CONSERVATION AGREEMENT AND STRATEGY

FOR

Thermie Riffle Beetle *Zaitzevia thermae* and Brown's Riffle Beetle *Microcylloepus browni* at the Bozeman Fish Technology Center, Bozeman, Montana

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I. INTRODUCTION

This Conservation Agreement and Strategy has been developed to identify and ensure implementation of conservation measures for *Zaitzevia thermae* and *Microcylloepus browni*. *Zaitzevia thermae* is a candidate for listing under the Endangered Species Act (Act). *Microcylloepus browni* is a species of special concern. Both species occupy limited spring or seepage habitat in and along Bridger Creek where it flows through the property of the U.S. Fish and Wildlife Service's (Service) Bozeman Fish Technology Center (Technology Center) in Bozeman, Montana. This document includes strategies for the long-term conservation of both of these species and describes how conservation actions will be funded, conducted, monitored and reported. The goal of this Conservation Agreement for *Z. thermae* and *M. browni* is to address threats and protect habitat for and to conserve the natural evolutionary trajectory of these two beetle species thereby preventing the need for listing under the Endangered Species Act.

II. BACKGROUND

Ecology & Habitat

All beetles of the family Elmidae are plastron respirers. Plastron respirers have an air-water barrier with the trachea opening into the air film which is held around the body so that they may be constantly submerged. These beetles feed on small pieces of algae and diatoms that they scrape from submerged rocks. Both *Z. thermae* and *M. browni* require warm and flowing surface water with temperatures of 60 to 84° F. The entire known range of *Z. thermae* is on property owned and managed by the Technology Center. Bridger Creek, as a legal water of the US is jurisdictionally managed under state authorities as well, but habitat in this occupied section of Bridger Creek is primarily affected by activities of the Technology Center as adjacent land owner.

Thermie

Hatch first described *Z. thermae* in the literature in 1938. *Zaitzevia thermae* is a flightless beetle commonly found securely attached to the bottom of rocks or clinging to watercress in the warm spring found in Bridger Creek (Hooten 1991). *Zaitzevia thermae* is not known to drift with any probability of survival and requires clean water and small rock substrate absent siltation. The distribution of *Z. thermae* is described as colonies found within three main areas along 50 linear meters of Bridger Creek where a warm spring emerges at or near creek water surface level. This warm spring is sometimes referred to as the Bridger Canyon Warm Springs and includes habitat within the Technology Center's warm water spring box. The status of *Z. thermae* has been qualitatively assessed as present and persistent throughout its known range.

Currently, the population is monitored monthly each year through visual confirmation of the presence or absence of beetles under rocks in the warm springs.

Browni

Hatch described *M. browni* in the literature in 1938. Due to their affinity for turbid water and muddy substrate, Brown's riffle beetle is more difficult to find, yet its status is considered less tenuous because it occupies a greater area. Many of the ecological requirements of *M. browni* remain unknown. The Brown's riffle beetle inhabits four warm water seeps that surface and flow into Bridger Creek along Fish Hatchery Road. It is assumed that *M. browni* is endemic to warm water seeps 250-400 m downstream from where *Z. thermae* is found (Hooten 1991). The status of this population has been assessed as present and persistent throughout its known historic distribution.

Browni is also visually monitored monthly through presence or absence surveys under rocks and on watercress in the warm water seeps where it is known to occur.

BFTC Management History of Beetle Habitat and Bridger Canyon Warm Springs

These two beetle species have persisted through habitat alterations, natural and human-induced, including flooding and drought, water diversions, and direct human disturbance.

The US Bureau of Fisheries purchased property and water rights for the Bozeman National Fish Hatchery in 1893. In its first years, the Hatchery constructed diversions in Bridger Creek to collect Bridger Creek and warm spring water. Over the years, the diversions have been modified and improved to protect water quality and quantity.

Prior to 1940, the warm springs in which *Z. thermae* occur was a popular local swimming hole. After that time, the Fish Hatchery closed the area to swimming and added a cover to the box because of concerns for human safety. From the 1960s into the 1980s, the focus of the program at the hatchery changed from trout production to research. During this time, the facility was designated as the Bozeman Fish Technology Center. Warm spring water continued to be important.

The Technology Center currently collects warm spring water at the original warm spring site with a concrete collection box which is covered with a steel roof (perforated to allow light and some leaf litter material to deposit). Although the box was designed to allow collection of warm water for use in fish rearing at the Technology Center, the box itself prevents swift currents and high sedimentation during spring floods to protect the spring water quality and quantity and should prevent water-borne pathogens in Bridger Creek from entering the Technology Center's water system.

The structure of the collection box has likely contributed to some level of protection for *Z. thermae* through preventing human disturbance and protecting the habitat from drought or flood. During construction work at the Bridger Creek Diversion (adjacent to the collection box) at the Technology Center in May 1993, two of three warm water seeps where *Z. thermae* occurred were

inadvertently covered with excess backfill material. This incident restricted suitable habitat for *Z. thermae* to approximately one square meter upstream of the warm water collection box. In response, the Technology Center staff and Montana State University entomologists met on September 28, 1993 to discuss actions to restore the impacted habitat.

The following actions were taken:

1. Within two weeks following that meeting, warm water seeps were uncovered, and large rocks were placed downstream of the collection box to protect this area.
2. Metal roofing was removed from one fourth of the existing warm spring collection box and replaced with expanded (open) steel perforated roof. This allowed sunlight to enter the spring box and promoted primary productivity.
3. A one-inch hole was drilled through the 36-inch concrete wall on the west side (downstream) of the collection box and then fitted with a PVC pipe to provide warm water drainage on the downstream side and opportunity for the beetles to re-colonize into the box.
4. A covered vertical culvert surrounded by rocks and gravel was installed to protect the box manifold. This allowed debris to be cleared away from the water out-flow thereby maintaining more stable water level and flow through the box.

Following population surveys in September, 1994, entomologists from Montana State University determined that *Z. thermae* had naturally re-colonized inside the collection box. The habitat in the collection box increased occupied habitat by 2-3 fold. *Microcylloepus browni* was not affected by the backfill.

Also during this time, concern was expressed for *M. browni* regarding plans to develop 2 warm water wells on the northwest side of Bridger Creek. It was speculated that pumping water from the wells could reduce flows from warm water seepages along Bridger Creek that support *M. browni* habitat. In response, the Technology Center installed and monitored 2 piezometers. After more than a year of pumping tests, it was determined and the workgroup affirmed that pumping water from 2 warm water wells did not impact flows or *M. browni* habitat.

The Technology Center has managed and protected to the extent possible, the two subject beetle species since they have been identified as species of concern. The Technology Center and State of Montana are mandated to protect wildlife and sensitive species. Species experts have personal and professional investment into the conservation of these beetle species.

Recent Conservation Actions

The box and roof were made more secure in the fall of 2002 when the roof was raised an additional 2 feet to decrease incidence of Bridger Creek water from contaminating water in the concrete box. The primary purpose of the construction was to protect the Technology Center water source from potential pathogens, silt, aquatic nuisance species, decreased water temperature and harmful chemicals in Bridger Creek.

During these improvements, contractors replaced the roof on the spring box, further improving light penetration into the box. Dr. Dan Gustafson from Montana State University and Mark Hooten, Ecologist, Ecological Risk and Environmental Decision Support from Neptune and Co., Inc. observed *Z. thermae* individuals in vascular plants. Algae mats which had developed in the box due to the lack of flushing flows were manually removed to improve sunlight penetration and encourage periphyton growth on rock surfaces. Clean rocks were strategically placed and some gravel was removed to increase habitat near the warm water surface. The removal of accumulated silt from the bottom of this BCWS collection box to improve habitat for *Z. thermae* was discussed but not implemented because the workgroup was concerned habitat disruption could be more damaging than beneficial.

The Technology Center's acquisition in 2001 of 40 acres of land, known as Drinking Horse Mountain, provides regulatory protection by preventing land development and adverse land use. This land is adjacent and goes uphill from the warm spring. With direct management over land-use, the Technology Center can ensure the area is protected from land development or other land management threats. Recently, the Technology Center drilled two warm water wells to provide additional fish rearing water. This reduced the demand for water from the warm spring collection box thereby adding to flow stabilization in the long-term. The new wells are ground water wells (not surface seeps) located down stream several hundred yards, a few hundred feet out of the active creek channel and across Bridger Creek from the warm springs collection box. Therefore water withdrawal from the new wells is not expected to affect warm water seeps along Bridger Creek.

A year-long water monitoring program was implemented to document the elevation and temperature at two piezometer gauging sites when different quantities of warm well water were used for fish rearing. This provided information on water fluctuations affecting *M. browni* habitat. Both piezometers were located above the site where four warm water seeps flow into Bridger Creek along Fish Hatchery Road and where a portion of *M. browni* habitat is located. Initial data from piezometers suggested that beetle habitat is not affected by the warm water collection. However, this information is preliminary and more monitoring is needed to determine the optimal water management strategy needed to prevent impacts to water levels within beetle habitat.

III. INVOLVED PARTIES

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IV. AUTHORITY

The signatory parties hereto enter into this Conservation Agreement and Strategy under Federal and State law, as applicable, including, but not limited to Section 2(c)(2) of the Endangered Species Act, which states that "the policy of Congress is that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species."

This Agreement is subject to and is intended to be consistent with all applicable Federal and State laws and interstate compacts.

V. PROBLEMS FACING THE SPECIES

The success of any conservation or recovery program depends on eliminating or reducing the impact of activities that may threaten the species existence. The following list is a compilation of threats as perceived by the Technology Center. For consistency, the general format is based on the five criteria considered for federal listing of a species in Section 4(a)(1) of the Act. The Conservation Strategy provides a detailed review of problems and threats to the species that signatories to this agreement will address with management actions.

The five criteria addressed are as follows:

1. **The present or threatened destruction, modification, or curtailment of its habitat and range**

For both endemic beetle species, habitat is naturally limited. Drought or flooding can negatively impact their status. Any alterations that may affect impacts from natural flooding in Bridger Creek should be regarded with particular caution since benthic organism populations may be severely affected by intense flooding (Fisher et. al. 1982). Service personnel do not have

management jurisdiction over upstream of Technology Center property. However, these are natural events and the spring collection box is anticipated to ameliorate the impacts of such events.

Negative impacts on beetles from habitat alteration resulting from development of warm water and surface water have not been documented in the 100 years.

Upstream land use activities have potential to become a threat but are not known to be a problem at this time aside from some detectable sedimentation. For *Z. thermae* silt deposition in the warm water collection box could negatively impact the species persistence. Although the warm springs collection box prevents sedimentation, the box also prevents flushing flows and some fine sediments may accumulate over time which could require management. It is recognized some effort may be needed to remove silt periodically over the long-term. The need, periodicity, and process for silt removal must be determined.

Possible future land development and land management upstream or in the vicinity are potential threats, but are not currently known as factors threatening the beetles. Subdivision construction and development, herbicide/pesticide application, dewatering, erosion, mining or fuels extraction testing, vehicle accidents, fuel spills and other human actions have potential to negatively influence the beetle populations. To date, land development impacts are minimal because land in Bridger Canyon (upstream of warm spring) is rural and of high value for low-density, high value residence and ranches. However, upstream land activities do include agriculture and ranching which may impact water quality in Bridger Creek.

2. **Over-utilization for commercial, recreational, scientific, or educational purposes**
Not known to be a factor; however, due to the naturally limited habitat, over-sampling of the two beetle species for scientific or educational purposes could be a threat if populations are not closely monitored.

3. **Disease or predation**
Not known to be a factor; disease, predation, competition and hybridization in the beetle populations are unknown.

4. **The inadequacy of existing regulatory mechanisms**
Currently, State of Montana and Federal regulations are adequate to allow review and oversight of any proposed actions that would modify the active stream channel and wetlands, including the springs; however, regulations do not necessarily protect the stream and water quality from upland actions. For this reason, it is important to monitor and ensure land management is conducive to good water quality and maintaining habitat in the area.

5. **Other natural and manmade factors affecting its continued existence**
Not known to be a factor at this time. Human traffic into the area of the warm spring collection box and other warm water seeps is limited and is discouraged by signage and access limitations.

VI. GAPS IN SPECIES INFORMATION

Some research may be needed to gain information on the effectiveness of previous management actions, to better understand life history needs of both beetle species, and to optimize effectiveness of conservation actions.

For both species, the following information is unknown:

1) Habitat requirements
    a. Temperature (especially for *M. browni*)
    b. Food habits (Seasonal)
    c. Effects of algal mats on diet, survival, and reproduction.
    d. Effects from water quality and other habitat impacts.
2) Population dynamics, density factors and migration
3) Life history strategies
4) Species differentiation

Acquiring this information will provide sufficient background for additional management activities for preserving these species.

VII. GOAL:

Ensure the long-term conservation and protection of *Z. thermae* and *M. browni* in their native habitat at the Technology Center.

VIII. OBJECTIVES:

The following two objectives will be required to attain the goal in this agreement:

1) Maintain populations and habitat of *Z. thermae* and the *M. browni* at the Technology Center at a sustainable level.

2) Eliminate or minimize threats to *Z. thermae* and *M. browni* populations and their habitats to the extent possible.

These objectives will be reached through implementation of the following described conservation management actions.

IX. CONSERVATION ACTIONS, FUNDING AND SCHEDULING

1. The warm water supply manifold to the collection box, box roof and other structures will be kept free of debris so adequate warm water flow is provided and habitat is protected. This has been done on a regular basis since 1993 and will continue.

2. On an annual basis, siltation of the warm spring collection box will be monitored. If siltation reaches critical levels as determined by the workgroup, removal of fine sediments will be implemented. Monitoring will begin in summer of 2006. Data from sediment monitoring (pebble counts) will be compared to population and other habitat monitoring to determine effects. If sedimentation is deemed problematic based on monitoring, adaptive management will be used to determine the most appropriate action to ameliorate siltation effects. Sediment removal may include stirring sediments and vacuuming from water column. *Zaitzevia thermae* would not be at risk of removal during this process because the beetle adheres to rock surfaces. The Technology Center will comply with all applicable environmental regulations (eg. CWA, NEPA) before initiating any action.

3. *Zaitzevia thermae* and *M. browni* populations (status and distribution), seasonal warm water flow regime, water temperatures, water elevation in the warm spring at the collection box, water levels in two developed wells, and flows at warm water seep areas will be monitored and evaluated according to an approved monitoring plan beginning in spring 2006. See monitoring plan Appendix A.
   To the extent possible, scientifically valid information and parameters will be used to determine the population status, dynamics and any impacts or changes. This will need to be adaptive as there is very little baseline of information other than general descriptions from year to year. With the development of a standard data-base through monitoring, the actions implemented can be evaluated and if found ineffective or better information exists, modified or additional actions will be identified.

4. Barricades and signage will be improved and maintained to prevent public disturbance of the sensitive habitat area of *Z. thermae* and *M. browni*.

5. Educational displays will be created and information disseminated for both the public and the beetles' benefit. Exact location of the beetles and their habitat will not be disclosed to minimize chance of vandalism.

6. The Technology Center and State of Montana will review any projects on lands adjacent and upstream to warm springs and promote protective measures regarding any activities with potential to impact *Z. thermae* and *M. browni* populations and habitat. This will be accomplished through review, comment and regulation where appropriate of proposed land- and stream-use activities for the affected area. This review will be done in close

collaboration with State of Montana and federal regulatory agencies (FWS, COE, EPA) and other partners (neighboring land-owners or MSU).

7. The Technology Center will coordinate annually with the workgroup to review monitoring and other data regarding the status of *Z. thermae* and *M. browni* and their habitat. Information will be used adaptively to improve management and conservation.

8. The Technology Center will commit funding during the next 5 years (FY06-FY10) for the above actions as well as pursuing additional research dollars to study important aspects of the beetle species which will benefit their populations, habitat and aquatic community and contribute to long-term conservation.

9. Adaptive management is necessary to ensure long-term protection because there is little base-line information on which to base current actions.

Funding as described is in-kind from existing salaries to conduct monitoring and some research and some base funding from the Technology Center is provided for equipment or other needs. These funds are available at the discretion of Congress and Department of Interior but have a high likelihood of continuing to be available as they have over the past couple of decades at the described levels.

Table 1. Conservation Actions, Funding and Scheduling

Action	Lead	Funding	Funding Source	Start	Schedule
Clearing debris from manifold in box	BFTC	In-kind $2000/yr	BFTC base funding-maintenance	1993	Annually completed after spring flows; inspected seasonally (Ap, Ju, Oct)
Silt monitoring and removal	BFTC	In-kind $500-$1200/yr As needed	BFTC base funding – Aquatic Health program	June-July 2006 First pebble count	Pebble count annually; visually inspected seasonally (Ap, Ju, Oct)
Population Monitoring	BFTC and MSU	In-kind $1000-3000/yr	BFTC base MSU salary	2006	See Appendix A
Habitat Monitoring	BFTC	In-kind $1000-3000/yr	BFTC base MSU salary	2006	See Appendix A
Signage	BFTC	$500-$1000 then as needed	BFTC base - maintenance	2006	Annually inspected - April
Educational Info	BFTC	$100-$500	BFTC base	2005	Newsletters and on-site interpretive info
Land/Stream use review/regulation	BFTC, FWP, MSU	In-kind	BFTC and FWP base	2006	As needed

Annual coordination	BFTC, FWP, MSU	In-kind	BFTC, FWP, MSU base/salaries	2005	Winter
Research Grants	BFTC, MSU	Must be solicited/approved	FWS, ANS grants	2006	As available

X. CONSERVATION PROGRESS ASSESSMENT

The Technology Center will write an annual assessment of progress towards implementing actions identified in this agreement and conservation accomplishments and will distribute to the signatory parties.

If additional or new threats to the survival of *Z. thermae* and/or *M. browni* become known the signatories will be notified immediately.

XI. DURATION OF AGREEMENT

The initial term of this Agreement shall be 5 years. Each year the agreement will be reevaluated, adapted if needed and progress of conservation measures will be reported. After 5 years, the status will be reviewed and the agreement will be updated and resigned as needed.

XII. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

Signing of this agreement is covered under authorities outlined in section V listed above. We anticipate that any monitoring, collection or non-land disturbing research activities conducted through the Conservation Agreement will not entail significant Federal actions under the NEPA and will be given a categorical exclusion designation unless otherwise determined.

XIII. FEDERAL AGENCY COMPLIANCE

The actions taken in this agreement will adhere to Executive Order 11246 on non-discrimination and participants will not discriminate against any person because of race, color, religion, sex or national origin.

No member or delegate of 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.

XIV. SIGNATORIES

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YVETTE K. CONVERSE

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17 July 2006

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Research Scientist

REFERENCES

Fisher, S. G., L. J. Gray, N. B. Grimm, and D. E. Busch. 1982. Temporal succession in a desert stream ecosystem following flash flooding. Ecological Monograms 52(1):93-110.

Hatch, M.H. 1938. Two new species of Helmidae from a warm spring in Montana (Coleoptera). *Entomological News* **49**(1): 16-19, 2 figs.

Hooten, M. M. 1991. Biological systematics of Zaitzevia thermae (Hatch). Masters thesis, Montana State University. 88 pp.

(http://www.roberth.u-net.com/waterinsect.htm)

Appendix A

Monitoring Plan for Thermie Riffle Beetle *Zaitzevia thermae* and Brown's Riffle Beetle *Microcylloepus browni* at the Bozeman Fish Technology Center, Bozeman, Montana

I. Goals and objectives
Based on feedback from species experts that developed the *Z. thermae* and *M. browni* Conservation Agreement and Strategy, the goal of monitoring for these species is to evaluate effectiveness of conservation over time and ensure the population and its habitat persists.

Monitoring for the Thermie Riffle Beetle *Zaitzevia thermae* and Brown's Riffle Beetle *Microcylloepus browni* at the Bozeman Fish Technology Center will include 3 main components:

1) Visual Population Monitoring
2) Water Monitoring
3) Physical Habitat Monitoring

Visual population monitoring is intended to provide information on the presence of the species, species persistence, and is designed to provide information about temporal and spatial population dynamics over time.

Water monitoring includes both water quality and quantity and will provide information about stability of water sources and impacts from upland uses.

Physical habitat monitoring includes inventory of vegetation, documentation of changes to vegetation and substrate composition and major stream or spring geomorphic changes that could impact the beetles.

II. Monitoring Design
A. Visual Population Monitoring will be conducted through visual inspection of rocks and vegetation for presence of both beetle species.

1. Monitoring sites for *Z. thermae*
   a. Inside collection box
   b. Just upstream of concrete box within 1 yard of box
   c. Just downstream of concrete box within 1 yard of box

2. Monitoring sites for *M. browni*
   4 sites with warm spring seeps along Bridger Creek will be identified. Three standard sites will be monitored plus 1 random site will be chosen for each monitoring event.

3. Site area will include 2 square foot area for each of 3 sites.
   a. For *Z. thermae*, each rock larger than 4 inches will be inspected (up to 10 rocks) and approximate number of individuals recorded.
   b. For *M. browni*, water cress wads will be inspected (up to 10 plants).
   c. If extremely abundant, a subsample of each area or plant can be used to estimate number.

4. Frequency: monitoring will be conducted every day (same time) for one week in April, July, Oct, Jan and 1 time per week during other months.

B. Water Monitoring

1. Water Quality
   a. Temperature will be recorded using a HOBO temperature recorder.
   b. Dissolved Oxygen, temperature and turbidity will be measured with a water quality meter.

2. Water Quantity
   a. Bridger Creek flows will be estimated or based on USGS gage records
   b. Warm Spring Seep will be estimated using a gage inside the box
   * gage inside box will be affected by Bridger Creek level but should be able to extrapolate relationship w/ spring seep over time.

3. Frequency: monitoring will be conducted every day (same time) for one week in April, July, Oct, Jan and 1 time per week during other months.

C. Physical Habitat Monitoring

1. Vegetation
   a. Species type will be noted and % coverage of 2 square foot area estimated.
   b. Photo will be taken for documentation of changes over time.

2. Substrate
   a. Substrate composition (% fine, pebble, cobble, boulder) estimated for 2 square foot area.
   b. Photo will be taken for documentation of changes over time.

3. Gross Habitat Changes
   Photos of occupied area will be taken from same spot for each monitoring event to document gross geomorphic or habitat changes over time.

4. Frequency: monitoring will be conducted every day (same time) for one week in April, July, Oct, Jan and 1 time per week during other months.