United States Department of the Interior

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AUG 1 4 2007

Chris Mebane
Project Chief
U.S. Geological Survey
Idaho Water Science Center
203 Collins Road
Boise, Idaho 83702

Subject: Nutrient Enrichment Effects Program, Upper Snake Basin—Elmore, Gooding and Twin Falls Counties, Idaho—Biological Opinion
File #1031.0100 2007-F-0598

Dear Mr. Mebane:

This letter transmits the Fish and Wildlife Service's (Service) Biological Opinion (Opinion) on the effects of the Nutrient Enrichment Effects Program in Upper Snake Basin, Idaho, to species listed under the Endangered Species Act (Act) of 1973, as amended. In a letter dated June 14, 2007 and received by the Service on June 18, 2007, the U.S. Geological Survey (Geological Survey) requested formal consultation on the determination under section 7 of the Act that the proposed action would not affect the Snake River physa snail *(Physa natricina)* or Utah valvata snail *(Valvata utahensis)* and are likely to adversely effect the Bliss Rapids snail *(Taylorconcha serpenticola)* and the Banbury Springs limpet *(Lanx* sp.*)*.

The enclosed Opinion is based primarily on our review of the proposed action as described in your June 2007 Biological Evaluation (Evaluation) regarding the effects of the proposed action on listed species and was prepared in accordance with section 7 of the Act. We conclude that your action will not jeopardize the continued existence of the Bliss Rapids snail *(Taylorconcha serpenticola)* or the Banbury Springs limpet *(Lanx* sp.*)*. A complete administrative record of this consultation is on file at this office.

TAKE PRIDE IN AMERICA

Thank you for your continued interest in the conservation of threatened and endangered species. Please contact Dave Hopper at (208)685-6957 if you have questions concerning this Opinion.

Sincerely,

Gary L Burton

for Jeffery L. Foss, Field Supervisor
Snake River Fish and Wildlife Office

Enclosure

BIOLOGICAL OPINION
on the
SAMPLING EFFECTS OF THE NUTRIENT ENRICHMENT EFFECTS PROGRAM
for the UPPER SHAKE BASIN
UNITED STATES GEOLOGICAL SURVEY
BOISE, IDAHO
2007-F-0598

AUGUST 2007
FISH AND WILDLIFE SERVICE
SNAKE RIVER FISH AND WILDIFE OFFICE
BOISE, IDAHO

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INTRODUCTION

This document transmits the Fish and Wildlife Service's (Service) Biological Opinion (Opinion) of the effects of aquatic sampling for the U.S. Geological Survey's (Geological Survey) proposed nutrient enrichment effects (NEET) study in the upper Snake River Basin, Idaho, on federally listed species in accordance with section 7 of the Endangered Species Act of 1973, as amended (Act). In a letter dated June 18, 2007, and accompanying the NEET proposal and Biological Evaluation (Evaluation), the Geological Survey requested initiation of formal consultation with the Service. The listed species covered in the Opinion are the Bliss Rapids snail (*Taylorconcha serpenticola*) and the Banbury Springs limpet or lanx (*Lanx* sp.). The Service has concluded the proposed action will not jeopardize either species.

This Opinion is based on information provided in the Evaluation, data in our records, information exchanged between the Geological Survey and Service, published literature, and other sources. A complete administrative record of this consultation is on file at the Snake River Fish and Wildlife Office in Boise, Idaho.

Consultation History

Following is a summary of correspondence and other actions relevant to our consultation with the Geological Survey and development of this Opinion.

April 10, 2006	The Service send an e-mail to the Geological Survey acknowledging a telephone conversation in which the Geological Survey inquired about permit needs under the Act to conduct aquatic surveys in areas where listed snails might be present.
February 11, 2007	The Service received a draft Biological Evaluation (Evaluation) documenting potential effects on listed species from implementing the NEET studies.
April 24, 2007	Representatives from the Geological Survey and the Service met to discuss the undescribed details of the proposal and determine if a study permit provided under section 10 or an incidental take permit provided under section 7 of the Act would be appropriate.
May 4, 2007	The Geological Survey provided further study details to assess the information needs of the Service before providing a finalized study Proposal.
June 18, 2007	The Service received a letter dated June 14, 2007, from the Geological Survey initiating formal section 7 consultation, along with the finalized NEET Evaluation.

Agency Determinations

In the Evaluation the Geological Survey determined that the proposed NEET studies would not affect the Snake River physa or the Utah valvata snails; the Service acknowledges these determinations. These species are not discussed further in this Opinion. The Evaluation also concludes that the Geological Survey's activities will affect, and are likely to adversely affect, the Bliss Rapids snail and the Banbury Springs limpet (or lanx). Critical habitat has not been designated for any of these snails species, therefore none shall be affected.

BIOLOGICAL OPINION

I. Description of the Proposed Action

A. Action Area

The action area is defined as all areas to be affected directly or indirectly by the proposed Federal action. The Evaluation lists 30 study sites where biological and water quality data will be collected for the proposed NEET studies. These sites are located in Gooding and Jerome Counties in springs and tributaries that feed into the Snake River. The Geological Survey selected sites that were nutrient enriched at intermediate or high levels, and sites not directly enriched ("pristine").

Five of these locations comprise the action area for this Opinion because listed snails are known to occur or have a possibility of occurring at those locations (Table 1). The study sites are represented by pristine or reference (experimental control) sites (Box Canyon and Briggs Springs) and those that are nutrient enriched (Blue Lakes Springs, Billingsley, and Clover Creeks). The two species of listed snails of concern are known to occur at the pristine sites and have been recorded from some locations or tributaries of the latter three sites. The remaining 25 sites are not considered in this Opinion because neither Bliss Rapids snail nor Banbury Springs limpet occur there.

At sample site #12 Blue Lakes Springs enters the Snake River at approximate river kilometer (Rkm) 982, making it one of the most up-stream locations from which the Bliss Rapids snail has been confirmed to be present. Blue Lakes is a spring derived tributary, the source of which is the Snake River Plain Aquifer, with contributions from agricultural return and an upstream lake where low water velocities contribute to eutrophication. Bliss Rapids snails were collected by the Geological Survey during work conducted at this site in 1994.

Table 1. Proposed NEET study sites likely to contain listed ESA snails. Resample column refers to the Geological Survey's plans to sample on more than one occasion for stream metabolism studies. River Kilometers (RKM) refers to the tributary's confluence along the Snake River.

NEET Site #	Site Name	Site Location	Nutrient Enriched	Resample (Yes/No)	Species Present
12	Blue Lakes Springs	42.6147222; 114.468333 RKM 982	Yes	No	Bliss Rapids snail
18	Briggs Springs	42.6738889; 114.809167 RKM 950	No	No	Bliss Rapids snail, Banbury Springs limpet
20	Box Canyon Springs	42.7075; 114.810278 RKM 946	No	No	Bliss Rapids snail, Banbury Sprs. limpet
24	Billingsley Creek	42.7983333; 114.867444 RKM 923	Yes	Yes	Bliss Rapids snail
30	Clover Creek	43.0022222; 115.1825 RKM 882	Yes	No	Bliss Rapids snail

Briggs Springs enters the Snake River at approximate Rkm 950 after leaving a private aquaculture facility and is the location of sample site #18. The proposed sample site is located upstream of the facility and is pure spring aquifer outflow. The area to be sampled is characterized as riffle, run, and glide habitat, predominately with rocky substrates. Sampling at this location by the Geological Survey in 1994 recorded the presence of both Bliss Rapids snails and Banbury Springs limpets.

Sample site # 20 is located at the Snake River-Box Canyon Spring confluence at approximate Rkm 946 and is the second sampling site where Banbury Springs limpets are located. This tributary is strictly spring-fed, and regarded as pristine. Habitat to be sampled includes riffles, glides, and run habitats over rocky and sandy substrates. As with Briggs Springs, sampling at this location in 1994 recorded both Bliss Rapids snails and Banbury Springs limpets; the latter were returned alive into appropriate habitat.

Billingsley Creek is a long tributary creek that is fed by multiple aquifer spring sources, many being influenced by agriculture and aquaculture return flows. It enters the Snake River at approximate Rkm 923. The proposed NEET sampling site is located upstream of the State Park and Wildlife Management Area, near the Vadir grade of the East 2900 South road.

At sample site #30, Clover Creek enters the Snake River at Rkm 882, the most down stream location where Bliss Rapids snails have been recorded. The area to be sampled is low gradient with pools, runs, glides, and riffles. Fine sediments are more prevalent in this creek given its primary source from interior snow melt; although spring and hyporheic influence is likely. The Geological Survey has not conducted sampling at this location in the past.

B. Proposed Action

1. Background

The proposed NEET study is part of the Geological Survey's National Water Quality Assessment Program (NAWQA) which was developed to systematically collect chemical, biological, and physical data for the assessment of water quality across the nation. The Geological Survey's Idaho Water Science Center in Boise, Idaho, will be conducting investigations at selected sites on tributaries to the Snake River to assess how resident biological communities respond to water quality perturbations from agriculture and other natural or anthropogenic factors. Information obtained from this study will likely be used to help Federal and State agencies develop water quality criteria and manage agricultural lands.

It is important to note that these studies are not targeting these listed species, although any individuals collected in the course of the study will be identified and noted.

2. Description of the Proposed Action

Thirty study sites have been selected by the Geological Survey to be sampled for the NEET studies. All of these are tributaries to the Snake River and all have varying degrees of anthropogenic nutrient enrichment. Biological information will be collected at each location by conducting collections of benthic invertebrates and plants to obtain biomass estimates and provide measures of species composition. Nutrient cycling and water quality data collected will include measurement of nutrients such as phosphorous and nitrogen-based compounds, sediments, particulates, and other common water quality parameters.

Researchers will access creeks and collect data by hand using commonly accepted methods. This will result in low-impact, short-term disturbance to the stream benthos. For most of the selected sites, only a single visit will be made, but repeat visits will be made at 10 sites to conduct stream metabolism studies. The Billingsley Creek sample site may be among these.

Actions that may affect listed snails are associated with macroinvertebrate sampling, accessing the collection sites when researchers enter the stream to collect data, and collection of benthic algae (epilithic periphyton). Other components of the research sampling are described in the Evaluation, but are not anticipated to affect listed snails (e.g., macrophyte biomass estimates) and will not be addressed here. Given the highly endangered status of the Banbury Springs limpet, the Geological Survey has agreed to conduct their sampling in such a way as to practice methods that will avoid killing the species and minimizing harassment or harm.

For macroinvetebrate sampling, five 0.25 m^2 plots will be sampled in riffle habitats totaling an area of approximately 1.25m^2 at each site. A Slack Sampler, fitted with a 500-µm Nitex™ collection net will be placed immediately downstream of the selected plot. Substrates within the plot are then disturbed, causing benthic invertebrates to become detached from the substrates and drift into the collection net. Cobbles will be inspected and any Banbury Springs limpets that are encountered will be left in place, recorded as present, and the rock set to the side in appropriate habitat and not sampled. Upon completion of the sampling, the rock(s) and any invertebrates attached to them will be placed back to their original location.

As proposed, no more than 11 transects will be placed through each of the sample sites and it has been calculated that this will result in the disturbance of no more than 1.8% of the available habitat at these sites.
Epilithic periphyton sampling will be conducted by removing cobbles from the stream, placing them in a holding basin, and scraping an area of approximately 25 millimeters (mm) in diameter. Larger areas may be used if periphyton is sparse on a particular rock. The intent of this sampling is to collect periphyton only and attached snails or other attached animals will be avoided. A total of 25 rock scrape samples will be taken at each site and each cobble returned to its approximate place of origin.

Other sampling methods such as for macrophytes and sediment nutrient samples are not discussed in detail here because they are not anticipated to affect listed snails since neither of the encountered species utilize these substrates. A full description of the study methods can be found on pages 11-17 in the Evaluation.

II. Status of the Species

A. Species Description

The Bliss Rapids snail was listed as threatened on December 12, 1992 (57 FR 59244). Critical habitat for this species has not been designated. Adult snails measure from about 0.2 to 2.5 mm in length, with three whorls, and are ovoid in shape. There are two color variants of the Bliss Rapids snail, the colorless or "pale" form and the orange-red or "orange" form. The pale form is slightly smaller with rounded whorls and more melanin pigment on the body (Hershler et al. 1994). The Bliss Rapids snail occurs in the Mid-Snake River and numerous cold-water tributaries along that river reach. The Service is currently reviewing a delisting petition for this species.

The Banbury Springs limpet was listed as threatened on December 12, 1992 (57 FR 59244). Critical habitat for this species has not been designated. The species is distinguished by a conical shaped shell of uniform red-cinnamon color with a sub central apex or point (Frest and Johannes 1992). While not formally described, the species' status as distinct has been confirmed using molecular techniques (Clark, S.A. in litt., 2007). The species is known to occur only in limited areas at four spring tributaries

along six river miles in the middle Snake River, all of which are derived from the Snake River Plain Aquifer.

A recovery plan was completed for both species, and other listed Snake River snails, in 1995.

B. Life History

The Bliss Rapids snail occurs on hard substrates in springs, creeks, and the Snake River within and adjacent to the Hagerman Valley (Hershler et al. 1994). The species does not burrow and avoids fine depositional sediment and surfaces with attached macrophytes (Service 1995), but has been found in association with smaller, pebble- to gravel-sized substrates (Hershler et al. 1994; Stephenson and Myers 2003). While the Bliss Rapids snail has been documented on submerged, coarse woody debris in a small tributary of Box Canyon Spring (USFWS in litt. 2006a), this is apparently very atypical habitat (Hershler et al. 1994) and the species is normally restricted to rocky substrates. This species is considered negatively phototaxic and primarily resides on the lateral sides and undersides of rocks (Bowler 1990; Hershler et al. 1994). The Bliss Rapids snail can be locally quite abundant, especially in large spring complexes and spring tributaries in the Hagerman Valley on irregular rock surfaces, commonly with encrusting red algae (Service 1995). Data collected to date suggest that Bliss Rapids snails that reside in the Snake River are more frequently encountered and/or occur at higher densities in shallower habitats ($\leq$1 meter (m) depth) (Richards et al., 2006). Reproduction appears to occur at different times of the year in different populations of snails. Those populations found in the main stem of the Snake River lay eggs from December to March, while those located in cold water springs lay eggs from December to April; however, some reproduction may occur throughout the year. Eggs are laid individually on the sides and undersides of rocks and require about one month to hatch into fully developed juveniles. The Bliss Rapids snail has been found inhabiting waters ranging from 7.6 ^{o} to 19.8^{o} C. Bliss Rapids snails are periphyton grazers (Richards in litt. 2007) and are not found in association with substrates supporting a heavy macrophyte load.

The Banbury Springs limpet occurs on hard substrates in only four spring tributaries of the Snake River within and adjacent to the Hagerman Valley. Its general habitat appears to be similar to that of the Bliss Rapids snail which is a coinhabitant wherever the limpet occurs. However, the limpet appears to have additional and more restrictive habitat requirements given the small number of populations that exist and the small area occupied by each population. It is restricted to tributary stream habitats with low sediment and constant water flow in riffles, runs, glides and eddies. Water quality in habitats where the limpets occur is regarded as being of good quality (e.g., water quality standards for cold-water biota) and year-round temperatures vary by only a few degrees (13.9 ^{o} to 17.2^{o} C).

C. Population Dynamics

Little is known about the population dynamics of the Bliss Rapids snail. This snail reaches its highest population densities in cold water springs and tributaries of the Hagerman reach of the middle Snake River. Population densities of this snail are typically much lower in the main stem of the Snake River. For example, at the Sidewinder site, 2002 annual mean density was 16.9 snails per square meter (m^2). Densities tend to be greater in tributary springs; for example, at Thousand Springs Preserve, 2002 annual mean was 104.3 per m^2 (Stephenson and Bean 2003). The differences between the frequency of colony presence and population densities in cold water springs versus the Snake River are likely attributable to water quality, but may also be influenced by other undetermined factors. The Bliss Rapids snail is likely univoltine, having a one-year life cycle. The only demographic studies conducted on the species to date are those by Richards et al. (2006) at Banbury Springs which show a slightly increasing trend in that isolated population.

The demographics of the Banbury Springs limpet are unknown. Idaho Power Company conducted periodic monitoring of the species at Banbury Springs from 1995 to 2001 and found average densities in that population to range from 51 to 74 snails per m^2, ranging from 0 to 236 per m^2 (data taken from summer months of those years). Monitoring has not been conducted for the other three known populations and the full area of occupation and densities within those individual springs are still not fully known.

D. Status and Distribution

The Bliss Rapids snail is discontinuously distributed in the mainstem Snake River and associated with spring tributaries between Clover Creek (Rkm 880) and Twin Falls (Rkm 982). The species' range appears to be limited to habitats controlled or influenced by spring waters derived from the Snake River Plain Aquifer. Colonies are concentrated in the Hagerman reach in cold water springs (e.g., Thousand Springs, Banbury Springs, Box Canyon Springs, Malad River, and Niagara Springs) and in lower densities within this mainstem Snake River reach (Hershler et al. 1994). Surveys for this snail in reservoirs have failed to locate it. The species has not been found outside of its documented historic range, although surveys conducted over the past 10 years have located the species at more locations within its known range. It is currently known from several large and multiple small springs and has been documented at low densities in about 19.8 miles of river habitat (Bean 2006).

Some researchers have noted the decline and disappearance of the Bliss Rapids snail from habitats where they were once common (Frest et al. 1991; Frest and Bowler 1992; Bowler, pers. comm., 2003). The Service is currently conducting a status review of the species' distribution and abundance in response to a delisting petition and analyzing and aggregating available data.

The Banbury Springs limpet is only known from four isolated populations, all within six river miles of one another; Thousand Springs, Box Canyon Spring, Banbury Springs, and Briggs Spring. The total area occupied by these colonies is small, and in most cases their densities are low, clumped, and/or unevenly distributed. The populations at Thousand and Banbury Springs appear to occupy areas of only a few tens of square meters, while those at Box Canyon and Briggs Springs appear to be patchily distributed over linear stream areas of a few hundred meters or less (USFWS in litt., 2006a, b).

E. Factors Affecting the Species

The free-flowing, cold water environments where the Bliss Rapids snail evolved have been negatively impacted by anthropogenic activities throughout its range. Development of water impoundments and hydroelectric dams has changed the fundamental character of the Snake River. This has resulted in fragmentation of previously continuous river habitat, affected fluvial and energy flow dynamics (Osmundson et al. 2002), and contributed to the degradation of water quality. In addition to the loss of habitat and isolation effects posed by dams and hydropower operations, specifically load following, are documented to have negative impacts to aquatic species occupying habitats downstream of such facilities (Fisher and LaVoy 1972; Kroger 1973; Brusven et al. 1974; Brusven and MacPhee 1976; Gersich 1980; Gislaison 1980; Morgan et al. 1991; Christman et al. 1996). This is especially important for shallow-dwelling species like the Bliss Rapids snail. Data from recent studies has shown that similar operations on the middle Snake River can be expected to negatively impact Bliss Rapids snails through desiccation and exposure to extremes in air temperature (Richards, D. and Arrington 2007; Richards, R. and B. Kerans in litt. 2007), but studies are ongoing and these impacts have not yet been fully quantified.

Changes in water temperature and dissolved oxygen (DO) have been noted as critical parameters for species typically associated with cold-water habitats such as the Bliss Rapids snail. This is likely an important factor controlling the distribution of this species and may explain why it reaches higher densities in spring habitats which tent to have significantly better water quality than the mainstem river (Cazier 1997, 2001, both as revised 2003). It is not known how impaired water quality may affect the reproduction, survival, or other life history characteristics of this species, but published and unpublished field observations suggest that the Bliss Rapids snail is not tolerant of pollution and low-oxygen environments (Hershler et al. 1994; Bowler and Frest, unpub. manscpt. A). Since the Bliss Rapids snail requires free-flowing water and rocky substrates, siltation associated with erosion, reduced flow velocity, water impoundment, aquaculture facilities, and other water uses that reduce DO and add excessive nutrients or contaminants, may be particularly detrimental and the species is typically absent from such environments or, if present, only found at low densities (Hershler et al. 1994; Bowler and Frest, unpub. manscpt. A).

Multiple studies have linked high nutrient loads, especially nitrates and other nitrogen compounds, in the aquifer to various agricultural practices (EPA 2002, Neely 2005). While some agricultural practices have remained relatively constant (e.g., irrigated crop lands), others have increased significantly (e.g., cattle and dairy production) and it has yet to be determined how such increases may impact the Snake River Plain Aquifer, nonpoint sources of pollutants into the Snake River, or the listed snails reliant on these spring or river habitats. Water quality issues are the greatest concern for the continued existence of these snail species.

Degraded water quality in some alcove and tributary springs and streams has also adversely affected snails (Frest and Johannes 1992). Despite the often high nutrient content of spring discharges (EPA 2002), free-flowing, cold-water spring tributaries are recognized as the most important habitats for the listed Bliss Rapids snail and other cold water-dependent species. Numerous cold-water springs in the Hagerman Reach and throughout the middle Snake River have been diverted for aquaculture, power generation (e.g., Thousand Springs), and agricultural uses which has resulted in degraded water quality in some springs.

In addition, infrequent and unpredictable contaminant spills represent a potential threat to the Bliss Rapids snail and other aquatic species in the Snake River.

Changes in the use of stored water in the Snake River Basin for agriculture or other uses also impact the Bliss Rapids snail and its habitats. For example, Federal and private water projects withhold, store, and release water to coincide with irrigation needs and this timing is substantially different than flows occurring under a natural hydrograph to which the species is adapted. The majority of water storage in the basin has recently reverted to agricultural use and this is reflected in the withholding of past below Milner Dam (USGS in litt. 2004). The combination of withholding of river flows together with input of agricultural returns below Milner Dam is a primary source of water quality degradation and likely a limiting factor in the distribution of the Bliss Rapids snail in this river reach (EPA 2002). River populations of the Bliss Rapids snail only become more numerous downstream of the Thousand Springs Complex and Malad River, where relatively cleaner spring contributions constitute a significant portion of the river volume.

In its altered state, the middle Snake River provides suitable habitat for numerous alien species, and these species have the potential to impact the Bliss Rapids snail. Most notable of these is the New Zealand mudsnail (*Potamopyrgus antipodarum*), which is now present, if not abundant, throughout a large portion of the middle Snake River, its distribution and habitat use overlapping with that of the Bliss Rapids snails. The New Zealand mudsnail appears to flourish in watercourses with relatively low DO and with substrates of mud or silt. It has also been recorded to reach high densities within some of the cold water spring complexes of the middle Snake River, in habitats commonly occupied by Bliss Rapids snail (e.g., in excess of 495,000 per m^2 at Banbury Springs) (Richards et al. 2001). Dr. D. Gustafson, of Montana State University (in Richards 2001), documented declines of native snails in the presence of a growing mudsnail

population, and others have observed New Zealand mudsnails densely packed on rock surfaces formally occupied by the Bliss Rapids snail (Frest et al. 1991; Bowler et al. 1993). Study of the competitive interactions of the mudsnail with native, North American aquatic species is ongoing; these non-native snails have been shown to spread and reproduce rapidly, and greatly deplete the standing crop of aquatic algae and periphyton (Cada 2001, Hall 2001; Hall et al. 2003). The physiologic plasticity of the New Zealand mudsnail allows it to thrive in eutrophic reservoir habitats, as well as some cold-water tributaries. It is likely that the anthropogenic alterations of the middle Snake River, including the presence of dams and hydroelectric operations, and reduced water quality are partially responsible for this invading snails' success (Bowler et al. 1993). The New Zealand mudsnail is present at various densities within the Malad River drainage and likely has some effect on the resident Bliss Rapids snails there.

Prior to construction of the Lower and Upper Salmon Falls and Bliss hydroelectric facilities, the Bliss Rapids snail occurred in a continuous or loosely connected population throughout this portion of the Snake River. These dams and their associated reservoirs constitute physical and biological barriers to movement of this species between these river reaches. In addition, Bliss Rapids snail populations have been isolated by spring and tributary development for aquaculture. Aquaculture development physically alters and reduces spring habitat, and typically degrades water quality downstream (Falter and Hinson in litt. 2003) to a point where Bliss Rapids snails are no longer components of the snail fauna at some locations (Bowler, pers. comm. 2003). Hence, while the headwaters of some developed spring tributaries may still contain colonies of Bliss Rapids snail, these are frequently isolated from downstream areas and the Snake River. Conservation theory and numerous studies have found that small and isolated populations are far more prone to extirpation (localized extinction) and recolonization is rarely, if ever possible given the human created barriers and/or habitat destruction that isolate these habitats (Soulé 1980, 1987; Shaffer 1981; Holsinger 2000). Recent findings on western fishes have shown isolated river populations to be far more prone to local extirpation and extinction (Winston et al. 1991; Fagan et al. 2002). Spring and river habitats within the range of the Bliss Rapids snail have been degraded and fragmented from human activities and this constitutes a threat to the persistence of the species.

Physical and ecological (e.g., reservoirs) barriers in the range of the Bliss Rapids snail preclude or limit genetic exchange between small, isolated populations and this results in reduced genetic variation, which is documented to have negative impacts on their reproductive output and overall vigor (Shaffer 1981; Dudash and Fenster 2000). At least one study has documented delayed maturation and reduced fecundity in small isolated colonies of aquatic snails (Puurtinen et al. 2004). Recent, preliminary data suggest the Bliss Rapids snail exhibits genetic isolation between some springs and river reaches, but details of these findings have not been finalized or made available for scientific review (Clark, W. in litt., 2007).

The free-flowing, cold water environments where the Banbury Springs limpet is known to occur have been negatively impacted by human developments. Prior development and

water diversions may have impacted the species at all of its known population sites, but most of these occurred before the species was known to science. In the early 1900s, a majority of the springs comprising the Thousand Springs complex were diverted for hydropower generation, resulting in the destruction and/or degradation of appropriate habitat within that complex. Similarly, a majority of the spring flow at Box Canyon Spring was diverted for use across the Snake River in an aquaculture facility. It is unknown if this diversion destroyed habitat or killed limpets, but the species is found to be present a short distance downstream of the diversion pool. The Briggs Spring population may have similarly been affected by the construction of water conveyance channels for another aquaculture facility. Habitat destruction also occurred at Banbury Springs, where an impoundment may have destroyed habitat formerly occupied by, or available to, the species. We have not been informed of any plans to modify these study sites, and the Box Canyon site's designation as a state park will help ensure its long-term protection.

Spring out-flows from the Snake River Plain Aquifer have been declining over the past 50 years. Prior data indicate that spring out-flow had actually increased since the turn of the century when the flood irrigation methods used at the time may have helped charge the aquifer (Kjelstrom 1992). Water conservation measures implemented over the past 30 years, along with increased ground water pumping may account for the more recent declines. Ground water pumping is currently a contentious issue in the area and will remain a serious threat as water demand for municipal or agricultural use increases and/or under conditions of prolonged drought.

F. Conservation Needs of these Species

Conservation of the Bliss Rapids snail will entail the preservation of the remaining high quality spring and tributaries habitats, accompanied by protection of spring water quality and the Snake River Plain Aquifer from which those springs originate. In addition, high water quality criteria would need to be established and implemented for the middle Snake River for the species to persist and recover (Service 1995).

Conservation of the Banbury Springs limpet will entail the preservation of the remaining high quality spring and tributaries habitats, accompanied by protection of spring water quality and the Snake River Plain Aquifer from which those springs originate (Service 1995).

III. Environmental Baseline

Regulations implementing the Endangered Species Act (50 CFR 402.02) define the environmental baseline as the past and present impacts of all Federal, State, or private actions and other human activities in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area which have undergone section 7 consultation, and the impacts of State, tribal, local,

and/or private actions that are reasonably certain to occur and are contemporaneous with the consultation in progress.

A. Status of the Species in the Action Area

With the exception of surveys conducted in 1994 by the Geological Survey, there is little information on the status of listed snails at the proposed Blue Lakes sample site. The site is classified as a nutrient enriched site and is at the upstream-most extent of the Bliss Rapids snail's range. The Geological Survey report that 96 Bliss Rapids snails were collected in this reach in 1994, but the species was absent from their collections in 1996 (Evaluation). Blue Lakes is well outside of the known range of the Banbury Springs limpet and the species is not anticipated to occur there.

Briggs Springs has been surveyed by the Service (USFWS in litt., 2007b) and the Geological Survey. The Service conducted a 20-cobble survey targeting Banbury Springs limpets just upstream of the Geological Survey stream gage, at the approximate sampling location proposed for the proposed NEET studies, as well as immediately downstream of the stream gage and road culvert. The Service encountered Bliss Rapids snails at lower to medium densities and found a single limpet. These surveys were conducted over about 30 meters upstream of the stream gage. By contrast, the Service encountered a total of 94 limpets on 16 of 20 cobbles in a run-eddy habitat just downstream of the stream gage, an area outside of the proposed NEET surveys. Surveys conducted by the Geological Survey in this reach in 1994 led to the discovery of this population of Banbury Springs limpets, which previously been unknown. (Evaluation). Based on the Geological Survey's finding of 25 Bliss Rapids snails during that effort, the species is probably present at this site in medium densities (<100/m^2). One limpet was found during that sampling effort.

Within Box Canyon Spring State Park, Bliss Rapids snails are known to occur at low to high densities at numerous locations, but they are absent from a number of other locations. Surveys conducted by the Service and others have shown both species to be present in riffle, run, and glide habitats between the Sculpin Pool and fish farm diversion, areas identified for NEET surveys. Surveys conducted by the Service in 2006 found Bliss Rapids snails to occur at low to medium densities; while quantified counts were not taken, their numbers did not exceed 50/m^2 in the areas searched (Hopper, unpublished data, USFWS in litt., 2006a). Banbury Springs limpet abundance was lower than that of Bliss Rapids snails, with 12 percent of the cobbles inspected (n=70) being inhabited and a total of 20 individuals being observed. This is the only reach of Box Canyon known to be occupied by the limpet, but the Bliss Rapids snail is known from upstream locations and was found in relatively high densities (100 to 1,000 per m^2) in a tributary upstream of the fish farm diversion. In 1994 the Geological Survey collected 16 Bliss Rapids snails during a sampling effort similar to the one proposed for these NEET studies. Banbury Springs limpets in this area were described as "rare" by the Geological Survey team and none were collected in their sampling. Hence, in the Box Canyon Spring area, Bliss Rapids snails could be described as occurring at low to medium densities at multiple

locations within the tributary, while Banbury Springs limpets are somewhat uncommon to occasional and localized in their distribution.

The Billingsley Creek sample site is located upstream of the State Park and Wildlife Management Area, near the Vadir Grade of the East 2900 South road. This site has not been surveyed by either the Geological Survey or the Service and we have no records of other investigations at this site. Billingsley Creek is derived from numerous spring sources, a number of which are known to be occupied by Bliss Rapids snail (e.g., Fisher Lake Springs, Florence Springs), though Banbury Springs limpet have not been documented from any of these. Away from the source springs, water quality within Billingsley Creek has been significantly altered. Effluent from numerous fish hatcheries and irrigation return canals entering the creek and this site is classified by the Geological Survey as nutrient enriched. Previous surveys in similar tributaries (e.g., Blind Canyon; Richards 2005) contained no Bliss Rapids snails and the Service anticipates this sample site may be devoid of listed species or other sensitive snails, although their presence is not ruled out at this time.

Clover Creek is another site to be visited during this NEET investigation that has been sampled previously and found to contain Bliss Rapids snail. Although the surveys conducted were not thorough or systematic, the Service found about three individuals to be present on one of two rocks inspected; New Zealand mudsnails were abundant at this site, the cobble bar on the south bank of the river's confluence with the Snake River (USFWS in litt., 2004). Idaho Power Company has also recorded Bliss Rapids snail at this site. Like Billingsley Creek, Clover Creek is nutrient enriched and the Service anticipates that few if any Bliss Rapids snails will be observed at this location unless the Geological Survey collects samples from near or at the Snake River confluence. Banbury Springs limpet is not known to occur at this site.

B. Factors Affecting the Species in the Action Area

1. Water Quality and Quantity

There are no known water quality or quantity issues specific to any of the proposed sample sites. However, they are all subject to these threats as described in Factors Affecting the Species (Section II. E., above).

2. Introduced Species

The New Zealand mudsnail is common throughout the action area and does inhabit spring tributaries with the listed snails addressed in this Opinion. While it can reach extremely high densities in parts of the Snake River and in disturbed and enriched tributary habitats, the higher water velocities encountered in Box Canyon and Briggs Creek may keep it from reaching high densities in those habitats. The New Zealand mudsnail is more common in habitats like Clover and Billingsley Creek. The apparent ability of this species to tolerate aquatic systems with compromised water quality may

provide it with a strong competitive advantage to both the Bliss Rapids snail and Banbury Springs limpet, but it is also possible that these two listed snails are more limited by the water quality itself rather than various competitive interactions from the mudsnail.

3. Habitat Loss and Fragmentation

A large percentage of the springs and tributaries that feed into the Snake River have been significantly altered by human activities. Springs have been diverted for use in small hydropower operations, for irrigation, municipal use, and most notably for aquaculture facilities. Not only has such development resulted in outright destruction of occupied snail habitat (e.g., Lower White Springs, now White Springs Fish Hatchery; Bowler in litt., 2004), but snail populations that occurred nearer the spring sources become isolated both due to altered habitat as well as reduced water quality.

Box Canyon Springs is managed by Idaho Parks and Recreation. Prior to State acquisition and management of Box Canyon Springs, a majority of that tributary's flow was diverted for use in an aquaculture facility, potentially destroying and fragmenting previously occupied snail habitat. Briggs Springs is privately owned and much of this water is diverted into a private aquaculture facility.

IV. Effects of the Proposed Action

Regulations implementing section 7 of the Act define effects of the action as "the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated and interdependent with the action, that will be added to the environmental baseline (50 CFR 402.02)." When analyzing the effects of the NEET study, the Service used the same approach as for other types of section 7 analyses. The following analysis was developed in accordance with the above guidance.

A. Direct Effects

Direct effects are defined as the direct or immediate effects of the action on the species or its habitat. Direct effects result from the agency action, including the effects of interrelated and interdependent actions.

The NEET studies as proposed are anticipated to have the following effects on listed snails. For the Bliss Rapids snail, snails will be adversely affected during benthic sampling; individuals will be fixed and removed as part of those collections. Additional individuals will be adversely affected by researchers walking over habitat and collecting data, resulting in the moving of substrate and possible crushing and dislodging of snails and or their eggs. For the Banbury Springs limpet, snails may be adversely affected by researchers walking over habitat, resulting in the moving of substrate and possible crushing and dislodging of snails and or their eggs. It is possible, but unlikely that limpets will be killed through direct collection. Geological Survey biologists will make efforts to identify and leave any limpets in place. Direct disturbances of both species

associated with this action will be short in duration and will occur over a small aerial extent, having been estimated to result in the disturbance of less than two percent of the available habitat at any of these locations (Table 2).

Table 2. Approximate areas to be disturbed during the proposed NEET surveys at five sample sites with the potential to contain listed snails. Numbers derived from Geological Survey estimates as provided in the Evaluation. Area of disturbance includes intensive benthic sampling and low disturbance access and sampling estimates.

Site #	Site Name	Area of Disturbance (~m^2)	Habitat Disturbed (~%)	Banbury Springs limpet, prior USGS collections	Bliss Rapids snails, prior USGS collections
12	Blue Lakes Springs*	85	0.4	Not present	96
18	Briggs Springs	85	1.8	1	25
20	Box Canyon Springs	47	0.2	0	16
24	Billingsley Creek*	46	0.04	Not present	Not sampled
30	Clover Creek*	46	0.8	Not present	Not sampled

*: Nutrient enriched site, snail densities anticipated to be low; sampling of Billingsley and Clover Creek likely to result in low numbers of incidental take;

Negative effects of suspension of sediments or other particulate mater on both of these listed snails is not anticipated to be great. The effect is considered insignificant because the habitats where these species occur are typically low in fine sediments and because water velocity in these habitats will move any suspended particulates out of snail habitats quickly and not allow such particulates to accumulate.

For sampling of rocks for epilithic periphyton, it is anticipated that no mortality will occur to listed snails since the researcher will be able to see and avoid snails and will replace the sample cobble back into the river promptly after sampling. Periphyton sampling may result in exposure of Bliss Rapids snails and Banbury Springs limpets since this will entail manipulation and exposure of rocks that may contain either of these species and or their eggs. Any such impact will be minimized since sampling will be conducted quickly and the rocks replaced promptly. Effects of such limited exposure is anticipated to be insignificant, and will not cause mortality or reduce reproduction.

B. Indirect Effects

Indirect effects are caused by or result from the agency action, are later in time, and are reasonably certain to occur. Indirect effects may occur outside of the immediate footprint of the Project area, but would occur within the action area as defined.

The Service does not anticipate that there will be any significant indirect effects from the proposed NEET studies. Within the two pristine habitat sample sites (Briggs Springs and Box Canyon Springs) sampling will only occur once and will not result in any long-term or intensive disturbances.

C. Effects of Interrelated and Interdependent Actions

Interrelated actions are those that are a part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration. The Service does not anticipate any interrelated or interdependent actions associated with the proposed NEET surveys.

V. 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 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 Act.

Throughout its range, habitats of the Bliss Rapids snail are likely to continue to be negatively affected by State, local, and private activities. These activities include destruction or modification of spring habitats and reduced water quality on, or downstream of, private and public lands used for agriculture, aquaculture, or other development projects, and contamination and depletion of aquifer water that feed spring habitats in the Hagerman area.
Southwestern Idaho supports a large agricultural industry. This industry relies on water from the Snake River and its tributaries for irrigation. The Snake River and its tributaries (including most springs considered in this Opinion) receive water that has been used in irrigation (agricultural return). These agricultural returns contain elevated quantities of sediment, nutrients (derived from fertilizers and live stock operations), and pesticides, and that have been warmed and depleted of DO. It is not known how agriculturally-derived nutrients and contaminants interact with the underlying groundwater, but many irrigation return flows do enter the Snake River and tributaries such as Billingsley Creek. Degraded water quality from these sources will continue to impact Bliss Rapids snail, Banbury Springs limpet, and their habitat, and these threats will increase with the growth of new agriculture and aquaculture projects, and increasing human population growth in the area.

VI. Conclusion

After reviewing the current status of the Bliss Rapids snail and Banbury Springs limpet, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, it is the Service's opinion that these studies, as proposed are not likely to jeopardize the continued existence of either Bliss Rapids snail or the Banbury Springs limpet. No critical habitat for these species has been designated, therefore none will be affected.

Adverse affects may occur to the Banbury Springs limpet as a result of benthic sampling and accessing the sample sites at Brigg and Box Canyon Springs, but the Service anticipates that the risk of direct mortality will be low given the Geological Survey's planned avoidance of the species and its general rarity and low density in most areas. The limpet is absent from the other three sample sites considered in this Opinion so no adverse affects to this species will occur at these locations. Adverse affect to the Bliss Rapids snail are anticipated. Snails will be collected and sacrificed during benthic sampling and may also be adversely affected by trampling when biologists access the sample sites. Adverse affects to the Bliss Rapids snail are anticipated to occur at Briggs, Box Canyon, and Blue Lakes Springs, and may occur at Billingsley and Clover Creek, however habitat and water quality conditions at those latter two sites are poor and so the species may not be present or be present in low densities.

After conducting a full analysis of the proposed NEET studies, the Service concludes that the methods proposed will not result in effects that are of high impact to occupied habitat and that those impacts will be of short duration. Any disturbed habitat is expected to fully recover to predisturbance levels within a short period of time (months or less). Disturbance to Bliss Rapids snails and Banbury Springs limpets will be limited to very small areas and very few of individuals are expected to be disturbed. These disturbance effects will occur in a very small area of the available habitat within each of the sample locations (springs or tributaries) (Table 2) and these springs and tributaries comprise only a small portion of the habitat known to be occupied by the Bliss Rapids snail. Half of the springs known to be occupied by the Banbury Springs limpet will be subject to effects from the sampling, but few individuals and limited habitat are likely to be affected. Habitats occupied by the Banbury Springs limpet, to be sampled by the Geological Survey, will only be sampled once and efforts will be made to avoid collecting or negatively affecting this species. These effects will not result in prolonged impacts to the population growth of either species, and the resident populations within these sample areas are anticipated to recover to predisturbance levels, probably within a single generation (estimated to be one year). The proposed NEET sampling is not anticipated to result in severe, permanent, or prolonged impacts to water quality, will not result in any permanent habitat destruction or fragmentation, and will not result in the introduction of invasive, nonnative species. The proposed NEET sampling is not expected to alter reproduction numbers or distribution of Bliss Rapids snail or Banbury Springs limpet. Therefore, impacts to these species will not rise to the level of jeopardizing the continued existence of the species.

VII. Incidental Take Statement

Section 9 of the Act and Federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, kill, trap, capture, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or

sheltering. Harass is defined by the Service 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. Incidental take is defined as take that is incidental to and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The measures described below are non-discretionary, and must be undertaken by the Geological Survey so that they become binding conditions of this Incidental Take Permit, as appropriate, for the exemption in section 7(o)(2) to apply. If the Geological Survey fails to assume and implement the terms and conditions, the protective coverage of section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the Geological Survey must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement [50 CFR §402.14(i) (3)].

A. Amount and Extent of Take Anticipated

The Service anticipates incidental take of Banbury Springs limpets in both Box Canyon Springs and Briggs Springs in the course of implementing the proposed NEET study. Harassment may occur during benthic sampling and mortality and harm may occur when Geological Survey personnel access the sample sites. The Service anticipates that mortality, if it occurs at all, would be low since disturbance will be minor, disturbance of large substrate is not expected and because the limpet is generally present in low densities. The Evaluation estimated that the proposed surveys in Box Canyon will occur in a total area of approximately 47 m^2, which is approximately 0.23 percent of the available habitat (Table 2). We anticipate that no mortality will occur due to collection, and that mortality and harm due to accessing the site will disturb an area considerably less than the 47 m^2 area to be surveyed. The Evaluation estimated that approximately 85 m^2 or 1.8 percent of the available habitat will be accessed to conduct the surveys and studies at Briggs Springs. As with Box Canyon Springs, we anticipate that no mortality will occur due to collection and that mortality and harm due to accessing the site will disturb an area considerably less than the 85 m^2 area. While the Service regards the likelihood of mortality of Banbury Springs limpets at these two sample sites as low, we anticipate an incidental take of four limpets total from the benthic sampling at both sites combined. We also anticipate incidental take associated with harassment from trampling within the access area of the 47 m^2 at Box Canyon Spring and 85 m^2 at Briggs Springs. Trampling will encompass only areas where workers walk to gain access to the sites and all animals trampled may be taken.

The Service anticipates incidental take of Bliss Rapids snails at the five described sample sites. Incidental take will occur in the form of mortality, harm, and harassment due to benthic and other sampling and accessing the study sites. The Service anticipates that all Bliss Rapids snails within the 1.5 m^2 area of benthic sampling will be killed during

collection at each of the five sites: Box Canyon Springs, Blue Lakes Springs, Briggs Springs, Clover Creek, and Billingsley Creek. Prior sampling by the Geological Survey resulted in collections of 16, 96, 25, and 25 individuals of this species respectively, and we regard these numbers as being reflective of the take likely to occur from benthic sampling. Clover Creek has not been sampled by Geological Survey and the Billingsley Creek numbers are from a more pristine site, Florence Springs, which is not anticipated to be representative of the Billingsley Creek site to be sampled during the proposed NEET studies. Given the nutrient enriched character of three of these sample sites (Billingsley Creek, Clover Creek, Blue Lakes Springs), the Service does not anticipate high densities of Bliss Rapids snail to be collected or harmed, although some previous collections at Blue Lakes Springs are contrary to this assumption. In addition, all of these sample sites will have larger areas disturbed when Geological Survey biologists access them for data collection. The total estimated areas to be disturbed for each sample site is provided in Table 2.

During the proposed surveys, the Geological Survey has estimated that 85 m^2 will be subject to disturbance at Blue Lakes Springs and 46 m^2 will be subject to disturbance at both Billingsley and Clover Creek. Most of this disturbance would be from accessing the sampling sites, with the exception of the 1.5 m^2 to be subjected to benthic monitoring, and will not be as intensively disturbed. Mortality to Bliss Rapids snails in this area is anticipated to be low since the species is frequently found in protected cracks and vesicles on rock surfaces and would not be as readily crushed. If present, some of these individuals are likely to be killed, but most would only undergo temporary harassment or some harm (possibly from deposited eggs being crushed). While the Service regards the likelihood of mortality of Bliss Rapids snails within the 1.5 m^2 benthic sampling site to be high, mortality within the access areas will be lower, those snails being subjected to harassment, some harm and limited mortality. The Service anticipates incidental take, in the form of harm, harassment, and mortality, of all Bliss Rapids snail within trampled portions of the area of 47 m^2 area at Box Canyon Spring, 85 m^2 at both Briggs Springs and Blue Lakes Spring, and 46 m^2 area at both Billingsley and Clover Creek.

B. Effect of the Take

Incidental take of both the Banbury Springs limpet and Bliss Rapids snail are anticipated to be insignificant at the population level, but individual snails may (Banbury Springs limpet) or will (Bliss Rapids snail) be taken. In areas of intensive benthic sampling (1.5 m^2), Banbury Springs limpets will be actively removed and placed back into the surrounding habitat unharmed, while the more robust populations of Bliss Rapids snail will not be significantly impacted by these collections. In the areas of low intensity disturbance (e.g., access areas) snails will be less likely to die as a result of the study's activities, but a substantially larger area will be disturbed. However, relative to the total habitat area available in the surrounding areas, this mortality is also anticipated to be insignificant at the population level. With the exception of Billingsley Creek, these sample sites will be visited only once and sampling at each location will require relatively little time, minimizing the duration of disturbance and reducing the risk of mortality to

resident snails. While incidental take is provided for Billingsley and Clover Creek, the service anticipates that few if any listed snails will be present and that past and current land-use impacts have eliminated one or both of these listed snails if they were present historically.

C. Reasonable and Prudent Measures

The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of Banbury Springs limpet and Bliss Rapids snails at the five sample sites.

> Reduce harm, harassment, and mortality to Banbury Springs limpet and Bliss Rapids snails during sampling.

D. Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the Commission must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outlined in the section on required reporting, which includes monitoring requirements. These terms and conditions are non-discretionary.

1. Avoid and/or minimize impacts to submerged benthic habitats by minimizing the duration of time spent collecting on or accessing sample plots, avoid rolling rocks and other substrate to any degree practical, and once sampling is complete, replace all substrate to its original position and orientation as much as is practicable.
2. Limit the amount of substrate trampled when walking through water to gain access to the site. If multiple workers ore conducting sampling, they should use the same access route so that the smallest amount of habitat possible is trampled. Egress from the sample site should follow the same route.

If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Geological Survey must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the sampling or of the reasonable and prudent measures.

E. Reporting Requirements

Report to the Service the numbers and locations of Bliss Rapids snails collected during NEET sampling, and numbers and locations of the Banbury Springs limpets encountered. Provide the Service with finalized reports and any resulting publications that utilize data from these surveys.

VIII. Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize 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 implement recovery programs or to develop information.

1. In reporting results of the NEET study, include data on numbers and densities of Bliss Rapids snails and Banbury Springs limpet encountered and collected. As appropriate analyze relationships between water quality and habitat conditions and status of the species at sample locations

2. If applicable, include recommendations for the conservation of these listed snails or other sensitive species in reports and publications resulting from these studies

IX. Reinitiation Notice

This concludes formal consultation on the Geological Survey's proposed NEET studies to be conducted on tributaries of the Snake River, Idaho. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (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 agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this opinion; (4) a new species is listed or critical habitat designated that may be affected by the action. Reinitiation of section 7 consultation may be necessary for such events. In instances where the amount or extent of incidental take is exceeded, the Geological Survey should contact the Service immediately.

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