dunefield, and perhaps increased energy expenditure to maintain burrows, these areas are where prey is most abundant. The swale vegetation supports the larval prey base of diptera, homoptera ants and other prey. Swales occasionally flood which may require increased energy expenditure from the beetle in order to maintain the burrows but swales support vegetation and the larval prey base including diptera, homoptera ants and other prey. Females may oviposit over a wider range than where the larvae are eventually found, because larval distribution is much more limited to swales in the fall. Larvae have rarely been found crawling on the dune, apparently moving to dig new burrows in a more favorable location. Most species of tiger beetle have larvae which remain in the same burrow throughout their development (Knisley 1987b, Knisley and Juliano 1988). In *Cicindela albissima*, burrow relocation is probably rare and may be a response to changes in soil moisture or changes in sand accretion and erosion. This behavior may allow larvae to select burrow sites with optimal physical conditions and/or higher food levels.

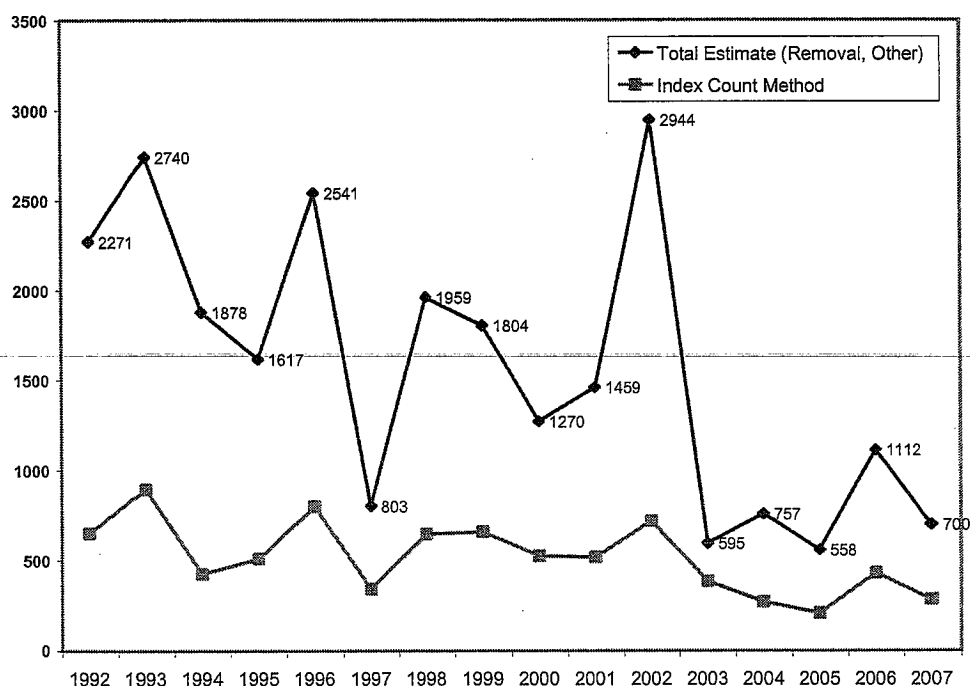
Population Dynamics and Status

The Coral Pink Sand Dunes tiger beetle population undergoes substantial year-to-year variation, which is typical of many desert arthropods that are greatly affected by climatic factors, especially rainfall (Knisley and Hill 2001). Populations in 2002 were the highest ever recorded, largely due to very large populations in core habitat swales. One year later in 2003, populations were the lowest ever recorded (Knisley and Gowan, 2005). This population decline is likely a result of drought (Knisley, 2002). Studies have indicated that rainfall has a positive effect on both

oviposition (recruitment) and survivorship, based on availability of prey food, and reduced mortality from desiccation and starvation (Knisley and Hill 2001). Soil moisture increases larval activity, attracts adults, and apparently increases oviposition. Watering of natural burrows several times in May and June increased survival of the larvae by 10% (Knisley and Gowan 2006).

Drought conditions since 2001 contributed to very low recruitment to the population (Knisley and Gowan 2005). Adult abundance in any year is related to the recruitment of new individuals 2 years previous (because of a 2-year life cycle) and the survivorship of the developmental stages of that cohort. The total estimate of the adult population in 2007 was only 700 compared to 1112 in 2006. In 2008 the population increased again to 1072 adult individuals.

Population estimates of the adult *C. albissima* population determined from various methods: removal method (1999-2007), mark recapture (1992-1998) and the corresponding index counts for all years Knisley and Gowan (2008).



Threats to the species

The Present or Threatened Destruction, Modification, or Curtailment of Its Habitat or Range

Off-road vehicle (ORV) activity had previously destroyed and degraded the beetle's habitat in CPSD; especially the inter-dunal swales used by the larval population (Knisley and Hill 2001, p. 392-393). Because ORV use predates any survey information, it is unknown how much habitat has been lost. The inter-dunal swales are the most biologically productive areas in this ecosystem and have the greatest abundance of suitable prey species. Adult beetles are killed by

ORVs, but more important impacts may be damage to vegetation, reduction in arthropod prey, and disturbance and increased desiccation of larval microhabitat by ORVs (Knisley and Gowan 2006, pp. 20-21). The BLM and State Parks have monitored ORV impacts to the majority of the species' habitat since 1998, enforced ORV restrictions, and designated Conservation Areas to protect beetle habitat by excluding ORV use (Knisley and Hill 1997, pp. 6-7; 2001, p. 10; Knisley 2000, p. 10; 2002, p. 12).

Approximately 668 ha (1,650 ac) in the CPSD State Park and 445 ha (1,100 ac) in the BLM managed WSA are open to ORV use. However, in the majority of years, over 90 percent of the known beetle population resides within ORV closure areas on State Park and BLM lands. In most years, 98 percent of the adult CPSD tiger beetle population lies within a 84-ha (207-ac) CPSD State Park conservation area, which is closed to ORV use. An additional 55 ha (137 ac) were restricted for use only as a travel corridor for ORVs. The northern conservation area on BLM land includes 150 ha (370 ac) protected from ORV use for the CPSD tiger beetle. A greater percentage of beetles are found outside of the conservation area only in years of very high numbers, presumably when the carrying capacity of that area has been reached (Knisley 2009; Knisley and Hill 2001, p. 10).

The Conservation Areas were selected to include the most densely populated swales. A limited number of swales outside the conservation area do support the beetle. These swales are in the ORV travel corridor area, a narrow area that serves to connect two ORV play areas north and south of the majority of the tiger beetle population. As a travel corridor, this area receives only a moderate amount of traffic.

Although 234 ha (577 ac) out of approximately 1,416 ha (3,500 ac) has been protected from ORV use, the CPSD tiger beetle population has failed to increase. This lack of increase appears to be primarily due to natural population fluctuations in response to drought (Knisley and Gowan 2009, p. 11). CPSD tiger beetles have occasionally expanded into habitat northeast of the conservation area in the CPSD State Park. However, this expansion only occurs during times of population growth, presumably when carrying capacity of the protected area has been reached (Knisley and Hill 2001, pp. 391-392; Knisley 2009).

The ability for CPSD tiger beetles to expand their range has previously been considered limited because ORV use continues to modify habitat adjacent to the conservation areas. Although increasing protected habitat may increase the overall carrying capacity of the habitat, this factor had little influence on risk of extinction in the latest population viability analysis (Knisley and Gowan 2009, p. 5). Increasing protected habitat may have a moderating effect on environmental stochasticity; however, the amount of additional suitable habitat is exceedingly small, approximately 8.1 ha (20 ac). In addition, increasing the protection area would result in an extremely narrow travel corridor that would likely be unsafe during peak ORV numbers on the dunes.

In summary, ORV use in unprotected areas may be a limiting factor to the species range expansion in times of high population numbers and further ORV management may have a small, positive impact on this species (Knisley and Gowan 2009, p. 22). However, the long-term recovery of CPSD tiger beetles may be more dependent on environmental factors such as

drought. Increase of rainfall would increase the productivity and suitable habitat inside the conservation areas, which would likely be enough to support the species successfully.

Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

The subspecies may be vulnerable to over-collecting by professional and hobby tiger beetle collectors. Tiger beetles are second only to butterflies among the insects that are desirable objects of natural history collections (Knisley and Hill 1995). The species has been collected, heavily at times, since its discovery and publication of the species description (Rumpp 1961, Knisley and Hill 1994, 1995). Collection of adults, before they mate and lay their eggs, may severely reduce the population's reproductive capacity. Some collection may be legitimate, adding valuable knowledge of biogeography, taxonomy and life history of the species, but this activity is controlled. Restrictions on collecting are enforced by Park and BLM personnel. Quantifying this threat is difficult, but at this time it is not considered to be of high magnitude (Knisley 2005, pers. comm.).

Disease or predation

Natural mortality through predation probably accounts for some population loss of both adult and larval CPSD tiger beetles (Knisley and Hill 1994, p. 16). Natural predators to adult CPSD tiger beetles are few, but include asilid flies, which are common at the CPSD. Asilid flies capture tiger beetles while both are in flight. Larvae tiger beetles have fewer natural predators than adults. Two types of parasitism have been observed at the CPSD. Bombyliid flies are known to flick eggs into beetle burrows. When the eggs hatch, the larvae parasite feeds on beetle bodily fluids, often resulting in death of the tiger beetle larvae. Wasps of the genus *Methoca* parasitize the CPSD tiger beetle larvae (Knisley and Hill 1995, p. 14). When the egg hatches, the wasp larva consumes the tiger beetle larvae. Levels of parasitism are low at the CPSD and not likely to limit populations (Conservation Committee 1997, p. 7). We have no evidence that predation is a threat to the species.

The Inadequacy of Existing Regulatory Mechanisms

The CPSD tiger beetle is not directly protected by regulatory mechanisms. No state laws in Utah provide protection to insects.

The Coral Pink Sand Dunes geologic feature covers approximately 3500 acres. Jurisdictionally, the dune ecosystem is bisected. The northern 1500 acres is Federal land managed by Kanab Resource Area of the BLM and is within the Moquith Mountain Wilderness Study Area (WSA). The southern 2000 acres of the dunes is within the Coral Pink Sand Dunes State Park. CPSD State Park is categorized as public land with a recreational emphasis. Most of the Moquith Mountain is designated as WSA for watershed protection; wilderness designation protects the beetle primarily in that it restricts ORV use in the wilderness area. Both the BLM and the State Park regulations prohibit harassment or collection of wildlife, including plants and animals, or geological or archaeological remains. Public education for both areas includes signage, brochures and interpretive programs.

Conservation actions defined in the previous Conservation Agreement and Strategy include the formation of two conservation areas to maintain and protect tiger beetle populations in the CPSD geologic feature. The southern portion of CPSD State Park contains the bulk of the tiger beetle population. In this area, 207 acres out of a total of approximately 2000 acres are closed to ORV use to provide protection for the core beetle habitat. The protected area is defined by signs, 20 feet apart around the perimeter of the habitat. Protection for the tiger beetle is enforced according to CPSD special closure and restrictions (R615-633-2 "1"). CPSD officers patrol the area daily during times of high recreational use. An additional 137 acres has restricted ORV use. This area functions as a travel corridor and provides ORV access between CPSD State Park and BLM land. The remaining 1656 acres of CPSD State Park provides no protection for the beetle.

A second conservation area managed by BLM is within the northern portion of the CPSD; 370 acres are closed to ORV use to protect a smaller known population of the beetle. Approximately 1100 acres is available for ORV use in the northern portion as a legitimate activity with the qualifications that ORVs stay on open dunes and keep a 10-foot buffer around vegetation. Enforcement is primarily voluntary compliance (Conservation Committee 1997).

The majority of habitat is protected within these conservation areas. However, the split ownership of the habitat and the possession of the majority of the habitat on state rather than federal lands provides a challenge to managing this species.

Other Natural or Manmade Factors Affecting Its Continued Existence

Movement of the swales due to sand dune movement and vegetative succession can complicate management of protected habitat areas. Dune movement can result in a decline in suitable habitat conditions within the designated protected areas (Knisley and Gowan 2008, pp. 21-22). To effectively manage conservation areas, boundaries should be reviewed and evaluated periodically. Tiger beetles appear to prefer a mid-succession vegetative habitat as they are excluded from areas with no vegetation and very dense vegetation. Therefore, continued vegetation succession could limit the available habitat within the protected area.

Climate change will likely impact the CPSD tiger beetle. If climate change results in more drought conditions, the existence of the tiger beetle may be further threatened. However, the weather patterns created by climate change are unpredictable, and effects to rainfall are particularly difficult to predict (Steenburgh et al. 2007, p. 6; Smith et al. 2001, p. 224). Changes in rainfall around the west have varied depending on location. Many parts of Utah have become warmer and wetter, whereas areas in Arizona have witnessed a decrease in rainfall (Smith et al. 2001, p. 220). The CPSD lie between these two areas, making predictions even more difficult. Utah as a whole is expected to see periods between precipitation events increase, while those precipitation events become more intense (Steenburgh et al. 2007, p. 6). It is difficult to predict the effects such a weather pattern would have on this species. In addition, spring rainfall totals (March-June) have a greater correlation with population levels than total yearly rainfall (Knisley and Gowan 2006, p. 7). If more intense rainfall events occur during this period, the species may benefit. However, if the precipitation events occur too infrequently, or at the wrong time of year, drought conditions will further depress the species. Because of these uncertainties, we cannot reliably assess the threat of climate change to the species at this time.

A population viability analysis indicated the most important factors affecting risk of extinction in the CPSD tiger beetle were population growth and environmental stochasticity or unpredictability (Knisley and Gowan 2009, p. 16-17). Both of these variables are affected greatly by rainfall amounts. Long lasting drought conditions may be the most severe threat to the species' survival.

Ecosystem Management

Dune ecosystem

Coral Pink Sand Dunes is unique as the only major dune field on the Colorado Plateau. At 6,000 feet elevation, it is also the second highest dune field in the country. The sand dunes cover a total area of about 3,500 acres. The sand dunes retain the iron oxide pigment color of the Navajo sandstone from which it is produced. The Coral Pink Sand Dunes ecosystem is also inhabited other rare and endemic species of invertebrates as well as the threatened Welsh's milkweed (*Asclepias welshii*).

The dunes are created by wind action. Prevailing winds from the Arizona Strip area are funneled between Moquith and Moccasin mountains, increasing their velocity. The winds pick up sand from the eroding Navajo sandstone found in the Vermillion cliffs. As the distance from the mountain funnel increases, the wind slows, depositing sand along the dunes. Vegetation within the dunes is primarily native forbs, shrubs and grasses.

Area Management

The dune ecosystem is bisected and managed jointly by the Bureau of Land Management and the Utah Department of Natural Resources, Division of Parks and Recreation. The dunes are managed by these agencies as a single ecosystem. The primary beetle population occurs on the state park, with a small number on the BLM portion.

The Division of Parks and Recreation has management responsibility to provide for both motorized and non-motorized recreation within its holdings. Conservation area A is a non-motorized area providing protection for the beetles. This has allowed the park to provide for both the beetle and recreation. At this time the conservation committee has no interest in changing the amount of area available for motorized recreation.

The Bureau of Land Management manages the northern half of the sand dunes. This entire portion is within the Moquith Mountain Wilderness Study Area. Wilderness study areas must be managed in a way that does not impair their suitability for Congressional Wilderness designation. Conservation area B, home to the secondary population of CPSD tiger beetle, is closed to OHV use entirely. The majority of the wilderness study area is open for limited OHV use. The area is open to a variety of non-motorized recreation.

GOAL

The goal of this agreement and strategy is to ensure the long-term persistence of the CPSD tiger beetle within its historic range and provide a framework for future conservation efforts.

Objectives

The following objectives will be required to attain the goal of this agreement and strategy. Each includes conservation actions selected to fulfill those objectives. New conservation actions can be added at any time by the Conservation Committee as needed to fulfill the objectives.

Objective 1: Effectively manage the species habitat, taking into account environmental changes and research results.

Conservation Actions:

- Currently designated conservation areas will be maintained and enforced
- Habitat enhancement will be considered as necessary

Objective 2: Establish a more secure population in conservation area B through translocation.

Conservation Actions:

- A protocol for translocation and captive refugia will be developed
- Translocation will be attempted and monitored for success

Objective 3: Effectively monitor population trends, existing and emerging threats, and the performance of protection and management strategies.

Conservation Actions:

- Yearly population monitoring will continue on both populations
- The feasibility and effectiveness of supplemental watering will be examined

Objective 4: Ensure effective education and outreach efforts to minimize threats associated with recreation use.

Conservation Actions:

- Educational materials will continue to be provided for interested parties
- Occasional live, interactive educational events will be presented

RESPONSIBLE PARTIES

Funding for the Conservation Agreement will be provided by a variety of sources, contingent upon appropriations from the appropriate State and Federal agencies. In-kind contributions in the form of personnel, field equipment, and supplies will also be provided by participating agencies. Responsibility for the execution of the Conservation Agreement is shared by the members of the conservation team. Below is a table containing the current distribution of responsibilities, subject to alteration on agreement of the conservation team.

| Conservation Measure | Funding Parties | Responsible Parties | Completion Date |
|--------------------------------------------------------|---------------------------|---------------------------|-----------------|
| Current conservation areas maintenance and enforcement | CPSD State Park, BLM, FWS | CPSD State Park, BLM | Perpetual |
| Habitat enhancement | FWS, BLM | B. Knisley | 2015 |
| Translocation and captive refugia protocol | FWS, BLM | B. Knisley | 2015 |
| Education | FWS, BLM, CPSD State Park | FWS, BLM, CPSD State Park | Perpetual |

GLOSSARY

| | |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Arthropod | A phylum of organisms including crustaceans, spider and insects. |
| Conservation Area | An area with special restriction, managed for the conservation of the tiger beetle in concert with other compatible areas. |
| Eclosed | The act of an insect leaving the pupal skin. |
| Elytra | The hard forewings of a beetle which cover the membranous wings when not in flight. |
| Instar | The stage between molts of an insect. Numbered to represent chronological periods in an insect's development. |
| Larvae | The earliest stage of an insect following hatching. Proceeds pupal and adult stages. |
| Oviposit | The act of laying eggs. |
| Pupal | The middle stage of an insect's development, follows larval stages and proceeds adulthood. |
| Swale | Low areas at the base of the dunes. |

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APPENDIX A - CONSERVATION HISTORY

A conservation strategy and agreement for CPSD tiger beetle was signed in March 1997. In this section, the progress under each conservation objective and action will be reviewed. Objectives are taken from page 17 of the original conservation strategy.

Objective 1: Permanently protect areas in the two designated conservation areas within or close to the historic range, and protect foremost the current large population in conservation area A, located in the CPSD State Park, maintaining this population at a level of at least 2000 adults. Increase the population of conservation area B to 300 adults.

- Both conservation areas were successfully created. OHVs are not allowed in these areas and the State Park and BLM enforce this restriction.
- The large population in conservation area A has not been maintained. Because wide fluctuations in invertebrate populations are common in desert environments a range of individuals may be more appropriate than a maximum number.
- No increase has been seen at conservation area B, this may require translocation of larvae.

Objective 2: Monitor the populations within the conservation areas and illustrate that they are demonstrably self-maintaining or expanding for at least 5 years, with no foreseeable threats.

- Yearly monitoring has continued, the overall population has declined over the last 10 years.

Objective 3: Research life history parameters, human impacts, and factors causing decline so that these areas are understood well enough to provide adequate protection and habitat management.

- The lifecycle of the tiger beetle is well established. Monitoring indicates lack of rainfall is responsible for the overall population decline, but more monitoring including soil moisture recordings and effects of supplemental watering are required.

Objective 4: Research and understand population genetics and taxonomy sufficiently for adequate protection.

- Genetic studies have shown the CPSD tiger beetle is an independent species, it was considered as sub-species when the original conservation agreement was drafted. A population viability analysis is in progress to determine the likelihood of extinction, and a population range required for these populations to persist.

Objective 5: Form a conservation advisory committee to coordinate all conservation action and to act as a central information gathering, dissemination and information center meeting annually.

- An advisory committee was established but has not met in several years.

Objective 6: Establish a continuing management program which educates and enforces tiger beetle conservation measures at Coral Pink Sand Dunes.

- Tiger beetle conservation is enforced at the Coral Pink Sand Dunes; in addition, educational material is displayed at the State Park. This task will continue.

Objective 7: Agency managers reasonably address the conservation needs of the beetle along with providing for recreational demands of users and local citizens.

- The conservation areas protect the majority of beetles and the remaining area is available for OHV and other types of recreation.

The conservation objectives were condensed in the summary of the previous strategy, and included an 8th conservation action: Enhance the habitat of tiger beetle based on existing and future research.

- No habitat enhancement has been completed. At this point there is no clear method that will successfully enhance the habitat to benefit the tiger beetle.