BIOLOGICAL OPINION
FOR THE
Clear Lake Hydropower Facility Maintenance

01EIFW00-2012-F-0371

U.S. FISH AND WILDLIFE SERVICE
IDAHO FISH AND WILDLIFE OFFICE
BOISE, IDAHO

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1. BACKGROUND

1.1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Biological Opinion (Opinion) of the effects of the issuance of a Clean Water Act Section 404 permit for the Clear Lake Hydropower Facility Maintenance (proposed action) on the Bliss Rapids snail (*Tayorconcha serpenticola*). In a communication dated November 6, 2012, the Army Corps of Engineers (Corps) requested formal consultation with the Service under section 7 of the Endangered Species Act (Act) of 1973, as amended, for its proposal to authorize the action. The Corps determined that the proposed action is likely to adversely affect Bliss Rapids snails. As described in this Opinion, and based on the Biological Assessment (Bean 2012; Assessment) developed by the applicant, and other information, the Service has concluded that the action, as proposed, is not likely to jeopardize the continued existence of Bliss Rapids snail.

1.2 Consultation History

This section provides a chronology of primary events that comprised the preconsultation and post-initiation processes of this Opinion. Only events that played some significant role in the initiation and implementation of the consultation are recorded, minor communications are not reported in this record. All communications reported in the Consultation History have been filed at the Idaho Fish and Wildlife Office as part of the permanent record of this consultation.

April 17, 2012:	Biologists from the Company and Service conduct surveys in the action area to assess the distribution of Bliss Rapids snails.
July 7, 2012:	The Company provides the Service with a draft biological assessment for the proposed action.
October 31, 2012:	The Service receives a letter from the Corps providing a brief description of the proposed action and a list of special conditions pertaining to that action. In this letter the Corps provides their determination that the proposed action is likely to adversely affect federally listed species in the area.
November 6, 2012:	In two separate e-mails to the Service, the Corps requests formal consultation under the Act and provides a final Assessment.
November 29, 2012:	The Service provides a letter to the Corps stating that they have adequate information to initiate section 7 consultation under the Act.
January 23, 2012	The Service provides a draft biological opinion to the Corps and the Company for their review.

2. BIOLOGICAL OPINION

2.1 Description of the Proposed Action

This section describes the proposed Federal action, including any measures that may avoid, minimize, or mitigate adverse effects to listed species or critical habitat, and the extent of the geographic area affected by the action (i.e., the action area). The term "action" is defined in the implementing regulations for section 7 as "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies in the United States or upon the high seas."

2.1.1 Action Area

The term "action area" is defined in the regulations as "all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action." The Clear Lake Hydroelectric Facility is situated at the downstream end of Clear Lake, located in south Gooding County, adjacent to the Snake River, approximate lat-long: 42.6696° N, -114.7775° W. The bypass channel downstream of the spillway/spill gates constitutes the original creek drainage from Clear Lake to the Snake River and is watered both by seepage from the intake canal, springs, and from the irrigation over-flow system from spillway bay 7 (see Section 2.1.2 below). The hydroelectric diversion and reject spillway are an estimated 600 meters (m) (1,935 ft) upstream from the creek drainage's confluence with the Snake River at approximate river kilometer (RK) 954 (river mile (RM) 593), an estimated 1.8 kilometers (km) (5,900 ft) downstream from the Clear Lakes Road Bridge (county road S 1700E). The intake and bypass spillway for the hydropower facility is located at the downstream end of Clear Lake, which receives effluent water from Clear Springs Foods®, the local, privately owned aquaculture facility and fish processing plant (Figure 1). Most of the estimated 550 cubic feet per second (cfs) that exits Clear Lake enters the power plant's penstock by way of an intake canal and forebay. From the diversion, this water is transmitted down the 370 m penstock to the powerhouse. The areas to receive maintenance and upgrading includes in-water work along portions of the intake canal and forebay (an estimated 100 m (316 ft) upstream of the diversion structure; elements of the diversion and intake structures; portions of the penstock; and portions of the bypass channel downstream of the diversion structure. Since elements of the upgrading and maintenance include diversion of all 550 cfs downstream through the bypass channel, an area that typically receives less than 100 cfs of flow, the entire channel will be affected by the proposed action and is therefore part of the action area. The Clear Lake Hydroelectric Project predates the Federal Power Act and as such does not require a license from the Federal Energy Regulatory Commission (Commission), and hence no Commission authorities are triggered as a consequence of the proposed action.

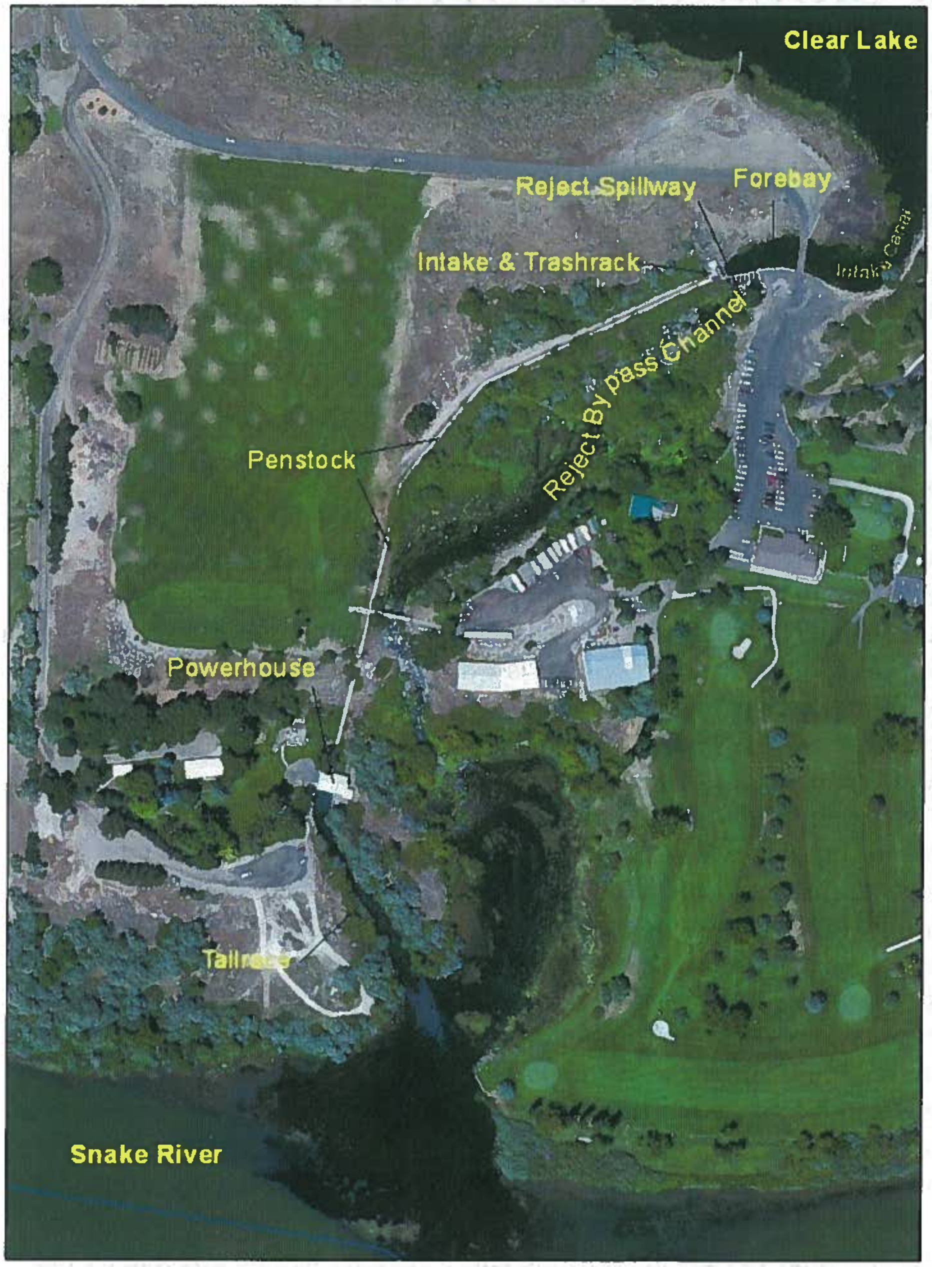

Figure 1. An overview of the project area at Clear Lake Hydroelectric Project, Gooding County, Idaho. Also see Figure 2.

2.1.2 Proposed Action

There are seven improvements or maintenance measures listed in the Assessment to be conducted in this proposed action. For the purposes of this Opinion and to conform to the action components as described in detail, we have combined some of those action components under the heading of Concrete Repair. The Assessment states that the proposed repairs will begin in Spring of 2013 and require a maximum duration of 6 months. More recent information from the Company places the completion date of this action at November 30, 2013. The main action components outlined in the Assessment are:

- Reduce subsurface leakage around the left spillway embankment (Seepage Repair);
- Repair the concrete structure of the reject channel spillways and apron (Concrete Repair) and replace the existing walkway associated with these structures;
- Modify spillway bay 7 to incorporate a golf course diversion pipe (Bay 7 Modification);
- Replace the in-take trash rack and trash-removal system (Trash Removal System);
- Install a penstock butterfly valve (Butterfly Valve);
- Place riprap downstream of the spillway apron (Riprap Installation).

Seepage Repair

An estimated 50 cfs of subsurface flow seeps from the intake canal and into the bypass reach below the reject spill-gates. This leakage reduces generation capacity and may be undermining the road and spillway structure. For this reason, the Company will attempt to repair the primary points of leakage using a quick-setting, underwater grout. The primary points of leakage will be determined using fluorescence dye, underwater investigation by diver, remotely operated vehicle, or flow measurements. Once located, temporary coffer dams will be placed around these locations and water pumped from within the coffer dam, filtered and returned to the intake canal. At each primary point of leakage, a mix of bentonite, road mix, and low-mobility, quick-set grout will be poured onto the point of leakage. It is estimated that up to 10 cubic yards will be applied at the primary seepage points. Biologists will be present to determine if any portion of the grout leaks into the bypass reach at which point grout application will be terminated and the Company shall contact the Service as soon as possible. After the grout mixture has set, the coffer dam(s) will be removed.

Concrete Repair

The concrete structures in the intake area are nearly 80 years old and are in various stages of decomposition. The existing bypass spillway and spillway apron will be removed and replaced with a new concrete spillway and apron. The aging walkway associated with these concrete structures will also be removed and new walkway installed.

There are seven spillway bays, six for bypass flows and one that provides irrigation water to the adjacent golf course. Three spillway bays are required to convey the full 550 cfs in the intake canal. For this reason at least three of the bays will need to be available at any time during the construction process to accommodate the full volume should there be a generator shutdown. Hence work will only be conducted on two to three bays at a time. A temporary construction bulkhead or coffer dam will be placed in two to three spill-gate forebays and a temporary headwall will be constructed downstream of these structures to allow the existing spillways, piers, and apron components to be dewatered. After dewatering, the existing spillways and piers will be removed using concrete saws and heavy equipment. After removal, new concrete piers and spillways will be poured and allowed to cure before removing the coffer dam structures. This process will be repeated for all of the spillway gates and piers to be replaced.

The spillway apron has undergone undercutting over the life of the facility. The apron will be reinforced by placing forms at the downstream end of the existing apron, after which holes will be drilled through the existing apron and concrete will be injected into the voids below the apron. Dependent on emergency spill contingencies and control measures, the contractor may conduct apron repair in sections larger or smaller than the two to three bay limit employed for spill-gate and pier replacement. Lastly, the existing wood-plank walkway will also be removed and a new, grated walkway installed. This work will all be done above high water line.

Bay 7 Modification

The function of the 7th spillway bay is to deliver water to the golf course watering system. This structure currently has a wooden bulkhead, which will be replaced with a concrete bulkhead and water-delivery pipe to the golf course irrigation system. Overflow from this irrigation intake structure enters the bypass reach below the Project spillway. The same coffer dam system will be used to isolate and replace this portion of the spillway structure as described above.

Trash Removal System

As proposed, a coffer dam will be placed in the forebay approximately 9 m (30 ft) upstream of the existing trash rack and the intake area dewatered. Any water leaking into the intake area will be pumped out, filtered, and returned to the forebay area. During this period and while the butterfly valve is installed, the entire 550 cfs of water used for power generation will be spilled into the bypass reach via the spill-gates increasing bypass flows to an estimated 600 cfs.

Butterfly Valve

The existing intake bulkhead gates are aging and do not adequately seal water from entering the penstock. For this reason the Company is planning on installing a supplemental penstock butterfly valve.

All of the 550 cfs flow will be directed into the bypass reach to allow all construction to be conducted in dry conditions. The existing bulkhead gates and temporary blocking of leaks in this structure, will allow those gates to be used as a coffer dam while the valve and associated materials are installed. A 229-cm (90-inch) diameter butterfly valve will be installed in the penstock a short distance down slope from the diversion structure. Concrete saddles will be installed under the penstock on both sides of the butterfly valve as additional support. A vent pipe will also be installed downstream of the butterfly valve to help reduce pressure changes when the valve is operated. This component of the construction may take advantage of an additional coffer dam proposed for the forebay as part of the trash rack construction process (see above).

Riprap Installation

The existing riprap below the spillway apron in the reject channel will be removed prior to concrete repairs of the spillways/spill gates and spillway apron. Riprap will be removed from an estimated depth of 1.2 m (4 ft), extending 4.6 m (15 ft) downstream of the spillway apron. Upon completion of the concrete repairs (see above) riprap will be replaced downstream of and abutting the spillway apron.

Lastly, the Assessment states that best management practices (BMPs) will be implemented for the control of erosion and sediment control. These BMPs will include the use of silt fencing structures to contain storm-water sediment runoff and prevent and contain fuel spills and leaks into wetted areas.

2.2 Analytical Framework for the Jeopardy Determination

2.2.1 Jeopardy Determination

In accordance with policy and regulation, the jeopardy analysis in this Opinion relies on four components:

1. The *Status of the Species*, which evaluates the Bliss Rapids snails' range-wide condition, the factors responsible for that condition, and its survival and recovery needs.
2. The *Environmental Baseline*, which evaluates the condition of the Bliss Rapids snail in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species.
3. The *Effects of the Action*, which determines the direct and indirect impacts of the proposed Federal action and the effects of any interrelated or interdependent activities on the Bliss Rapids snail.
4. *Cumulative Effects*, which evaluates the effects of future, non-Federal activities in the action area on the Bliss Rapids snail.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed Federal action in the context of the Bliss Rapids snails' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of the species in the wild.

The jeopardy analysis in this Opinion places an emphasis on consideration of the range-wide survival and recovery needs of the Bliss Rapids snail and the role of the action area in the survival and recovery of the species as the context for evaluating the significance of the effects of the proposed Federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

2.3 Status of the Species

This section presents information about the regulatory, biological and ecological status of the Bliss Rapids snail that provides context for evaluating the significance of probable effects caused by the proposed action.

2.3.1 Bliss Rapids Snail

2.3.1.1 Listing Status

The Bliss Rapids snail was listed as a threatened species on December 14, 1992 (57 FR 59244). Critical habitat for this species has not been designated. The recovery area for this species is designated as the Snake River and tributary cold-water spring complexes between RK 880 (RM 547) and RK 941 (RM 585) (USFWS 1995, pg. 31). On December 26, 2006, the State of Idaho and the Idaho Power Company petitioned the Service to delist the Bliss Rapids snail from the Federal list of threatened and endangered species, based on new information that the species was more widespread and abundant than determined at the time of its listing. The Service reviewed the information provided in the petition and initiated a 12-month review of the species' status. After compilation and review of new information, the Service hosted an expert panel of scientists and a panel of Service managers to reevaluate the species' status. On September 16, 2009, based on the findings of these expert panels, the Service posted a notice in the Federal Register stating the Bliss Rapids snail still warranted protection as a Threatened species given its restricted range and the persistence of threats (USFWS 2008, pg. 19-37).

2.3.1.2 Species Description

The shells of adult Bliss Rapids snails are 2 to 4 mm (0.08 to 0.16 in) long with 3.5 to 4.5 whorls, and are clear to white in color when empty (Hershler *et al.* 1994, pg. 235). The species is known to occur in at least two different color morphs, a white or pale form, and a red form (*ibid.*, pg. 240). It is not known what controls these color forms, but some populations contain both.

2.3.1.3 Life History

The Bliss Rapids snail is dioeceous (has separate sexes). Fertilization is internal and eggs are laid within capsules on rock or other hard substrates (Hershler *et al.* 1994, pg. 239). Individual, life-time fecundity is not known, but deposition of 5 to 12 eggs per cluster have been observed in laboratory conditions (Richards *et al.* 2009c, pg. 26). Reproductive phenology probably differs between habitats and has not been rigorously studied in the wild. Hershler *et al.* (1994, pg. 239) stated that reproduction occurred from December through March. However, a more thorough investigation by Richards (2004, pg. 135) suggested a bimodal phenology with spring and fall reproductive peaks, but with some recruitment occurring throughout the year.

The seasonal and inter-annual population densities of Bliss Rapids snails can be highly variable. The greatest abundance values for Bliss Rapids snails are in spring habitats, where they frequently reach localized densities in the tens to thousands per square meter (Richard 2004, pg. 129; Richards and Arrington 2009, Figures 1-6, pg. 23-24). This is most likely due to the stable environmental conditions of these aquifer springs, which provide steady flows of consistent temperatures and relatively good water quality throughout the year. Despite the high densities reached within springs, Bliss Rapids snails may be absent from springs or absent from portions of springs with otherwise uniform water quality conditions. The reasons for this patchy distribution are uncertain but may be attributable to factors such as habitat quality (USFWS 2008, pg. 11-13), competition from species such as the New Zealand mudsnail (Richards 2004, 89-91), elevated water velocity, or historical events that had eliminated Bliss Rapids snails in the past (*e.g.*, construction of fish farms at spring sources, spring diversion, *etc.*).

By contrast, river-dwelling populations are subjected to highly variable river dynamics where flows and temperatures can vary greatly over the course of the year. Compared to springs in which water temperatures range between 14° to 17° C, river temperatures typically fluctuate between 5° to 23° C, and river flows within the species' range can range from less than 4,000 cfs to greater than 30,000 cfs throughout the course of a year. These river processes likely play a major role in structuring and/or limiting snail populations within the Snake River (Dodds 2002, pg. 418-425; EPA 2002, pg. 9-10–9-12). While Bliss Rapids snails may reach moderate densities (10s to 100s per m^2) at some river locations, they are more frequently found at low densities ($\leq$10 per m^2) (Richards and Arrington 2009, Figures 1-6, pg. 23-24; Richards *et al.* 2009b, pg. 35-39) when they are present. It is likely that annual river processes play a major role in the distribution and abundance of the Bliss Rapids snail throughout its range within the Snake River by killing or relocating snails, and by greatly altering the benthic habitat (Palmer and Poff 1997, pg. 171; Dodds 2002, pg. 418-425; Liu and Hershler 2009, pg. 1296). While declines in river volume due to a natural hydrograph are typically less abrupt than load-following (see Section 2.5.1.1), they are of much greater magnitude, and hence it is logical to assume these natural events play an important role in limiting snail populations within the river.

A genetic analysis of the Bliss Rapids snail based on specimens collected from throughout its range (Liu and Hershler 2009, pg. 1294) indicated that spring populations were largely or entirely sedentary, with little to no movement between springs or between springs and river populations. Most spring populations were highly differentiated from one another as determined by DNA microsatellite groupings. By contrast, river populations exhibited no clear groupings, suggesting that they are genetically mixed (Liu and Hershler 2009, pg. 1295) and without genetic barriers, or they have not been isolated long enough to establish unique genetic differentiation. This pattern supports the suggestion made by other biologists that the river-dwelling population(s) of the Bliss Rapids snail exist in either a continuous river population (Liu and Hershler 2009, pg. 1295-1297) or as a metapopulation(s) (Richards *et al.* 2009b, entire document) in which small, semi-isolated populations (within the river) provide and/or receive recruits from one another to maintain a loosely connected population.

Habitat Characteristics

The Bliss Rapids snail is typically found on the lateral and undersides of clean cobbles in pools, eddies, runs, and riffles, though it may occasionally be found on submerged woody debris (Hershler *et al.* 1994, pg. 239) where it grazes on periphyton (benthic diatom mats) (Richards *et al.* 2006, pg. 59). This species appears to be restricted to aquifer spring-influenced bodies of water within and associated with the Snake River from King Hill (RK 879 (RM 546)) to Elison Springs (RK 972 (RM 604)). The snails' distribution in the Snake River is, with rare exception, within reaches that are not impounded and receive significant quantities (current est. 5,000 cfs) of recharge from the Snake River Plain Aquifer (Clark and Ott 1996, pg. 555; Clark *et al.* 1998, pg. 9). It has not been found within impounded reaches of the Snake River (Richards *et al.* 2006, Table II.1.5, pg. 37), but can be found in spring pools or pools with evidence of spring influence (Hopper *in litt.* 2006). With few exceptions, the Bliss Rapids snail has not been found in sediment-laden habitats. It is typically found on, and reaches its highest densities on, clean gravel-to-boulder substrates in habitats with low-to-moderately swift currents, but it is typically absent from whitewater habitats (Hershler *et al.* 1994, pg. 237). Difficulties in rearing this species in a laboratory setting (Warbritton, *in litt.*, 2009), along with its natural distribution within spring-influenced waters, suggest it requires cool water of relatively high or specific quality.

Previous observations have suggested that the Bliss Rapids snail is more abundant in shallower habitats, but most sampling has been in shallow habitat since deeper river habitat is more difficult to access. Clark *et al.* (2009, pg. 24-25) used a quantile regression model that modeled a 50 percent decline in snail abundance for each 3 meters of depth (*e.g.*, snail density at 3 meters was approximately 50 percent less than that at shoreline (pg. 24). Richards *et al.* (2009a, pg. 6-7) used an analysis of variance (ANOVA) to assess snail densities at 1-m (3 ft) intervals and only found a statistical difference (increase) in densities in the first meter of depth, with no declining trends with increasing depth. Nonetheless, these authors suggest that greater than 50 percent of the river population could reside in the first 1.5 meter (5 ft) depth zone of the Snake River (Richards *et al.* 2009a, Appendix 1).

Diet

Richards (2004, pgs. 112-120) looked at periphyton (benthic diatoms, Aufwuchs) consumption by the Bliss Rapids snail and the New Zealand mudsnail (*Potamopyrgus antipodarum*) in competition experiments. He described the Bliss Rapids snail as a "bulldozer" type grazer, moving slowly over substrates and consuming most, if not all, available diatoms. The dominant diatoms identified in his controlled field experiments consisted of the bacilliariophyt genera *Achananthus* sp., *Cocconeis* sp., *Navicula* sp., *Gomphonema* sp., and *Rhoicosphenia* sp., although the species composition of these and others varied greatly between seasons and location. At least one species of periphytic green algae was also present (*Oocystis* sp.). Richards (2004, pg. 121) suggested that the Bliss Rapids snail appeared to be a better competitor (relative to the New Zealand mudsnail) in late successional diatom communities, such as the stable spring habitats where they are often found in greater abundance than the mudsnail.

2.3.1.4 Status and Distribution

The U.S. Fish and Wildlife Service (1995, pg. 10) reported that the Bliss Rapids snails' "modern" range extends along the Snake River from Indian Cove Bridge (RK 845 (RM 525)) to Twin Falls (RM 610.5 (RK 982.3)) and that it likely occurred upstream of American Falls in a disjunct population where it had been reported from springs (RK 1207 (RM 750)). The current documented range of extant populations is more restricted; this species has been identified from the Snake River near King Hill (RK 878 (RM 546)) to below Lower Salmon Falls Dam (RK 922 (RM 573)), and from spring tributaries as far upstream as Ellison Springs (RK 972 (RM 604)) (Bates *et al.* 2009, pg. 100). The "American Falls" occurrence was later discounted after multiple surveys failed to relocate the species (USFWS 2008, pg. 5-6). There is an isolated river population that occupies a limited bypass reach (Dolman Rapids) between the Upper and Lower Salmon Falls reservoirs (Stephenson 2006, pg. 6).

Recently completed studies by the Company found the species to be more common and abundant within the Snake River (RK 879-920 (RM 546-572)) than previously thought, although typically in a patchy distribution with highly variable abundance (Bean 2006, pg. 2-3; Richards and

Arrington 2009, Figures 1-6, pg. 23-24). Most, if not all, of the river range of the species is in reaches (Lower Salmon Falls and Bliss) where recent records show an estimated 5,000 cfs of water entering the Snake River from numerous cold springs from the Snake River Plain Aquifer (Clark and Ott 1996, pg. 555; Clark *et al.* 1998, pg. 9). This large spring influence, along with the steep, unimpounded character of the river in these reaches, improves water quality (temperature, dissolved oxygen, and other parameters) and helps maintain suitable habitat (low-sediment cobble) for the snail that likely contributes to the species' presence in these reaches (Hershler *et al.* 1994, pg. 237). It is noteworthy that the species becomes absent below King Hill, where the river loses gradient, begins to meander, and becomes more sediment-laden and lake-like. Although Bliss Rapids snail numbers are typically lower within the Snake River than in adjacent spring habitats, the large amount of potential habitat within the river suggests that the population(s) within the river is/are low-density but large compared to the smaller, isolated, typically high-density spring populations (Richards and Arrington 2009, Figures 1-6, pg. 23-24). These river reaches comprise the majority of the species designated recovery area as well as the action area (see Section 2.4.1.1 below).

The species' range upstream of Upper Salmon Falls Reservoir (RK 941-972 (RM 585-604)) is restricted to aquifer-fed spring tributaries where water quality is relatively high and human disturbance is less direct. Within these springs, populations of snails may occupy substantial portions of a tributary (*e.g.*, Box Canyon Springs Creek, where they are scattered throughout the 1.1 miles (1.8 km) of stream habitat) or may be restricted to habitats of only several square meters (*e.g.*, Crystal Springs). Spring development for domestic and agricultural use has altered or degraded a large amount of these habitats in this portion of the species' range (Hershler *et al.* 1994, pg. 241; Clark *et al.* 1998, pg. 7), often restricting populations of the Bliss Rapids snail to spring source areas (Hershler *et al.* 1994, pg. 241). Within the Snake River (and with the exception of the small, isolated population in the Dolman Rapids bypass reach), the Bliss Rapids snail only occurs in the unimpounded reaches from below Lower Salmon Falls Dam (RK 922 (RM 573)) to near the town of King Hill (est. RK 879 (RM 546)), a total of approximately 31 river km (19 river miles). In the King Hill area the gradient and velocity of the Snake River declines and the benthic habitats begin to become more sediment laden; a habitat from which the species is absent. Although the species is typically less abundant within river habitats than within springs, it is far more widespread and genetically similar within the river where it probably is distributed via river transport mechanisms during high-flow events (see Life History section).

2.3.1.5 Previous Consultations and Conservation Efforts

The Service recently completed a biological opinion for operational changes at two Snake River hydroelectric projects, also owned and operated by the Company. That biological opinion relied extensively on research conducted as part of a Settlement Agreement (2004) between the Company and the Service, the research of which was used to assess the effects of project operations (Clark 2009). As part of the proposed action for the license amendment to modify operations, the Company submitted a Bliss Rapids Snail Protection Plan (Plan) (Company 2010) as part of the proposed action. This plan provided a monitoring program for Bliss Rapids snails both within the Snake River as well as numerous springs within the range of the species, and outlined a collaborative approach between the Company and the Service for assessing impacts to the species range-wide as well as a process for planning and implementing future conservation actions should the need arise. The Plan also provides assurances that the Company will not knowingly implement actions that would reduce the species' chances at recovery (*e.g.*, preserving habitat and water quality/quantity) and would be willing partners in pursuing conservation actions when identified and within their power. At this time, the Federal Energy Regulatory Commission, the Federal agency overseeing the relicensing of the Snake River hydroelectric projects addressed in the Plan, has not issued these license amendments nor approved the Plan. Despite this, the Company has undertaken annual monitoring of Bliss Rapids snail populations and continues to meet with the Service in an effort to fully implement the agreed-to monitoring and assess their on-going activities to assess and avoid impacts to the species.

2.3.1.6 Conservation Needs

Survival and recovery of the federally listed snails in and adjacent to the Snake River, Idaho, is considered contingent on "conserving and restoring essential main-stem Snake River and cold-water spring tributary habitats" (USFWS 1995, p. 27). Given the Bliss Rapids snail's habit of utilizing both river and spring habitats, the above stated recovery goal is critical. The generalized priority tasks for all of the listed Snake River snails, including the Bliss Rapids snail, consist of the following.

Priority 1

- Securing, restoring, and maintaining free-flowing main-stem habitats between the C.J. Strike Reservoir and American Falls Dam, and securing, restoring, and maintaining existing cold-water spring habitats.
- Rehabilitating, restoring, and maintaining watershed conditions (specifically: cold, unpolluted, well-oxygenated flowing water with low turbidity. (*ibid.*, pg. 1)).
- Monitoring populations and habitat to further define life history, population dynamics, and habitat requirements (*ibid.*, pg. 27-28).

Priority 2

- Updating and revising recovery plan criteria and objectives as more information becomes available, recovery tasks are completed, or as environmental conditions change (*ibid.*, pg. 28).

Given the known limited distribution of the Bliss Rapids snail and its specific habitat requirements, maintaining or improving spring and river habitat conditions within its range is the primary need for this species' survival and recovery. The Bliss Rapids snail reaches its highest densities in cold-water springs dominated by cobble substrates and free, or relatively free, of fine sediments, and with good water quality. Protecting these habitats that contain Bliss Rapids snail populations is critical to their survival and recovery.

Ensuring that water quality within the Snake River is not degraded is important for sustaining the species' river-dwelling populations. Since water quality appears to be of crucial importance to the species, protection of the Snake River Plain Aquifer is a priority. The aquifer is the source of water for the springs occupied by the snail and serves a major role in maintaining river water quality within the species' range.

2.4 Environmental Baseline of the Action Area

This section assesses the effects of past and ongoing human and natural factors that have led to the current status of the species, its habitat and ecosystem in the action area. Also included in the environmental baseline are the anticipated impacts of all proposed Federal projects in the action area that have already undergone section 7 consultations, and the impacts of state and private actions which are contemporaneous with this consultation.

2.4.1 Bliss Rapids in the Action Area

2.4.1.1 Status of the Species in the Action Area

Surveys conducted by the Company and the Service in 2012 revealed a relatively low density of Bliss Rapids snails occupying the bypass reach. Inspection of 120 cobbles, with a total area of approximately 3.6 m^2, located 23 individual Bliss Rapids snails for an estimated density of 6.4 snails per m^2 (Assessment, pg. 7). However, the distribution of Bliss Rapids snails is not uniform throughout the bypass channel and no reliable estimate of the population number can be made with the available data. The highest concentration of these snails were located a short distance downstream of the reject spillways within and along the edge of the reject channel, several meters downstream from where excavation of riprap will occur as described above. Most snails found within the bypass channel were located in areas with ground-spring contributions located on river right, in shallow pebble-cobble habitat. Although snails were not found within the actual project (riprap) footprint, the proximity of springs and difficulty of searching the undersides of riprap leaves open the possibility that snails could be present within the construction footprint, but may have missed detection. Additional occupied patches of snails were found on cobbles downstream of this point, primarily on river right for a distance of approximately 130 m (425 ft) below the existing spillway.

2.4.1.2 Factors Affecting the Species in the Action Area

The Bliss Rapids snail reaches its highest densities in spring habitats watered from the Eastern Snake River Plain Aquifer. While found in some portions of the Snake River, these locations are typically influenced by spring flows and largely free of fine sediments. This species is known to reach higher spring densities at springs both downstream (Briggs, Banbury Springs) and upstream (Niagara, Crystal Springs) of the action area. Reasons for their reduced abundance within the Clear Lake area are speculative, but likely include compromised water quality and alteration of the remaining spring habitats, which includes the bypass reach within the action area.

As discussed in Section 2.6 below, portions of the Eastern Snake River Plain Aquifer (ESRPA) flow beneath intensively used agricultural lands and the aquifer is documented to receive contaminants from these land uses. Figure 2 shows the proximity of one large confined animal feeding operation (CAFO), as well as irrigated croplands which occur on the canyon rim above the source springs. Most springs that have been sampled for water quality (see citations in

Section 2.6) show seasonal increases in nitrates, but most of these fall well below 10 parts per million (ppm), the human health quality threshold. However, some of the springs feeding the Clear Lake system reach seasonal nitrate levels in excess of 5 ppm at their source with nitrate values from one of these springs reported in excess of 14 ppm (Schorzman *et al.* 2009, pg. 8-13).

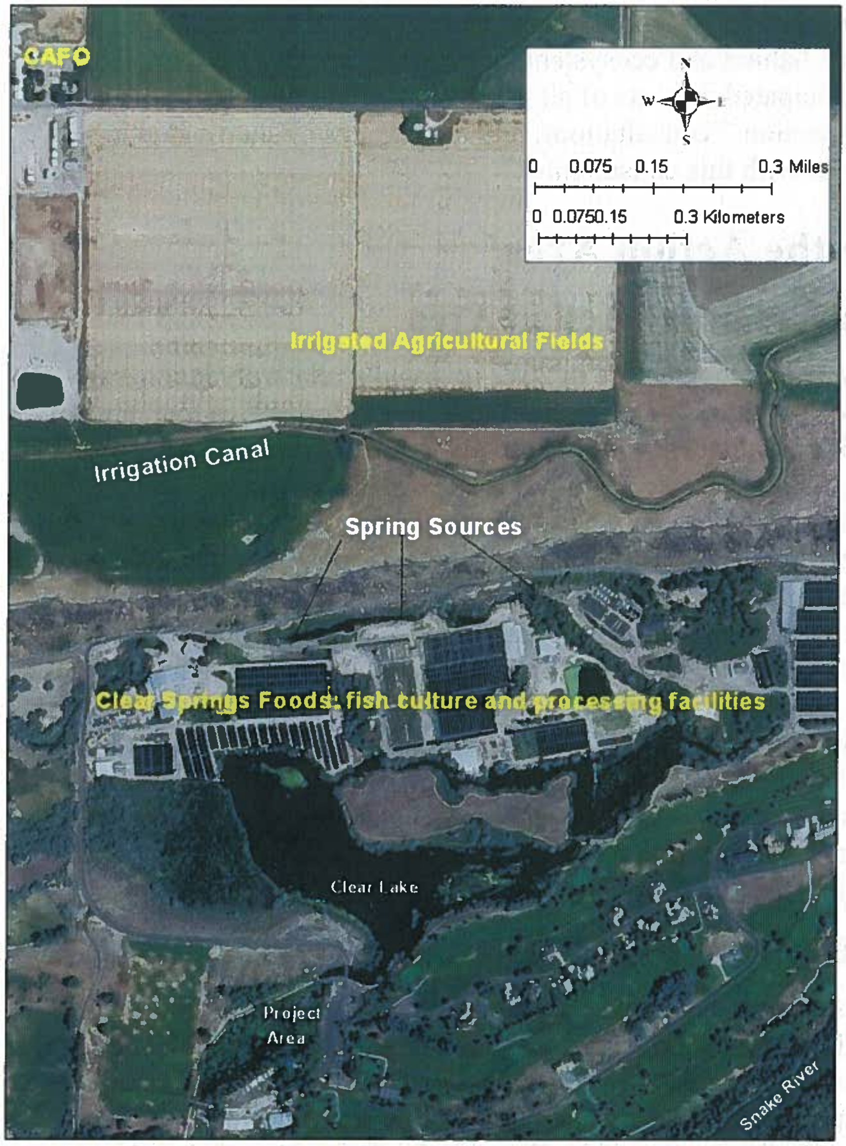

Figure 2. The greater project area illustrating some of the adjacent land uses and their proximity to the project area. The different land uses contribute to local and regional water quality impairment, potentially affecting ground-water (irrigated agriculture, CAFO) as well as surface water sources (aquaculture). Periodic spill events that inundate the bypass channel subject resident Bliss Rapids snails to reduced water quality. Resident populations of this species likely rely on springs that surface along the bypass channel.

The springs studied in the Shorszman *et al.* 2009 report are used by Clear Springs Foods® for aquaculture and/or fish processing, before being released into Clear Lake, hence it is reasonable to assume that water entering the project and bypass reach have become additionally compromised by these uses after leaving the spring source. In this regard, it is notable that within the bypass channel, most of the Bliss Rapids snails recorded to date are associated with what are likely aquifer-derived springs and not the water sources directly derived from Clear Lake. This is not to state that poor water quality from the lake does not influence these springs, but the lack of snails in waters derived entirely from Clear Lake suggests water quality could be playing a role in this local distribution.

Another factor that has likely impacted resident populations of Bliss Rapids snails may be the periodic high flows of water introduced into the bypass channel during power plant shut-downs. Figures 3 and 4 illustrate the increases in bypass flow (est. 50 cfs to 600 cfs) during plant shut-down. Records show that recent shut-downs have occurred for periods of up to nearly 6 months (e.g., 2003: March 31 to September 22; Bean, pers. comm. 14 Nov 2012). These events not only expose local colonies of Bliss Rapids snails to excessive water velocity and bed-scour, but also to reduced water quality due to inundation with water from the upstream sources. The effects that these periodic bypass events have had on the resident Bliss Rapid snails are not known, but the species has persisted despite periodic, and sometimes extended, bypass events. Similar high flow events in bypass streams (Snowbank Springs at Thousand Springs Hydroelectric Project) have been monitored and those events reduced resident Bliss Rapids snail densities from 23.9 snails per m^2 to 5.9 per m^2 (a decrease of 75 percent), and reduced their occupancy from 72 percent of cobbles occupied to 34.4 percent (USFWS, *in litt.* 2012). The elevated bypass flows at Snowbank Springs were of good spring water quality and were estimated to have been maintained at 170 cfs for a period of 6 months. Given the record of such high flow events at the Clear Lake Hydroelectric Project for facility inspection and maintenance (Bean, pers. comm. 14 Nov 2012), it is reasonable to assume that the resident colonies of Bliss Rapids snails have been negatively affected by bypass spills, likely more so given the poor water quality associated with the upstream supply.

2.5 Effects of the Proposed Action

Effects of the action considers the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action. These effects are considered along with the environmental baseline and the predicted cumulative effects to determine the overall effects to the species. Direct effects are defined as those that result from the proposed action and directly or immediately impact the species or its habitat. Indirect effects are those that are caused by, or will result from, the proposed action and are later in time, but still reasonably certain to occur. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation.

Figure 3. Clear Lake bypass reach below the spillgates/spillway, during power plant operation. This photo illustrates the bypass channel when all water is being diverted into the power house intake/ penstock. The estimated 50 cfs visible in the channel in this photo is from the current subsurface leakage as well as the golf course irrigation intake (spill at center left of photo). The red arrow shows the location where Bliss Rapids snails were found at their highest densities, several meters downstream of the suspended irrigation pipe crossing. Additional colonies of snails were found in similar habitats downstream from this point. (Idaho Power Co. photo).

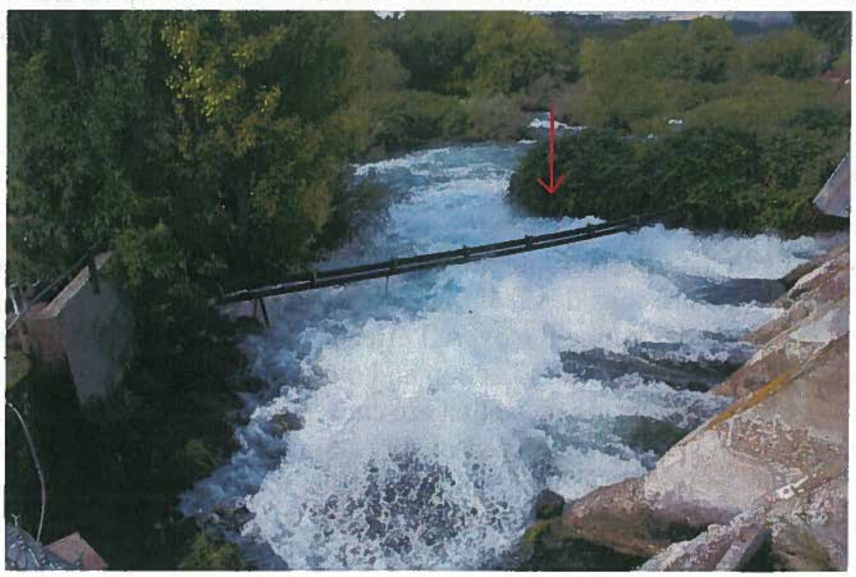

Figure 4. The bypass reach during full spilling of 550 cfs (600 cfs total), with the red arrow showing the location of the Bliss Rapids snail colony, as indicated in Figure 3 above. (Idaho Power Co. photo).

2.5.1 Bliss Rapids Snail

2.5.1.1 Direct and Indirect Effects of the Proposed Action

1. Direct effects will come from three primary sources: 1) crushing and burying of snails during construction, 2) bed scour, and 3) reduced water quality. The latter two of these were discussed in Section 2.4.1.2 above to describe some of the periodic and on-going impacts the local population of Bliss Rapids snails is subjected to within the action area. While Bliss Rapids snails in the project area are already periodically subjected to poor water quality and bed scour, the proposed construction activities will also subject snails to crushing and burying as well as additional exposure to suspended sediments created by construction activities. Lastly, a potential but uncertain effect of the proposed action is decline of the existing, occupied bypass springs due to the seepage repair component of the action. A number of these individuals were recorded within or at the confluence with emergent springs. Based on the likely point of leakage/seepage in the intake channel on river left (Figure 11, pg. 14, Assessment), relative to the occupied springs in the bypass reach on river right, it seems highly unlikely that seepage repair will significantly impair spring discharge. While such an outcome is plausible, the Service regards this as an unlikely outcome.

<u>Crushing and Burying</u>

Based on the surveys recently conducted by the Company, it is believed that Bliss Rapids snails do not occupy the cobble and riprap areas immediately downstream of the spillway apron. While snails were not found upstream of the bypass spring (Figs. 3 and 4), it is plausible that some may occur within spring-influenced waters below the large, immobile riprap currently armoring this portion of the bypass reach. Given this, any snails that are present will be subjected to crushing and/or burying during the removal and replacement of riprap below the project spillway. Any Bliss Rapids snails that might occupy these habitats will be adversely affected and these effects could include death and injury.

<u>Bed Scour</u>

Elevated flows in the bypass reach will subject the snail colonies to high water velocities and scour of gravels, pebbles, and cobbles on which the species reside. This will dislodge, kill, and inflict other adverse effects (e.g., scour food and disrupt normal behaviors) on snails or their habitat. Snails that are dislodged are almost certain to die since habitat outside of those influenced by springs will be of poor quality, given the poor water quality associated with flows in the bypass channel. Only Bliss Rapids snails that are attached to substrates that are too large to be moved or which occupy bypass springs that may be above the elevated bypass flows can be expected to survive the proposed action. Since the proposed action as a whole is not expected to exceed 6 months, elevated flows are not expected to approach this duration. Elevated bypass flows are only expected when the butterfly valve and trash rack replacement components of the action are being implemented. As described, bypass flows are expected to be at a reduced level when concrete structures associated with the spillway, and riprap placement components are being implemented (with the exception of emergency spills). It is plausible that elevated flows and bed scour could result in the extirpation of Bliss Rapids snails from the bypass channel, but given the record of elevated bypass flows in the past and the persistence of the species in the reach, we regard this as unlikely.

The scouring effects of elevated bypass flows are expected to have an adverse effect on periphyton and Aufwuchs on which Bliss Rapids snails feed. As well as interrupting normal feeding behavior, elevated flow and sediment scour will adversely affect this food source both during the elevated flows and for some time after the elevated flows have ceased. While this may have some extended effects on snails by reducing food availability, the Service regards these as secondary compared to direct effects of scour on the snails themselves. The Service anticipates that, protected, cryptic, and upstream habitats will provide a local source of colonizing diatoms when the construction disturbances cease. Based on some of the available literature (Gislason 1980, pg. 71-72, Figs. 22, 23; Kaufman 1980, pg. 77-80), the Service anticipates the periphyton community will become reestablished within days to weeks after bypass flows cease. Aside from this effect, the Service has not identified any other indirect effects associated with the bed scour pathway that are likely to result in significant harm to the species due to the proposed action.

Water Quality

Elevated bypass flows will subject portions of the bypass spring to water of poor quality, most of which has passed through the upstream aquaculture facility and processing plant. Bliss Rapids snails are reliant on good water quality, a characteristic that largely controls the species' distribution. Although they are found in some areas of the Snake River with compromised water quality (relative to springs), such areas are highly influenced by springs from the ESRPA. The species reaches its highest densities in springs and are typically absent from waters below fish hatcheries or similar disturbances. Very few controlled studies have been conducted on Bliss Rapids snails to understand their water quality requirements (*e.g.*, Besser *et al.* 2007), so we cannot provide water quality thresholds below which the species will die or exhibit other sublethal adverse effects. For the purposes of this Opinion, we conclude that the compromised water quality will inundate most if not all of the spring-dwelling Bliss Rapids snails within the bypass reach, and this will have an adverse effect on those individuals. However we cannot provide a quantified assessment of those effects.

Water quality will also be negatively affected by temporary increases in suspended sediments during construction activities. This will be most pronounced when construction activities disturb benthic substrates during removal and replacement of riprap, but will also occur when water transports concrete fines, from spillway demolition, downstream to occupied portions of the bypass channel. This pulse (or pulses) of suspended sediment will occur during the proposed action and will likely result in some respiratory stress to resident snails, potentially causing harm, and possibly some mortality, to Bliss Rapids snails in the bypass reach. Elevated flows are expected to move these sediments through the bypass reach quickly and will not result in prolonged exposure to snails, although heavier debris from concrete demolition could settle out in downstream areas occupied by snails.

Reduced Spring Flow

The seepage repair component of the proposed action is being conducted to reduce the amount of subsurface flow that currently leaks from the intake channel and forebay, and passes as groundwater to the bypass channel. Given the poor water quality entering the project from Clear Lake, and the preference of Bliss Rapids snails for water of good quality, the Service concludes that the springs currently occupied are from groundwater sources other than those directly associated with the intake channel and forebay, and/or influenced by cleaner, likely aquifer-derived, sources. Nonetheless, reducing subsurface flows leaking from the intake channel and forebay could affect the bypass springs that currently support resident colonies of Bliss Rapids snails within the bypass reach, most likely those springs in closer proximity to the diversion structure. Upon completion of the seepage repair action, there may be no practical way to restore good quality spring-flow to the identified bypass springs. Under such a scenario, Bliss Rapids snails occupying such springs could also be adversely affected, including local extirpation. While the Service recognizes this as a possible outcome, we regard it as very unlikely. Most of the seepage repairs will occur on the river-left side of the bypass channel whereas bypass springs emerge on the river-right side. Hence, while seepage and forebay repairs will affect subsurface flows, we regard the possibility that they will affect springs on the right channel, assumed to primarily be from aquifer-sources, as being of very low probability or of little influence; potential effects associated with reduced spring flows are considered discountable.

2.5.1.2 Effects of Interrelated or Interdependent Actions

The Service has been unable to identify any interrelated or interdependent actions related to the proposed action that will have an adverse effect on resident Bliss Rapids snails or other federally listed species.

2.6 Cumulative Effects

The implementing regulations for section 7 define cumulative effects to 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. A number of these adverse effects were briefly mentioned in Section 2.4.1.2, but are provided in more detail here.

As discussed above (Section 2.3.1.4), the ESRPA probably represents the most important single resource for the conservation of the Bliss Rapids snail, but it is heavily influenced by human use. Aquifer depletion and contamination are global problems (Foster and Chilton 2003, entire document; Loague and Corwin 2005, entire document) that threaten human welfare as well as biological diversity (Deacon *et al.* 2007, entire document). Impacts such as these do not occur within the action area or project area, however, the resulting impacts affect water resources in the action and project area via a direct pathway. As illustrated in Figure 5 and Kjelstrom (1992, entire document), groundwater pumping has resulted in declines of ESRPA spring discharges over the past 60 years. While aquifer recharge has been suggested as a partial solution to over-pumping (IWRB 2009, pg. 10-11), this may be overstated and may also increase the level of risk of aquifer contamination (Foster and Chilton 2003, pg. 1959-1961, 1967-1970).

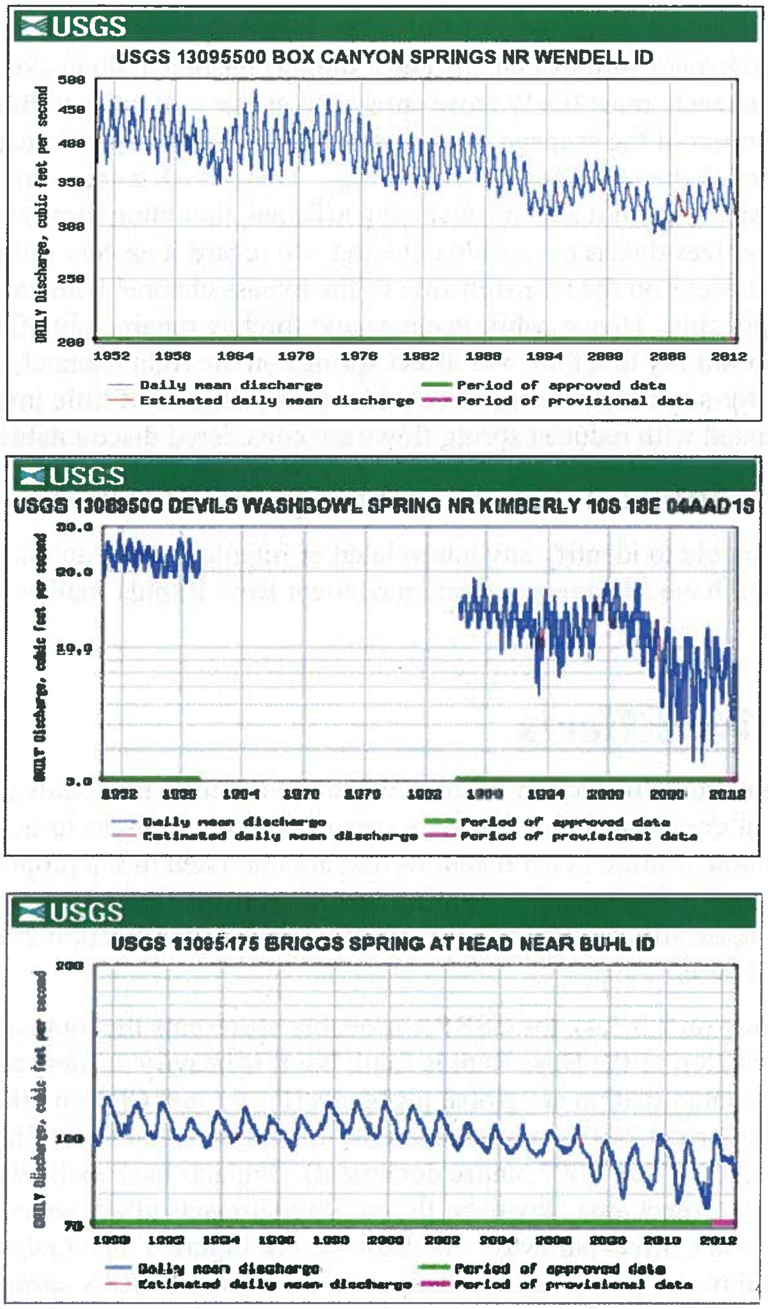

Figure 5. Monitoring at USGS-selected springs illustrate the over-all decline in spring discharge adjacent to the action area (confluences of above springs with the Snake River are located at RM 588, 590, and 617, respectively). The 3 springs depicted are all derived, in part or fully, from the ESRPA. The seasonal lows in these figures have dropped by approximately 21%, 82%, and 25%, respectively, but the period of record is different for each spring. The above data were obtained from the U.S. Geological Survey (2012).

Clark *et al.* (1998, pg. 17) found the largest amounts of pesticides to be present in wells adjacent to agricultural areas around the Snake River between Burley and Hagerman, which are also the locations with the highest frequencies and concentrations of nitrates in ground water. These locations occur in the uplands adjacent to the recovery area of the Bliss Rapids snail. Nitrate concentrations showed significant increases at several major springs, most with populations of the Bliss Rapids snail, from 1994 through 1999 (Baldwin *et al.* 2000, Figure 18, pg. 22-23), and these elevated concentrations are linked to heavy agricultural use (Holloway *et al.* 2004, pg. 4-6). Both fertilizers and animal wastes contribute to groundwater nitrates and these contaminants have been documented to reach toxic levels in the ESRPA (Tesch *et al.* 2003, pg. 3-7; Neely 2005, 3-9). Such threats have not diminished as the number of cattle in Gooding County (one county of several that overlay the Snake River Plain Aquifer) have increased by 180 percent between 1992 and 2011 (Figure 6), and poultry and egg producing facilities are expected to increase in the coming years (Welch *in litt.* 2010), bringing yet another source of potential contamination. The effects of these contaminants on the Bliss Rapids snail are not known, but in numerous wells in the region nitrate values have been recorded to exceed human health standards (Neely 2005, pg. 2-7; Schorzman *et al.* 2009, pg. 9-19); the latter study contained a source spring that contributes water to the Clear Lake Hydroelectric Project. The presence of nitrates and other agrochemical contaminants in the groundwater (Holloway *et al.* 2004, pg. 4-6; Carlson and Atlakson 2006, pg. 3-5; Schorzman *et al.* 2009, pg. 9-19) illustrates the pathway through which these agricultural contaminants can reach the habitats of the Bliss Rapids snail and other sensitive species living within the aquifer springs as well as the Snake River. The close proximity of Confined Animal Feeding Operations (CAFOs) and other intensive agricultural practices on the adjacent canyon rim (Fig. 2) illustrate the immediacy of potential agricultural-related influences on spring habitats occupied by Bliss Rapids snails.

Lastly, aquaculture facilities make up a significant amount of non-consumptive water use in the middle Snake River region, and use an estimated 2,500 cfs of groundwater, derived primarily from the ESRPA, before releasing that water into the Snake River. This use contributes wastes from fish food, fish metabolism, and processing (Clark *et al.* 1998, pg. 9) as well residual antibiotic and antiseptic compounds to the Snake River (EPA 2002, pg. 4-19). While many of these facilities are permitted (80 in 2002; EPA 2002, pg. 4-19) by the U.S. Environmental Protection Agency under the National Pollutant Discharge Elimination System (NPDES), those facilities producing less than 20,000 pounds of fish (dry weight) per year are exempt from NPDES requirements and are not federally regulated (EPA 2007, pg. 9). Clark and others (1998, pg. 7) state that those unregulated facilities may account for an estimated 95 percent of the point-source pollutants within the Snake River Basin. While this sounds (and may be) substantial, they also point out that unregulated non-point sources are responsible for 98 to 99 percent of total nitrogen and phosphorous discharge (*ibid.*, pg. 2). Nonetheless, smaller aquaculture facilities,

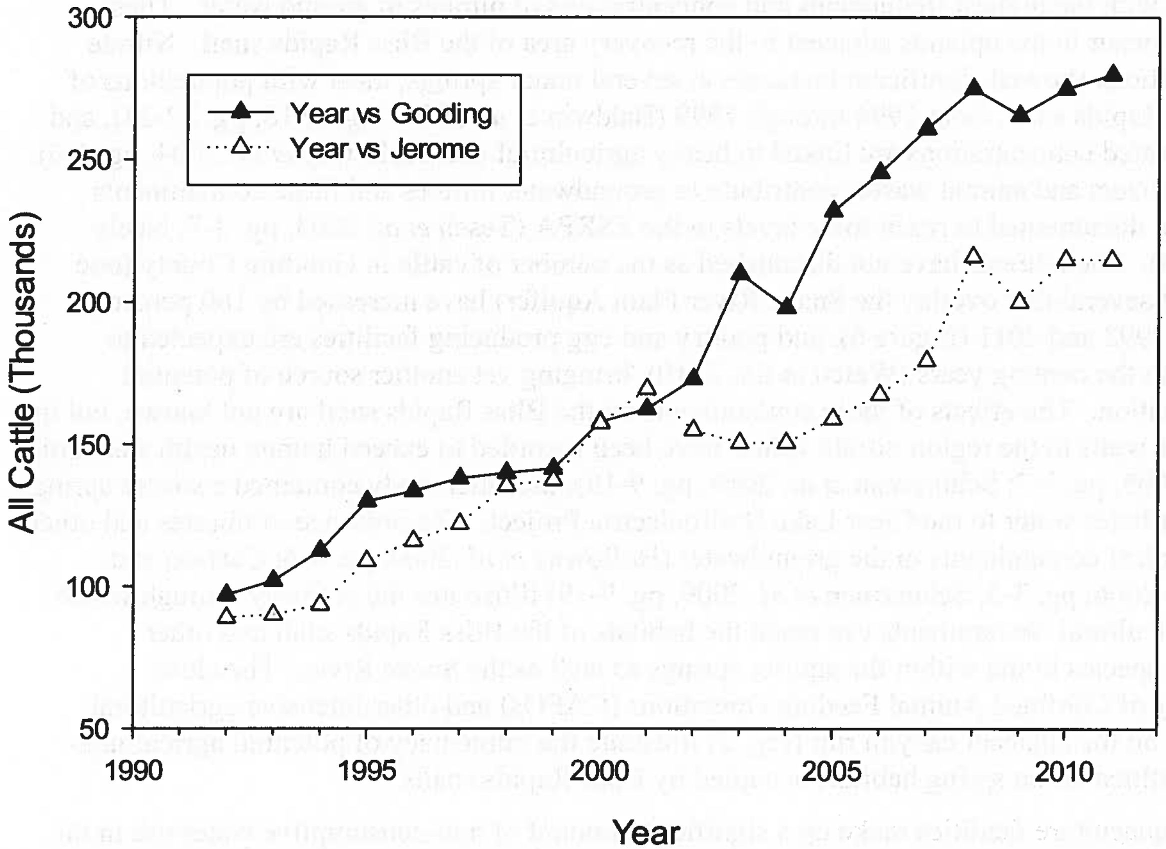

Figure 6. Gooding and Jerome County annual cattle statistics presented for all cattle (beef and dairy) since the Federal listing of the Bliss Rapids snail. Data are from the Idaho Agricultural Statistics Service, 1992-2011.

not restricted by Clean Water Act provisions, are an additional source of pollutants not regulated or monitored by Federal or State agencies. While no data exists on what effects, if any, Clear Lake Foods® may have on water quality in the project area, given the size of the facility, it is reasonable to assume that they influence downstream water quality. It could be argued that without the diversion of water into the hydroelectric project, water quality conditions would likely be consistently poorer within the bypass reach, since the influence of bypass springs would be lost to the constant high volumes of poor water quality.

At present, the above noted cumulative effects likely pose the greatest threats to the Bliss Rapids snails' future survival and may undermine other conservation actions that would otherwise benefit the species and its habitats. The lethal limits of these threats (*e.g.*, aquifer depletion and spring discharge, increasing contaminant risks from growing agricultural industries) on the species are not known, but it is likely that continuing degradation and over-consumption of water resources (due to increasing human use) will degrade snail habitat and place the Bliss Rapids snail at greater risk over time. Many of the above discussed issues or programs (*e.g.*, aquifer recharge) are derived from private, local, or State initiatives and currently have little to no Federal oversight. As such, aquifer management and nonpoint source pollutant issues will likely continue to provide challenges into the future.

The Bliss Rapids snail may be threatened by future introduction of invasive species. The severity of such introductions cannot be quantified since we do not know what species will become established, or how they will respond to their new habitats, but given sufficient time we are reasonably certain such introductions will occur. Based on documented aquatic invasions elsewhere in North America, we do know the impacts can be severe, drastically changing ecosystems and costing millions of dollars in economic losses (Pimentel *et al.* 2000, entire document). While some such introductions could be the result of Federal activities, they are more likely to come from private individuals or local industries and hence not be subject to Federal or other government review, and hence conducted without oversight or regulation. These uncertainties make assessing the risks posed from this threat within the context of the action area impossible at this time.

Rieman and Isaak (2010) synthesized much of the existing literature on effects of climate change on aquatic ecosystems in the Rocky Mountains, including the Pacific Northwest; and Isaak *et al.* (2011) analyzed the effects of climate change on stream and river temperatures in the northwestern U.S. and discussed the implications to salmonid fish species. If their climate change projections are reasonably accurate for the Snake River Basin, then areas in central and southern Idaho may experience moderate to extreme drought over the next 50 years (Rieman and Isaak 2010, p. 5).

Mean annual air temperatures have been warming more rapidly over the Rocky Mountain West compared to other areas of the coterminous U.S., by about 0.4° C during the twentieth century (*ibid.*, 2010, p. 3). Precipitation appears to be increasing in extreme western and southeastern Idaho, while precipitation data is lacking for southern and central Idaho. However, data from stream flow gages in the Snake River watershed in western Wyoming, and southeast and southwest Idaho indicate that spring runoff is occurring between one to three weeks earlier compared to the early twentieth century (*ibid.*, 2010, p. 7). These altered hydrographs have been attributed to interactions between increasing temperatures (earlier spring snowmelt) and decreasing precipitation (declining snowpacks). Global Climate Models (GCM) project air temperatures in the western U.S. to further increase by 1-3° C by mid-twenty first century (*ibid.*, 2010, p. 5). Global Climate Models are in closest agreement in their prediction of significant decreases in precipitation for the interior west. Areas in central and southern Idaho within the Snake River watershed are projected to experience moderate to extreme drought (*ibid.*, 2010, p. 5).

Richards (2004, pg. 25) provides data on optimal water temperatures for the Bliss Rapids snail, showing they have an optimum of 17° C (for growth, comparing differences of 15°, 17°, and 20° C). As such, any resulting increases in river temperature may negatively impact river-dwelling populations, more narrowly restricting them to spring-influenced sites (thermal refugia). As previously discussed, the Bliss Rapids snail are largely restricted to springs and/or spring-influenced habitats, and springs from the ESRPA have historically provided water of fairly consistent temperatures (14° to 17° C). Precluding possible human influences that might elevate the temperatures of the ESRPA (e.g., surface water injection for aquifer recharge), the aquifer springs utilized by the species should not see significant warming. A more important consideration in this regard would be increased aquifer pumping to offset late-season declines in river flows and/or reservoir declines brought on by drought. It has already been pointed out that aquifer depletion is an on-going, and possibly increasing, threat to the Bliss Rapids snail and other spring-reliant species. While it is impossible to accurately predict the magnitude of climate change and how society will respond to these changes, some of the predicted changes are likely to have a negative effect on populations of the Bliss Rapids snail.

As discussed above, increasing temperatures (earlier spring snowmelt) and decreasing precipitation (declining snowpacks) may ultimately have impacts on flow volume in the Snake River. Should this result in increased human demand of river water (or decreasing availability of that resource), especially for agricultural use, reduced river flows and elevated water temperatures could further impair water quality (*e.g.*, lowering dissolved oxygen concentrations). The multiple contingencies that could be attributable to climate change, forecasts which are variable and uncertain, are difficult to predict with any degree of confidence. However, most scenarios would likely not be beneficial to the Bliss Rapids snail.

2.7 Conclusion

The Service has reviewed the current status of the Bliss Rapids snail, the environmental baseline in the action area, effects of the proposed action, and cumulative effects, and it is our conclusion that the proposed action is not likely to jeopardize the species continued existence.

It is likely that a sizeable percentage of the Bliss Rapids snail population will be adversely affected by elevated flows in the bypass reach. This could include extirpation of the Clear Lake population; all colonies occupying emergent springs along the bypass reach. However, while this is a distinct possibility, such high flow events, of substantial duration have occurred at this location in the past and Bliss Rapids snails persist at this location despite these events. Based on this, the Service expects the Clear Lake population of Bliss Rapids snails to be adversely affected by the proposed action, but does not expect their extirpation and anticipates that colonies within springs in the bypass reach will recover to pre-action population densities, given adequate time, after the bypass flows have been reduced to lower levels.

Even in the event that the Clear Lake population of Bliss Rapids snails could become extirpated, it represents a small and isolated population and likely does not contribute in any significant way to the long-term conservation of the species. Given our current understanding of the genetics of this species (Liu and Hershler 2009, pg. 1290-1296), it is plausible that the Clear Lake population is genetically unique and worthy of conservation on this basis. However, unlike vertebrate species, the Act does not provide protection for genetically unique populations (subspecies or distinct population segments) of invertebrates (Act, Section 3(16), 61 FR 4722).

2.8 Incidental Take Statement

Section 9 of the Act and Federal regulations pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without specific exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm in the definition of take in the Act means an act which actually kills or injures wildlife. Such act may 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 an intentional or negligent act or omission which creates the likelihood of injury to listed species by annoying it 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 Corps has a continuing duty to regulate the activity covered by this incidental take statement. If the [agency] 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 Corps 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)].

2.8.1 Form and Amount or Extent of Take Anticipated

The Service anticipates that incidental take of Bliss Rapids snail will occur in the form of death, injury, and displacement due to elevated water velocities and bed scour in the bypass channel as well as from crushing and burying of individuals in close proximity to the construction; specifically excavation and replacement of riprap below the spillway apron. Snails that are displaced as a result of elevated water velocity and bed scour are anticipated to die, or if not die, will not contribute to the persistence of the population. Additional mortality and/or sublethal effects may occur as a result of exposure to poor water quality from upstream springs and aquaculture effluents as well as suspended sediments derived from construction activities associated with the proposed action. Lastly, while this Opinion discusses the potential for alteration of spring discharges as a result of the proposed action (Section 2.5.1.1), we regard this scenario as unlikely; adverse effects and take are not expected as a result of reduced spring flows.

Incidental take in the form of harm, harassment, and mortality are expected for all Bliss Rapids snails living within the bypass reach within the action area. Based on high flow events under similar circumstances at another local hydroelectric project, the Service anticipates that mortality may exceed 75 percent of resident snails (see 2.4.1.2 above), but could exceed that and include all snails in the bypass reach. Given past events of this type in the action area, and the persistence of Bliss Rapids snails, we conclude this is unlikely. All snails in the population will likely undergo harm and/or harassment due to inundation with water of reduced quality relative to that of their resident springs, as well as inundation by suspended sediments from construction activities. Incidental take will have been exceeded if bypass spill from the proposed action exceeds the action's scheduled completion date. For the purpose of this Incidental Take Statement, incidental take associated with the proposed action will be exceeded if construction activities and/or spill into the bypass reach associated with this action occur past the scheduled completion date of November 30, 2013.

2.8.2 Effect of the Take

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to jeopardize the continued existence of the Bliss Rapids snail across its range. This is due to the small and isolated nature of the Clear Lake population and its insignificance to the range-wide status. Based on previous bypass events and data from other projects we anticipate that population numbers will be immediately reduced. However, upon return to lower flows and with persistence of the resident springs, local populations will likely rebound to pre-project levels within 2 to 3 years given the small size of resident populations. As noted above, extirpation of the Clear Lake colony as a result of the proposed action cannot be ruled out, but given the persistence of this population after numerous past events of this magnitude, the Service concludes this is unlikely, and hence population levels are expected to rebound to pre-project levels.

2.8.3 Reasonable and Prudent Measures

The Service concludes that the following reasonable and prudent measures are necessary and appropriate to minimize the take of Bliss Rapids snails caused by the proposed action.

1) Implement measures to protect BRS from elevated bypass flows. [Construct riprap barrier around primary BRS colony]
2) Upon completion of seepage repairs, the Company shall monitor and report the status of selected springs within the bypass reach as well as the status of populations of Bliss Rapids snail.
3) Contain and clean up any grouting material that inadvertently enters the bypass reach.
4) Contain and remove silt and suspended sediments below the construction footprint (riprap) within the bypass channel.
5) Reduce the duration and frequency of elevated bypass flows to the extent practical.

2.8.4 Terms and Conditions

- 1) Prior to elevating flows in the bypass reach, large basalt boulder riprap shall be securely placed downstream of the spillway apron, and upstream of the identified Bliss Rapids snail colony and occupied spring in order to provide protection to the colony from elevated water flow and bed scour. Riprap should be placed immediately upstream of the upstream-most occupied spring and along its stream-side edge to provide a barrier to direct elevated flows away from the occupied spring an occupied substrates within the bypass reach. This barrier riprap will be large enough to withstand the forces of elevated flows such that it is immobile and forms a permanent barrier. This riprap is to be left in place for the life of the hydroelectric facility to help protect resident Bliss Rapids snails from elevated bypass flows and associated bed scour from future, periodic elevated flows attributable to facility shut-downs.

- 2a) Upon completion of the proposed action, Company biologists shall inspect the springs immediately downstream of the completed apron riprap and the riprap barrier (Term and Condition 1 above). The Company shall report the status (presence or absence) of the spring(s) at this location as well as the number of Bliss Rapids snails observed (using standard monitoring techniques) to the Service within three months of completion of the action.

- 2b) A second monitoring effort shall be conducted one year (spring 2014) following the initial post-action survey (2a above). This survey effort will utilize standard cobble count monitoring techniques and include the entire bypass reach (as surveyed in April of 2012). Results of those surveys shall be reported to the Service as described below.

- 3a) If during the Seepage Repair component of this action, grout-mixture is observed in the bypass reach below the spillway, the Company shall immediately halt application of the grout mixture, and contain the leakage at its source below the spillway/spill gates.

- 3b) To the extent possible, all of the grout/grout mixture that has leaked into the bypass reach will be removed and disposed of at an approved off-site location.

- 3c) In the event of a grout leak into the bypass reach, the Company shall contact the Service and the Corps to notify them of the spill and efficacy of containment and clean up. At this time the Company should discuss any modifications or alternatives to the use of grout or other toxic compounds, before proceeding with additional grout applications. Use of other, nontoxic, compounds other than grouts (specifically road mix and bentonite), is permitted with appropriate implementation of Reasonable and Prudent Measure 4 below. Other components of the action that do not require application of grout are permitted to proceed as scheduled.

- 4a) Prior to moving/removing riprap, and removing concrete structures associated with the spillway/spill gates, the Company shall install silt-fence or other appropriate silt-collection geotextiles in the bypass channel to capture liberated suspended sediments and construction materials that may be transported downstream in stream flow. Installation of silt-capture materials can be placed downstream of the construction footprint to ensure effective use of these materials. Every effort should be made to install the silt-fence (other) materials as close to the construction area as possible, while still effectively removing suspended sediments from moving waters within the bypass reach.

- 4b) Upon completion of these components of the action (e.g., riprap placement and removal, seepage repair, concrete repair, bay 7 modification), these silt-containment structures will be removed and disposed of at an approved off-site location. If substantial amounts of silt have accumulated upstream of the silt-capture structures, the Company shall remove these sediments, to the extent possible, using a suction dredge or other appropriate equipment, and dispose of them at an approved off-site location prior to removal of the silt-containment structures.

- 5a) The Incidental Take Statement allows for a period of elevated bypass flows (spill) for a duration not to exceed the project completion date of November 30, 2013. However, reducing the duration of elevated flows in the bypass channel/reach will reduce adverse effects to the resident Bliss Rapids snails. To any extent possible, duration of elevated bypass spill should be shortened to reduce adverse effects to the species. The Company shall report the start and stop dates of bypass spills to the Service via a written letter or e-mail within one week of the event.

5b) The Company will make every effort to reduce the number of elevated bypass spill events that occur, preferably keeping the frequency of such events to one single elevated bypass spill event for completion the proposed action, and it will not exceed the completion date of November 30, 2013. If the Company conducts multiple spill events, those will be reported to the Service within one week of their occurrence and must occur within the above stated 6-month duration.

2.8.5 Reporting and Monitoring Requirement

In order to monitor the impacts of incidental take, the Federal agency or any applicant 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)]. For purposes of this Incidental Take Statement, the applicant shall report completion of the project and the results of the follow-up surveys/monitoring to the Service within one week of the completion of those events. Reporting on the above monitoring will be done in writing and can be done via e-mail to Service biologists at the Idaho Fish and Wildlife Office in Boise. Reporting should include a qualitative assessment on the status of the springs and quantitative data pertaining to cobble counts for Bliss Rapids snails.

2.9 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 new information on listed species. The Service proposes no conservation recommendations as part of the proposed action.

2.10 Reinitiation Notice

This concludes formal consultation on Bliss Rapids snail for the Clear Lake Hydroproject Maintenance. 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. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.**

3. LITERATURE CITED

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