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Subject: Wildlife Biological Evaluation – Diamond Lake Restoration Project

To: Project Files

INTRODUCTION

The National Forest Management Act (16 U.S.C. 1600) requires the Forest Service to maintain viable populations of existing native and desired non-native wildlife in the planning area (36 CFR 219.19). Guidelines for each planning area must provide for a diversity of plant and animal communities based on the suitability of the specific land area. Section 7 of the Endangered Species Act (ESA) requires the Forest Service ensure its actions do not jeopardize the existence of Federally listed species. The Forest Service established a Sensitive Species Program and a Biological Evaluation process (FSM 2672.4) to ensure compliance with these laws.

Regional Foresters are responsible for identifying and maintaining a list of sensitive species occurring within their Region. This list includes species for which there is a documented concern for viability within one or more administrative units within the species' historic range (FSM 2670.22, WO Amendment 2600-95-7). These species may require special management emphasis to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing. There are currently seventeen wildlife species listed as "sensitive" that occur or are suspected of occurring on the Umpqua National Forest (Attachment 1).

Biological Evaluations incorporate concerns for sensitive species into the planning process and provide a standard by which to ensure that they, and Federally listed species, receive full consideration in the decision-making process (FSM 2672.41). This analysis and Biological Evaluation addresses four alternatives associated with the proposed Diamond Lake Restoration Project and their effects on sensitive wildlife species, including federally listed species and designated critical habitats. In doing so, it reviews the proposed project alternatives for consistency with the Umpqua National Forest Land and Resource Management Plan (1990) as amended by the Northwest Forest Plan (1994) and includes an analysis of effects on Survey and Manage wildlife species, Landbirds and Management Indicator Species. Other potentially, impacted wildlife species, not routinely addressed, are also analyzed for purposes of full disclosure.

PROJECT AREA OVERVIEW

The area being analyzed in the Diamond Lake Restoration Project EIS encompasses Diamond Lake, Lake Creek, Lemolo Lake, and the North Umpqua River. The project area is Diamond Lake proper, located on the Diamond Lake Ranger District, Umpqua National Forest within the Umpqua River Basin. The project area is bounded to the North by the North Umpqua River, to the South by Crater Lake, to the East by Mt. Thielsen, and to the West by Mt. Bailey. The project area includes all or portions of sections 30 through 32, T27S, R6E; sections 25 and 36, T27S, R5E; sections 4 through 9 and sections 16 through 21, T28S, R51/2E, and sections 1 and 12, T28S, R5E Willamette Meridian, Douglas County, Oregon.

Diamond Lake is a natural lake located at about 5,191 feet elevation. It has a surface area of approximately 3,031 acres and is relatively shallow, with a maximum depth of 48.5 feet and an average depth of 22.5 feet (Eilers and Gubala, 2003). Diamond Lake drains into Lake Creek, which empties into Lemolo Lake, an impoundment on the North Umpqua River. Two other impoundments are located downstream from Lemolo Lake-Toketee Lake and Soda Springs Reservoir. The flow of water from Lemolo Lake and the other impoundments is regulated by PacifiCorp, a public utilities cooperation.

Diamond Lake is a high use destination recreation area[1] considered important to the economy of southern Oregon. Originally fishless, the lake has been managed as a recreational trout fishery since 1910. Tui chub were introduced into the lake in the mid-1940's and rapidly overpopulated the lake. In 1954, the Oregon Game Commission constructed a canal near the Lake Creek outlet, lowered the lake level, and treated Diamond Lake with rotenone to eradicate tui chub. The lake was restocked with trout following the rotenone treatment and a thriving fishery was maintained for several decades. In 1992, tui chub were again discovered in Diamond Lake and have since overpopulated the lake for a second time. Associated negative impacts on the recreational fishery and on water quality in Diamond Lake and down stream prompted multiple local, state, and federal agencies to work cooperatively in the exploration of restoration solutions for the lake as summarized below.

DESCRIPTION OF ALTERNATIVES

The following summarizes the information contained in Chapter 2 of the Draft Environmental Impact Statement (DEIS). It is intended to provide the reader sufficient detail to understand the impacts described later in this document. Refer to Chapter 2 of the DEIS for a complete description of the alternatives being evaluated.

ALTERNATIVE 1 (No Action)

This alternative serves as the baseline for estimating environmental effects of the action alternatives. No canal reconstruction, lake draw down, mechanical fish harvest, chemical treatment, fish carcass removal, or lake refill would occur. No active measures to improve water quality at Diamond Lake would be implemented. Potentially harmful algae blooms and lake closures would be expected to continue.

[1] Estimates for recreation use at Diamond Lake are approximately 700,000 Recreation Visitor Days per year (meaning continuous or intermittent recreational use for 12 hours by an individual) (USDA 1998).

ODFW would continue with the existing experimental fish stocking program (100,000 fish per year) in 2004 and 2005. In 2006, ODFW and the Oregon Fish and Wildlife Commission (OFWC) would revisit the Diamond Lake Fishery Management Plan to determine appropriate stocking. Based on current knowledge and budget, it is expected that ODFW would stock Diamond Lake with 24,000 legal sized rainbow trout on annual basis in 2006 and beyond.

ALTERNATIVE 2 (Proposed Action)

Key components of the Proposed Action are summarized from Chapter 2 as follows:

Canal Reconstruction: A blocked and debris-filled existing earthen canal that connects Diamond Lake to Lake Creek would be reconstructed to facilitate a lake draw down. The portion of the canal within Diamond Lake would be dredged to its original depth using a floating suction dredge. Dredge spoils would be used to expand an existing wetland. From the lakeshore to the canal outlet, the canal would be excavated to its original configuration and fitted with a new head-gate structure to control water flow. If necessary, new bridges or culverts would be constructed over the canal to maintain access to the bike trail and summer homes using Forest Service Road 4795.

Fall/Winter Lake Draw Down: Diamond Lake's water level would be lowered by eight feet from its normal summer level, by using both the reconstructed canal and Lake Creek for water transport. The lake draw down would begin on or around September 15 in the year prior to a chemical treatment. A gravity-driven draw down would occur at a discharge rate approximating a bankfull flow in Lake Creek.

***Mechanical Fish Removal and Utilization*:** Several methods would be used to remove and utilize fish biomass from Diamond Lake prior to chemical treatment including: liberalizing catch limits on fishing at the lake; harvest of fish by individual crews using traps, nets and seines; and, harvest of fish through commercial fishing operations. Harvested fish carcasses would be converted to an organic fish emulsion product on site (lake shore) or trucked to an off-site plant for utilization as fertilizer.

September Rotenone Treatment: The powdered formulation of the fish toxicant rotenone would be applied to Diamond Lake in September**.** This would happen when water temperature and chemistry reached conditions considered optimal for achieving a complete fish kill. Rotenone would be administered according to label instructions at the necessary amounts based on water volume, temperature, and chemistry in Diamond Lake at the time of application. Sections of Silent Creek and Short Creek would also be treated with liquid rotenone.

Mechanical Fish Carcass Removal and Utilization: A commercial fishing or professional fish mortality recovery and recycling operation would be employed to collect fish carcasses following a chemical treatment of the lake. Fish carcasses would be converted to an organic fish emulsion product on site or trucked to an off-site plant for utilization as fertilizer.

Water Management During Lake Refill Period: An active water management strategy would be implemented to limit the length of time that Lake Creek is reduced to no or very low flows. When water in Diamond Lake becomes suitable for release (about November), canal headgates would be opened to allow approximately 10 cubic feet per second (cfs) of water to flow into Lake Creek and through the North Umpqua River system.

Monitoring: A variety of monitoring activities would be used to verify assumptions, evaluate project success, and formulate appropriate lake management strategies including: stream flows and water quality in Lake Creek; water quality in Diamond and Lemolo Lakes and the North Umpqua River; tui chub presence; and phytoplankton, zooplankton and benthic invertebrate and trout populations.

Fish Restocking Strategy: ODFW would pursue approval for a change to the following strategy for restocking Diamond Lake with fish through the OFWC and the appropriate public process.

Diamond Lake would be restocked with fish using an ecologically appropriate stocking strategy. The Oregon Department of Fish and Wildlife would manage the lake for hatchery production under the *Basic Yield Alternative* of Oregon's Trout Plan. However, ecological indices of lake health(i.e., zooplankton and benthic invertebrate populations), existing data and knowledge, annual fish monitoring data and applicable nutrient loading allocations provided in ODEQ's pending Total Maximum Daily Load (TMDL) publication would be used to determine appropriate numeric goals for annual fish stocking and harvest post-project.

Under this stocking strategy, it is expected that conservatively small numbers of fingerling "Fishwich" or Oak Springs rainbow trout and legal and/or trophy sized predacious fish species (Eagle Lake rainbow trout, brown trout, or spring Chinook) would be introduced into Diamond Lake as soon as the food chain recovered adequately to support them without compromising progress toward water quality goals. Annual stocking rates would be expected to increase as the food chain and water quality continued to recover.

Education: A number of educational activities would be considered to reduce the likelihood of tui chub reintroduction into Diamond Lake including: "angler stamps", interpretive signs and brochures, and boat inspections.

Tui Chub Contingency Plan: Because it is recognized that tui chub may be illegally reintroduced, several actions designed to control tui chub populations would be implemented including: an extensive monitoring program to facilitate early detection of tui chub presence in the lake; stocking with predacious fish species following rotenone treatment and increasing the numbers of predacious fish if tui chub are detected; and using mechanical treatments such as netting and electro-shocking to limit tui chub population growth.

Connected Actions: The Diamond Lake Resort has informed the Forest Service that they intend to request a permit to accomplish the following projects while Diamond Lake is drawn down to eight feet below its normal level. These activities are "connected actions" under NEPA because they cannot or will not proceed unless the draw down occurs previously (40 CFR 1508.25 (a ii)).

The Diamond Lake Resort proposes the following two projects:

1. Resort Marina Cleanup and Improvements
   This project would remove accumulated sediment (silt) around the Resort Marina on the northeast corner of the lake near the mouth of Two Bear Creek. The Resort also proposes to make needed repairs to parts of the docks that are normally below the water line, and remove accumulated trash from the lake bottom in and around the marina. The affected area is approximately 28,000 sq. ft. (2/3 acre). Resort personnel estimate that there is approximately 1.5-2.0 feet of accumulated sediment/silt near the creek and less away

from the mouth of the creek. Dock repairs entail replacing old boards, posts and supports that have not been repaired in years. Expected project duration is one to two weeks.

2. South Shore Store/Pizza Parlor Dock Area Cleanup
   This project would remove obstacles/water hazards such as old cribbing, concrete blocks, pilings, etc. that are remnants of old boat docks and moorage. Many of these obstacles are just below the normal water line and are an existing boating hazard. Equipment needed to accomplish this work would be a small bobcat or back hoe and dump truck. Expected project duration is one week.

ALTERNATIVE 3 – (Put and Take Fishery)

Alternative 3 responds to the fish stocking issue. This alternative is designed to provide a "good"[2] recreational fishery that minimizes potential effects of fish on water quality in Diamond Lake. Alternative 3 is identical to the proposed action except that it would utilize a different fish stocking strategy to restock Diamond Lake following a rotenone treatment.

Alternative 3 includes all of the following components of the proposed action described in Alternative 2***: canal reconstruction, fall/winter lake draw down, mechanical fish removal and utilization, mechanical fish carcass removal and utilization, water management during the lake refill period, monitoring, education, and a tui chub contingency plan***.

Additionally, under this alternative, ***ODFW would pursue approval for a change to the following strategy for restocking Diamond Lake with fish through the OFWC and the appropriate public process***.

If approved by OFWC, management of the Diamond Lake recreational fishery would change from a Basic Yield Alternative under Oregon's Trout Plan (OAR 635-500-0703 and OAR 635-500-0115(4)) to an Intensive Use Alternative (OAR 635-500-0115(5))[3]. In layman's terms this is a "put and take fishery" where legal sized fish are stocked in the spring and are harvested by anglers later in the same season.

Under this stocking strategy, it is estimated that ODFW would stock Diamond Lake annually with approximately 400,000-500,000, 8-10" domesticated rainbow trout. Trout from this brood stock would not reproduce successfully in Diamond Lake, would not prey significantly on available food organisms, and the majority would not survive over winter. Diamond Lake would be stocked with domesticated trout in late spring following a fall rotenone treatment (since these fish would not require a robust existing food base). Stocking would occur periodically from late spring to early fall on an annual basis.

Subsequently, as part of the "tui chub contingency plan", legal or trophy sized predacious fish species (Eagle Lake rainbow trout, brown trout, or spring Chinook) would be introduced into

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[2] In general, a "good" recreational fishery represents a substantial improvement over the current fishery, but would not be expected to achieve the status of an "excellent" fishery such as existed at Diamond Lake during its previous peak period as a recreational fishery.

[3] Intensive Use--"….Waters managed for this alternative are apt to be near large population centers or attract intensive angler use because of easy accessibility or location of other water-oriented recreational facilities. Many of these waters support fisheries year-round. Many of these waters can be used heavily by anglers or for short periods (April, May, and June) and afterwards be used for sailboating, water skiing, swimming, and camping. Other waters can support fisheries year-round. Some of these waters are stocked with yearling rainbow trout on a regular basis. Guidelines which apply are:…." (OAR 635-500-0115(5).)

Diamond Lake as soon as the food base recovered adequately to support them without compromising progress toward water quality goals. Ecological indices of lake health (i.e., zooplankton and benthic invertebrate populations), existing data and knowledge, annual fish monitoring data and applicable nutrient loading allocations provided in ODEQ's pending Total Maximum Daily Load (TMDL) publication would be used to determine appropriate numeric goals for all annual fish stocking and harvest post-project.

Connected Actions: Connected actions by the Diamond Lake Resort are the same as those described in Alternative 2.

ALTERNATIVE 4 – (Mechanical/Biological)

Alternative 4 responds to the issues of fish stocking, non-target species, water quality, and wetland ecology. This alternative is designed to minimize effects of a chemical treatment and associated lake draw down on resources while limiting/controlling the tui chub population. This alternative includes a modified fish stocking strategy designed to reduce the potential impacts of a recreational fishery on water quality in Diamond Lake.

Alternative 4 would use mechanical techniques in combination with predacious fish stocking to selectively harvest chub, disrupt chub spawning and increase predation on chub, with the objective of severely diminishing chub populations over time. Alternative 4 includes the following components of the proposed action described in Alternative 2: ***education*** and ***monitoring***. Additionally, this alternative includes all of the following components:

Annual Mechanical Harvest: Mechanical fish harvest treatments would occur on an annual basis for six consecutive years utilizing a variety of commercial fishing tools/techniques determined to be most effective through an adaptive management process. Potential tools include: seine nets, trawl nets, cast nets, gill nets, lampara[4] and beach seines, custom-built traps, or other types of commercial nets, seines, and traps. Fish harvest activities would likely occur for two months in June and July prior to and during the chub spawning period at Diamond Lake. Commercial fishing operations would only occur in certain portions of the lake at a given point in time and would be rotated to different portions of the lake during the two month period. Areas where commercial fishing was occurring would be closed to recreational angling. Commercial fishing would also occur annually for approximately one month in September in an effort to harvest chub as they move from the shallows into more open water within the lake. Mechanical fish harvest treatments would target reproductive age chub. The goal of these activities would be to harvest 85-95%[5] of the reproductive-age chub annually, while attempting to maintain a biological control (predacious fish) on the tui chub population. It is expected that annual commercial fishing operations described above would be needed to effectively limit tui chub recruitment in Diamond Lake over time.

Spawning Disruption: In addition to the above activities, electro fishing boats would be used during the peak chub spawning period to disrupt spawning in the shallow areas of the lake that have abundant aquatic macrophytes.

[4] A lampara net is a type of open water seine with tapered ends and a relatively deep, loosely hung center section. The net is set in a circle around the fish school and the two ends are brought together capturing the fish in the middle (Nielsen and Johnson 1989)

[5] Rationale and supporting documentation for the 85-95% are provided in Appendix *.

***Predacious Fish Stocking*: *ODFW would pursue approval for a change to the following strategy for restocking Diamond Lake with fish through the OFWC and the appropriate public process*.** In general, Diamond Lake would be stocked annually with large predacious fish in sufficient numbers and of sufficient size/age classes to serve as potentially effective predators on the tui chub as well as to provide a recreational fishery. Specifically, if approved by OFWC, management of the Diamond Lake recreational fishery would change from a Basic Yield Alternative under Oregon's Trout Plan (OAR 635-500-0703 and OAR 635-500-0115(4)) to either a Featured Species[6] (OAR 635-500-0115(2)) or Trophy Fish Alternative[7] (OAR 635-500-0115(3)).

A Featured Species stocking strategy would include annual stocking with legal and/or trophy sized Eagle Lake rainbow trout. A Trophy Fish stocking strategy would include annual stocking with legal and/or trophy sized brown trout or Kamloops rainbow trout. Special angler harvest regulations to protect large trout would be considered. Ecological indices of lake health(i.e., zooplankton and benthic invertebrate populations), existing data and knowledge, annual fish monitoring data and applicable nutrient loading allocations provided in ODEQ's pending Total Maximum Daily Load (TMDL) publication would be used to determine appropriate numeric goals for annual fish stocking and harvest post-project.

TOXINS AND WILDLIFE

Effects of Toxic Algae Blooms on Wildlife

Because Alternative 1 proposes no active management intervention at Diamond Lake, it is assumed that toxic algae blooms will continue to affect the lake ecosystem and likely worsen in the future. Thus, a general description of the effects of toxic algae blooms on wildlife is documented below.

Introduction

In the summers of 2001, 2002, and 2003, Diamond Lake experienced severe cyanobacterial or blue-green "algae" blooms. Certain species of blue-green algae produce toxins that in high concentrations (such as during and following major blooms) are harmful to wildlife and humans. Toxic algae blooms are known to have caused death in domestic animals (cattle, pigs, sheep, dogs), waterfowl and other wildife (Government of Alberta 2003).

The two main types of algal toxins are neurotoxins and hepatotoxins. Neurotoxins affect the nervous system, are fast acting (acting on a timescale of minutes to hours), and can cause death by respiratory failure. Heptatoxins are relatively slow acting (acting on a timescale from hours to days), and attack the liver and other internal organs. Acute (short-term) exposure to high doses of heptatoxins can cause death from liver haemorrhage or from liver failure. Chronic (long-term) exposure to low doses may promote the growth of liver, kidney, and other tumours (MRACC 2002).

In 2001-2003, the blue-green algae *Anabaena flos-aquae*, bloomed in Diamond Lake. This species produces the neurotoxin, anatoxin-a. *Anabaena* was present in sufficient densities that closures to protect human health and safety were implemented at the lake for portions of all three

[6] "Featured Species and Waters—Management under this alternative emphasizes species or stocks that are uncommon or unique and waters that have historical benefit or potential for unique natural beauty, water quality, aesthetics or recreational capabilities…" (OAR 635-500-0115(2))
[7] "Trophy Fish—Certain waters are capable of producing large "bragging-size" trout …"(OAR 635-500-0115(3))

summers (See EIS for additional details). In 2003, *Microcystis aeruginosa,* was also detected in water samples at Diamond Lake. This species produces heptatoxins known as microcystins and nodularin.

Mortality & Illness

Toxic algae blooms have been identified as the cause of mortality for a broad spectrum of species world-wide: a human tragedy in Brazil, an alligator die-off in Florida, domestic livestock kills in Australia, Africa, and South America, and waterfowl and other species in Canada and the United States (Government of Alberta 2002; Wright State University 2003; MRACC 2002; NSW 2002; Burgess 2001). Although standards for human drinking water have been established by the World Health Organization, there are no established toxic thresholds for wildlife species (Creekmore 2001). In general, the amount of toxic water that will kill an animal is usually proportional to the size of the animal. Old, very young, sick or weak animals may have lower tolerance levels and will be poisoned with much smaller amounts (Government of Alberta 2003).

Creekmore (2001), in the Field Manual of Wildlife Diseases, provides a table of documented instances of wild bird mortality caused by algal toxins. The following excerpt is relevant to Diamond Lake:

Toxin	**Algal species**	**Toxin type (s)**	**Migratory bird species affected**	**Route of exposure**
Cyanobacterial	Microcystis sp., Anabaena sp., Aphanizomenon sp., Nodulariasp., And Oscillatoria	Heptatoxins (mycrocystins and nodularin) Neurotoxins (anatoxin-a and anatoxin –a(s)	Unidentified ducks, geese, and songbirds, Franklin's gull, American coot, mallard, American wigeon	Oral (Water)

Creekmore (2001) also notes that cyanobacterial toxicosis (poisoning) has been suspected in mortalities of free-ranging ducks, geese, eared grebes, gulls, and songbirds.

Some symptoms of illness in wildlife exposed to toxins are known from clinical testing. Clinical signs in muscovy ducks dosed with anatoxin-a(s) included excessive salivation, regurgitation of algae, diarrhea, tremors, reduced responsiveness and activity, incoordination, difficult breathing, excessive thirst, congestion in foot webs, wing and leg weakness, and recumbency and intermittent seizes prior to death.

To date, there have been no documented wildlife deaths attributed to toxin exposure at Diamond Lake. However, a recreationist at the lake reported that their dog entered the water during a bloom in July 2003, emerged wobbly and drunk, and vomited for several hours (Graham 2003).

Toxicity of Rotenone to Wildlife

Because Alternatives 2 and 3 involve treatment of Diamond Lake with the chemical rotenone, a general description of the toxicity of rotenone to birds, mammals, and amphibians is

documented below. Additional information about rotenone is documented in Chapter 3 of the Diamond Lake Restoration DEIS. The following summarizes information considered most relevant to wildlife species addressed in this report.

Introduction

The fish piscicide rotenone is a naturally occurring substance derived from the roots of tropical plants in the bean family. Rotenone is commonly used in fisheries management to eradicate undesirable fish populations. Rotenone kills living organisms by inhibiting a biochemical process at the cellular level making it impossible for the organism to use the oxygen absorbed into the blood and needed in the release of energy during respiration (Finlayson et al. 2000).

Rotenone has the ability to inhibit cellular respiration in fish, mammals, birds, insects, reptiles, amphibians, and even plants. However, at concentrations used in fisheries management, rotenone is only toxic to gill-breathing organisms such as fish, some forms of amphibians and aquatic invertebrates (Bradbury 1986; Finlayson et al. 2000). Studies determined that the reason rotenone is generally toxic to fish, tadpoles, and aquatic invertebrates and not to other animals is that gills provide an efficient mode of entry of the chemical into the cells and the stomach does not (Bradbury 1986; Finlayson et al. 2000).

Finlayson et al (2000) describe that all animals (including fish) have natural enzymes in the digestive tract that neutralize rotenone, and that the gastrointestinal absorption of rotenone is inefficient. However, gill-breathing organisms are more susceptible to rotenone because rotenone is readily absorbed directly into their blood through their gills (non-oral route) and thus, digestive enzymes cannot neutralize it.

Attachment 2 includes excerpts from two documents detailing the toxicity of rotenone to wildlife (Bradbury 1986; CDFG 1994). These documents include median lethal doses (LD50)[8] of rotenone for birds, mammals, amphibians and reptiles and expected impacts to these species groups as described in scientific literature. Important concepts regarding acute and chronic toxicity detailed in Attachment 2 are summarized below. Most laboratory studies[9] have revealed no evidence of carcinogenic activity and the prevailing scientific opinion is that rotenone does not cause cancer, birth defects, or genetic mutations (USEPA, 1981 and 1989); the Human Health section of the DEIS identifies limited exceptions to this conclusion. The primary pathways of exposure to rotenone by wildlife would be oral and dermal (through the skin). Wildlife would have negligible inhalation exposure to rotenone because they would not be in close proximity to the concentrated powder.

Mammals

Mammals that live near water bodies treated with rotenone may ingest rotenone either by drinking treated water or by eating dead fish that were killed by the rotenone treatment.

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[8] LD50 or median lethal dosage is the dosage of a toxin that when fed or injected kills 50% of the test animals. It is usually expressed as mg of toxin per kg of the test animal's body weight (Bradbury 1986).

[9] A recent study (Betaret et al. 2000) reported that rats injected with rotenone at 2 to 3 mg/kg body weight each day in the jugular vein for 5 weeks showed symptoms similar to that of Parkinson's disease. Other chemicals were administered with the rotenone to enhance tissue penetration. None of the other studies that used realistic exposure pathways of rotenone have reported such findings. Rotenone entering the body via the actual exposure pathways is unlikely to enter the brain (Rotenone Stewardship Program 2001).

Toxicity data for orally administered rotenone indicate that mammals will not be affected by drinking rotenoned water or eating rotenone-killed fish (Bradbury 1986).

As described above, the digestive system is not an efficient mode of rotenone entry into an animal's body, thus limiting potential for harm. Rotenone residues in dead fish are generally very low (< 0.1ppm), unstable, and not readily absorbed through the gut of an animal eating a rotenone-killed fish (Finlayson et al. 2000).

An applied example: the lowest LD50 of pure rotenone found in the literature on mammals is 55 mg/kg of body weight for guinea pigs. In order for a small mammal weighing approximately ½ pound to be killed by rotenone, it would have to drink 33 gallons of lake water treated with a 2 ppm dosage. (Bradbury 1986).

Chronic toxicity levels are also described in CDFG (1994). The authors conclude that no chronic toxicity affects to mammalian wildlife are expected under a normal rotenone treatment. For example, to exceed the chronic no-effect level, a 22 pound dog would have to regularly consume 10 gallons of water or over 88 pounds of fish per day. A 22 pound dog would be expected to consume less than 0.5 gallons of water or 2 pounds of fish per day.

Birds

As with mammals, birds that live near water bodies treated with rotenone may ingest rotenone either by drinking treated water or by eating aquatic invertebrates or fish killed by the rotenone treatment. Toxicity data indicate that birds will not be affected by ingesting treated water or consume rotenone-killed organisms (Bradbury 1986).

An applied example: a bird weighing ¼ pound would have to drink 25 gallons of treated water or eat more than 40 pounds of fish and invertebrates within 24 hours to receive a lethal dose. This same bird would normally consume 0.2 ounces of water and 0.32 ounces of food daily (Finlayson et al. 2000).

CDFG (1994) documents the chronic no effect level of rotenone for birds at 50ppm. To exceed this level, a bird would have to consume water containing 50 ppm of rotenone for 30 days or more. (A rotenone treatment used for fisheries management generally does not exceed 2 ppm).

Amphibians and Reptiles

Toxicity data indicate that amphibians are more tolerant of rotenone than most fish species, nonetheless, rotenone is generally considered toxic to all gill-breathing life stages of amphibians. At concentrations routinely used in fisheries management, rotenone kills frog tadpoles, salamander larvae and gill-breathing adult salamanders. Laboratory tests also indicate that rotenone can impair cell respiration and normal development in amphibian eggs (Bradbury 1986).

Non-gill breathing adult amphibians are much less susceptible to rotenone than larvae. Bradbury (1986) documents that the median lethal concentration (LC50)[10] of rotenone for adult leopard frogs (*Rana pipiens*) ranged from 3.2 to 7.9 ppm; routine rotenone treatments usually don't

[10] LC50 or median lethal concentration is the concentration of a toxin in water that kills 50% of the test animals in the water within a specified time (usually 24, 48, or 96 hours). It is usually expressed as ppm (Bradbury 1986).

exceed 2ppm. At concentrations typically used in fisheries management, CDFG (1994) concludes that rotenone treatment would have little effect on non-gill breathing amphibians. However, Maxell and Hokit (1999) conclude that adult turtles and tailed frog adults are likely to suffer mortality through the application of piscicides.

Inert Ingredients

Liquid formulations of rotenone (i.e. Noxfish®) contain dispersants and emulsifiers known as "inert ingredients". Finlayson et al. (2000) documents that inert ingredients impart no toxicity to fish, insects, birds, or mammals. CDFG (1994) documents the acute toxicity levels of inert ingredients for fish, amphibians, mammals, and birds and concludes that inert ingredients have little if any effects to species in typical rotenone applications. Based on this information, it is assumed that inert ingredients would not have added impacts to species beyond those expected for the active ingredient and they will not be discussed as a separate element in the remainder of this document. All potential effects of inert ingredients are included in the documented effects of the rotenone treatment. Toxicity data on inert ingredients is available upon request at the Diamond Lake Ranger District.

AFFECTED ENVIRONMENT AND EFFECTS ANALYSIS

In this Biological Evaluation the term "effect" applies to Federally listed threatened or endangered species and the term "impact" applies to Regional Forester sensitive species or other wildlife species of concern. Direct, indirect and cumulative effects/impacts[11] are considered for all wildlife discussed in this document and are incorporated into the effects determination for Federally listed species and the determination of whether or not the proposed activities would cause a loss of viability to a species or its habitat and would cause a trend toward Federal listing for a Regional Forester sensitive species.

Conclusions regarding the consequences of the direct, indirect, and cumulative effects to a Federally listed species or its habitat are defined as follows:

> "No effect" – is the appropriate conclusion when a proposed activity will not have any effect on a listed species or critical habitat.
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> "May effect but is not likely to adversely affect" – is the appropriate conclusion when effects on a listed species or critical habitat are expected to be beneficial, discountable, or insignificant. Insignificant effects relate to the size of the impact and should never reach the scale where "take" occurs. Discountable effects are those extremely unlikely to occur. Based on best judgment, a person would not: (1) be able to meaningfully measure, detect, or evaluate insignificant effects; or (2) expect discountable effects to occur.

[11] Direct effects are the immediate environmental changes that occur as a result of implementing project activities. Indirect effects are environmental effects that are caused by the action, are later in time or occur in a different place (i.e. downstream from the project area), but are reasonably certain to occur.
Cumulative effects are effects that are caused by other projects and activities in the same "area" as the project being considered. Cumulative effects are analyzed by considering the proposed activities in the context of past, present, and reasonable foreseeable actions.

"Is likely to adversely affect" – is the appropriate conclusion if any adverse effect to a listed species or critical habitat is expected to occur as a result of the proposed activities.

Conclusions regarding the consequences of impacts to Regional Forester sensitive species are self explanatory: "no impact"; or "beneficial impact"; or "may impact individuals or habitat, but will not likely contribute to a trend towards Federal listing or loss of viability to a population or species"; or "will impact individuals or habitat, and would be expected to contribute to a trend towards Federal listing or loss of viability to a population or species".

PETS SPECIES

Table 1 is a Pre-field review and biological evaluation summary table. This table summarizes the presence or absence of sensitive species and/or their habitat within or adjacent (in terms of being potentially impacted – e.g. noise) to the actual proposed project area(s). It is based on the latest documented survey and sighting data, scientific literature review and GIS analysis. Impact or effect determinations are based upon this review. If there is a potential impact or effect to the species, further analysis and discussion is provided in subsequent paragraphs.

Table 1. Prefield review and biological evaluation summary table.

Common Name	Species Present		Habitat Present		Impact/Effect Expected		Conservation Strategy or Recovery Plan		Loss of Viability or Trend	Comments
	In	Adj.	In	Adj	Species	Habitat	Type	Consistent		
Northern Spotted Owl		✔	✔	✔	YES	NO	NFP	YES	NO	SEE SPECIES DISCUSSION
Bald Eagle	✔	✔	✔	✔	YES	YES	P Bald Eagle RP	YES	NO	SEE SPECIES DISCUSSION
Peregrine Falcon		✔		✔	NO	NO	Pacific Coast RP	YES	NO	The closest falcon eyrie is approximately 11.6 miles northwest of the project area boundary. No impacts are anticipated.
Harlequin Duck		✔	✔	✔	YES	YES	NONE	N/A	NO	SEE SPECIES DISCUSSION
Bufflehead	✔	✔	✔	✔	YES	YES	NONE	N/A	NO	SEE SPECIES DISCUSSION
Yellow Rail			✔	✔	NO	YES	NONE	N/A	NO	SEE SPECIES DISCUSSION
Oregon Spotted Frog			✔	✔	NO	YES	NONE	N/A	NO	SEE SPECIES DISCUSSION
Foothill Yellow-legged Frog					NO	NO	NONE	N/A	NO	The project area does not contain suitable habitat for this species. The upper elevation range for this frog is about 1,800 feet (Corkran & Thoms 1993). Species was not detected in Hayes surveys (1997 & 1998). No impacts anticipated
Southern Torrent Salamander					NO	NO	NONE	N/A	NO	The project area does not contain suitable habitat for this species. Hunter (1998) documented the species at 4,800 feet, but the upper elevation range on the Umpqua National Forest appears to be about 3,550 feet (local survey data). Species has not been located on the DL Ranger District. Surveys of the best potential habitat on the District (Copeland and Fish Creeks) occurred in 2002 with no detections. No detections occurred during Hayes surveys (1997, 1998). No impacts anticipated.
Western Pond Turtle					NO	NO	NONE	N/A	NO	The project area does not contain suitable habitat for this species. The upper elevation range for pond turtles in Douglas Co is 3,700 feet & most naturally occurring populations occur below 2,500 feet (T. Farrel, 2003). No historical records occur & species was not detected in Hayes surveys (1997 & 1998). No impacts anticipated.
Common Kingsnake					NO	NO	NONE	N/A	NO	The project area does not contain suitable habitat for this species. The upper elevation range for this snake in Oregon is about 1,500 feet (PacifiCorp 1995, Hayes 1996). Species was not detected in Hayes surveys (1997 & 1998). No impacts anticipated.
Canada Lynx					NO	NO	Conservation Strategy & Assessment	N/A	NO	The project area does not contain suitable habitat for this species. Interagency lynx biologists recommended that land management guidelines in the *Canada Lynx Conservation Assessment and Strategy* not be applied west of the Oregon Cascade Crest. These recommendations were finalized in Regional direction (9-19-2000). No impacts anticipated.
California Wolverine	✔	✔	✔	✔	YES	NO	NONE	N/A	NO	SEE SPECIES DISCUSSION
Pacific Fisher	✔	✔	✔	✔	YES	NO	Northwest Forest Plan	YES	NO	SEE SPECIES DISCUSSION
Pacific Fringed Myotis	LIKELY	LIKELY	✔	✔	YES	YES	Northwest Forest Plan	YES	NO	SEE SPECIES DISCUSSION
Pacific Pallid Bat					NO	NO	Northwest Forest Plan	N/A	NO	The project area does not contain suitable habitat for this species. Pallid bats are usually associated with desert areas. In Oregon, west of the Cascades the species is restricted to the drier interior valleys of the southern portion of the state (Verts and Carraway 1998). The closest sighting is 50 miles southwest of the project area. No impacts anticipated.
Pacific Shrew	LIKELY	✔	✔	✔	YES	YES	Northwest Forest Plan	YES	NO	SEE SPECIES DISCUSSION

Northern Spotted Owl (*Strix occidentalis caurina*)

Nesting, roosting, and foraging habitat (NRF) for the spotted owl usually occurs in late successional coniferous forests containing the following habitat features: large snags or large conifer trees (>32 inches d.b.h.) with broken tops, large branches or cavities for nesting; a multi-layered closed canopy that facilitates thermal regulation and protection from predation during roosting; and adequate amounts of dead wood on the forest floor to support populations of prey species (small mammals) for foraging. NRF habitat at high elevations (≥ 4,500 feet) is characterized by smaller diameter overstory trees (>26 inches d.b.h.) and a different tree species composition than lower elevation habitat.

Large contiguous blocks of NRF habitat are necessary for nesting success and survival. Within the southern Cascades, a 1.2-mile radius circle around an owl nest/activity center represents its home range. Forty percent NRF within 1.2 miles (1,182 acres) is considered the minimum acceptable amount of home range habitat for long-term owl survival. The United States Fish and Wildlife Service (USFWS) utilizes this bench mark to determine if a proposed project will result in an "incidental take" of the species under the Endangered Species Act (ESA).

Dispersal habitat for spotted owls satisfies needs for foraging, roosting, and protection from predators and is characterized by forests that have a minimum average tree diameter of 11 inches and ≥ 40% canopy cover. As with NRF habitat, dispersal habitat at higher elevations may be characterized by somewhat smaller diameter trees (> 9 inches d.b.h.). Maintenance of dispersal habitat on a minimum of 50% of federal lands within a given area (e.g., planning area, sub-watershed, quarter-township) is a conventional threshold utilized to evaluate dispersal habitat conditions.

Critical habitat for the spotted owl is a land allocation the USFWS designated to provide protection of spotted owl habitat under the ESA. Any modification of habitat in Critical Habitat Units (CHUs) which may affect either NRF or dispersal habitat must be addressed through consultation. LSR's are land allocations under the Northwest Forest Plan that are also designed to provide functional connected habitat for spotted owls at the species range scale.

Habitat loss is the primary factor impacting northern spotted owl survivability (Forsman et al. 1984). Non-habitat disturbing activities (e.g., hiking, recreation, etc.) are thought to be relatively insignificant threats (USDI 1995).

Affected Environment

The project area is not located in a CHU or LSR. There are no known spotted owl pairs within 1.0 miles of Diamond Lake proper. The closest known spotted owl to the project area is located approximately 2.1 miles north of Diamond Lake and 0.3 miles west of the Lake Creek project area boundary.

Spotted owl NRF habitat in the vicinity of Diamond Lake was field verified by Forest Service and USFWS biologists. There are 544 acres of NRF habitat within the 7,856 acre project area boundary. Surveys for this species are no longer required because standards and guidelines in the NWFP were designed to ensure species viability through their range. However, occupancy of these NRF stands by nesting birds is considered unlikely due to elevation and high levels of year-round human use in and closely adjacent to the habitat.

At the landscape scale, a July 2003 USFWS Biological Opinion concludes that the "condition of the Forest's (Umpqua National Forest) LSR's has not changed very much since they were established and habitat exists that should facilitate the movement of spotted owls across the landscape; the landscape

should support the conservation and recovery of spotted owls by providing for clusters of reproducing spotted owls and the connnectivity between those clusters" (USDI 2003 pg. 31).

Environmental Effects

Direct Effects

The project area is not located in a CHU; there would be "no effect" to critical habitat under any alternative. None of the alternatives would destroy, degrade or downgrade habitat for spotted owls. Thus, under alternatives 1-4 there would be "no effect" to habitat.

Alternative 1 would have no direct effects to spotted owls or their habitat.

If spotted owls were nesting in NRF habitat within the project area, there would be potential direct effects to the species associated with some of the proposed activities. Because habitat loss rather than disturbance impacts are believed to be the limiting factor for this species, all potential impacts are considered to be minor.

Alternatives 2 and 3 would reconstruct the existing canal within the lake and adjacent to Lake Creek. Reconstruction activities would entail staging and utilization of heavy equipment within 0.25 miles of unsurveyed suitable spotted owl habitat during the early (March 1-July 15) and late (July 16-September 30) nesting season for this species. Duration of activities would be four-eight weeks. Additionally, it is possible that equipment associated with boat ramp extensions, "connected actions" by the Resort, and fish rendering operations could create above ambient noise levels within 0.25 miles of unsurveyed suitable habitat during the breeding season. For purposes of consultation, the United States Fish and Wildlife Service (USFWS) assumes that all unsurveyed suitable spotted owl habitat is occupied and that operation of heavy power equipment in proximity to spotted owls could disrupt their normal reproductive activites (USFWS 2003 Biological Opinion Log # 1-15-03-F-0454). Based on these assumptions, proposed activities described above "may affect and are likely to adversely affect the northern spotted owl". Alternatives 2 and 3 would treat Diamond Lake with rotenone. Based on information documented under "Toxicity of Rotenone to Wildlife", spotted owls would not be harmed if they ingested rotenone treated water.

Under Alternative 4, it is possible that equipment staging for commercial fish harvesting activities and fish rendering operations could occur within 0.25 miles of unsurveyed suitable habitat at the north end of Diamond Lake during the spotted owl breeding season. Based on the aforementioned USFWS assumptions, these activities could result in a disturbance effect to spotted owls. Thus, this alternative "may affect and is likely to adversely affect the northern spotted owl".

Seasonal restrictions to protect spotted owls during the breeding season are not recommended because they would make implementation of action alternatives infeasible.

Indirect Effects

Alternative 1 perptetuates the existing condition of Diamond Lake, however, due to the species habits and lack of confirmed presence in the project area, it is not reasonable to assume any risk to spotted owls from ingestion of algal toxins. None of the alternatives impact existing or future spotted owl habitat in the project area. There are no anticipated existing or future impacts to the owl's prey base associated with any of the alternatives. Thus, there are no expected indirect effects for any alternative.

Cumulative Effects

Cumulative effects tables included as Attachment 3 document a broad range of past, present, and reasonably foreseeable actions that may contribute to the cumulative effects of land management activities on the spotted owl within the analysis area. None of the action alternatives contribute to the cumulative effect of habitat loss, the primary threat to the species.

Alternative 1 makes no contribution to a cumulative disturbance effect to this species because monitoring that is perpetuated under this alternative would not exceed ambient noise and thus, would not be expected to impact spotted owls. Alternatives 2, 3, and 4 represent a potential contribution to a cumulative disturbance effect for the species. However, because spotted owl habitat is limited in the project area, the scale of this potential effect is minor and considered insignificant to the species. Cumulative effects of disturbance activities on spotted owls were recently analyzed at the Forest-wide scale. The USFWS evaluated proposed activities (FY2003-2007) that did not modify habitat, but had a potential disturbance effect on owls and determined that these activities were not likely to result in jeopardy to the spotted owl (USDI 2003 Biological Opinion Log # 1-15-03-F-0454).

Conclusions

Alternative 1 has no anticipated effects to the species.There are no meaningful or measureable differences between the action alternatives with respect to potential effects on spotted owls.

Following consideration of the direct, indirect and cumulative effects of the proposed activities, it is determined that:

Alternative 1 will have "no effect" on spotted owls.

Alternatives 2, 3, and 4 will have "no effect" on spotted owl habitat or CHUS's, but "may affect and are likely to adversely affect" individual spotted owls through disturbance during the breeding season.

Northern Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle tends to nest in close proximity to large bodies of water such as lakes, rivers, and large streams. Eagles prey primarily upon fish, but they are also opportunistic feeders that utilize waterfowl, shorebirds, and carrion. Primary habitat components include clean water with abundant populations of fish and large wolfy perch trees and roost sites located nearby. Nest and roost trees are often the biggest trees available with stout limbs capable of supporting large nesting structures. Nest trees must also have suitable flight paths into the nest and offer good visibility of the surrounding terrain. The breeding season for the species in Oregon is generally January 1 through August 31.

Bald eagles were placed on the federal Endangered Species list in 1978 due to reduction of numbers caused by DDT and other pesticides in their food supply. The Pacific Bald Eagle Recovery Plan (Recovery Plan) provides guidelines and population goals for muliple management zones (Recovery Zones) within the seven state Pacific Recovery Region (Recovery Region) - Oregon, Washington, California, Idaho, Nevada, Montana, and Wyoming (USDI 1986).

Affected Environment

There are two eagle nest sites at Diamond Lake – the Rocky Point and Silent Creek sites. Over 20 years of annual reproductive survey data exists for each of these sites. Reproductive history by decade is summarized in Table 2 below.

Table 2. Reproductive History of Bald Eagle Nest Sites at Diamond Lake

Site Name	Time Period	Young Fledged
ROCKY POINT	1982-1989	**1 Total** (1 in 1987)
	1990-1999	**4 Total** (1 in 1992) (2 in 1994) (1 in 1995)
	2000-2003	**5 Total** (1 in 2001) (2 in 2002) (2* in 2003)
SILENT CREEK	1981-1989	**4 Total** (1 in 1981) (1 in 1982) (1 in 1985) (1 in 1986)
	1990-1999	**6 Total** (1 in 1990) (? in 1991) (1 in 1994) (2 in 1995) (1 in 1998) (1 in 1999)
	2000-2003	**5 Total** (2 in 2000) (1* in 2001) (2 in 2002)

* = young assumed fledged but not actually observed flying

The Rocky Point bald eagle nest was first discovered in 1982. Reproductive success appears to have increased steadily over time at this site. The nest was active in 2003 and the birds successfully fledged two young. The Silent Creek nest was first discovered in 1981. Reproductive success also apears to be on a postive trend at this site. However, although the nest was active in 2003, the eagles failed to fledge any young this season.

Historic midwinter bald eagle surveys provide sporadic documentation of winter-time eagle presence at Diamond Lake over the past decade. However, it is likely that eagles use the lake year round. According to eagle expert Frank Isaacs, the nesting eagles are generally on territory at Diamond Lake by January. Diamond Lake freezes in most winters by early December so foraging opportunities at the lake are limited to areas of open water around the Short and Silent Creek inlet and Lake Creek outlet. Diamond Lake eagles probably go downstream to forage until ice-off which usually occurs from late March to early May. Nesting activities proceed from winter through spring and summer. Young eagles likely remain at Diamond Lake until late fall (Pers. comm. Frank Isaacs).

There are two additional eagle nests in the broader analysis area for this project. There is one eagle nest at Lemolo Lake and one at Toketee Lake. Eagles are known to use these lakes year-round. At the landscape scale, available information indicates that bald eagle populations are increasing range-wide. In the Pacific Recovery Region, the number of occupied territories has consistently increased since 1986. Eagle productivity goals for the Recovery Region have been met since 1990, but distribution and nesting goals for some Recovery Zones within the Recovery Region have not been met (USDI 2003).

In Oregon, for the 1998- 2002 time period, the state-wide population, distribution, and productivity goals were met. Eight out of ten Recovery Zones met or exceeded their population goals and thus attained the 80% distribution level identified in the Recovery Plan. The state-wide average for productivity exceeded the goal of 1.0 young fledged per pair. However, some Recovery Zones were still below this goal (Pers. comm. Frank Isaacs).

The project area is located within the California/Oregon Coast Recovery Zone (#13). During the 1998-2002 time period, all Recovery Plan goals for this zone were met. The population goal for Recovery Zone 13 is 45 occupied territories; in 2002 there were 83 occupied territories. The productivity goal is 1.0 young fledged per pair; from 1998-2002, the five year average productivity rate was 1.07 (Pers. comm. Frank Isaacs).

Environmental Effects

Direct Effects

Alternative 1 would have no direct effects to bald eagles.

Alternatives 2 and 3 propose multiple activities that would potentially directly affect bald eagles at Diamond Lake throughout the lifetime of the project. Canal reconstruction activities would occur within line of sight of the Rocky Point eagle nest and in-lake activities would occur in areas utilized as foraging habitat by the pair. These activities would likely occur in late spring or summer during the bald eagle breeding season and thus represent a potential disturbance impact. However, this is considered to be a discountable effect to the species because bald eagles at Diamond Lake have adapted to high levels of year-round human use and continue to reproduce successfully; based on this information, it is considered unlikely that this potential disturbance effect would actually occur.

The proposed draw down respresents a short-term beneficial effect to bald eagles at Diamond Lake because fish would be concentrated into a smaller area and readily accessible to the birds. Subsequent mechanical fish removal activities (described in detail in the EIS) would reduce the availability of prey and potentially disrupt normal foraging activites for both nesting eagle pairs. Mechanical harvest activities would likely occur late in the breeding season when young eagles are about to fledge. These activities are not expected to hinder reproductive success because an adequate prey base would likely

remain in Diamond Lake (or downstream) and eagles would not be expected to abandon their young at this stage in the breeding season.

Rotenone treatment would occur after the bald eagle breeding season, but eagles would still be present at the lake. Eagles would be expected to ingest rotenone treated water and consume rotenone killed fish. However, as described in the "Toxicity of Rotenone to Wildlife" section of this document, eagles are not expected to be harmed as a result. Because the rotenone treatment is designed to kill all of the fish, this activity would effectively eliminate the primary prey base for bald eagles at Diamond Lake for an extended period of time. Because it would occur after young eagles have fledged (and likely dispersed), loss of prey base in late fall would not compromise eagle reproductive success in the year of chemical treatment. Eagles normally utilizing Diamond Lake in the late fall to early winter season could be displaced to adjacent water bodies downstream or east of the Cascades.

The Rocky Point and Silent Creek eagle pairs would be expected to be on territory by the January following chemical treatment and would likely attempt to nest as usual (Pers. comm., Frank Isaacs). Under normal circumstances, nesting bald eagles probably routinely forage in adjacent/downstream habitat until ice-off at Diamond Lake in the spring. Lack of available fish prey base at Diamond Lake in the late spring and summer when fish are normally abundant at the lake and eagles are feeding themselves and their young represents the greatest potential adverse affect associated with these alternatives. Although eagles would not be expected to abandon their nests, lack of a fish prey base could compromise nesting success (Pers. comm., Frank Isaacs).

Because timing of proposed restocking of Diamond Lake with fish would be based on ecological indices of lake health (i.e. when the biota in the lake has recovered adequately to support fish without compromising water quality), it is not possible to state unequivocably when the eagle prey base would be restored. However, for this analysis, it is assumed that Diamond Lake would not be stocked in the first spring/summer following the chemical treatment, but would be stocked in the following spring/summer. Based on this assumption, bald eagle nesting success would be compromised for one to two breeding seasons.

For Alternatives 2 and 3, the following mitigation is recommended to reduce potential effects to nesting bald eagles associated with the short-term loss of their fish prey base:

- A supplemental bald eagle feeding program would be implemented during the time period when the fish population in Diamond Lake is non-existent or limited. A detailed plan would be developed jointly by the USFWS, ODFW, and the USFS.

Fish restocking under Alternatives 2 & 3 would restore the eagle prey base at Diamond Lake and thus beneficially affect eagles. Alternative 3 would be expected to provide a higher number or larger prey items more quickly than Alternative 2 because Alternative 3 proposes stocking with legal-sized fish while Alternative 2 is primarily a fingerling based stocking strategy. None of the other activities proposed under these alternatives nor the "connected actions" associated with them have consequential effects to the bald eagle or its habitat.

Alternative 4 would utilize commercial fish operations for approximately two months in June and July and one month in September on an annual basis to harvest tui chub from Diamond Lake. Commercial fishing activities represent a potential disturbance affect to eagles during the breeding season. However, as discussed earlier, it is considered unlikely that these additional activities would actually disturb eagles given the existing high levels of human activity at the lake. This represents a discountable effect to the species. Commercial fishing would also reduce the available prey base for eagles. These activities are not

expected to hinder reproductive success because an adequate prey base would likely remain in Diamond Lake throughout the lifetime of the project. This is considered to be an insignificant effect to the species.

Indirect Effects

Alternative 1 perpetuates the existing condition, forgoes the opportunity to address declining water quality and thus leaves eagles vulnerable to exposure to toxic algae blooms in the future. Under this alternative, it is possible that eagles would become ill or die from ingestion of water containing algal toxins during or following a summer bloom.

Alternatives 2 and 3 could result in increased use of Lemolo and Toketee Lakes by the "Diamond Lake eagles" during the time when the fish prey base is absent or limited at Diamond Lake. As a result, the "Lemolo and Toketee eagles" and winter migrant eagles could experience a temporary increased competition for prey. This potential effect is considered insignificant because the downstream prey base is likely adequate to support the additional foraging pressure and the supplemental feeding mitigation would reduce the dependence of the "Diamond Lake eagles" on downstream forage.

Under Alternative 4, it is expected that annual commercial fishing operations would be needed beyond the lifetime of this project to control the tui chub population. Thus, potential disturbance effects and prey base reduction effects described above would be expected to continue in the future. As documented above, these potential effects are considered discountable and insignificant, respectively.

Cumulative Effects

Past, present, and future management activities that entail fish stocking and development near Diamond and Lemolo Lakes and the North Umpqua River are the primary management activities of relevance to bald eagles in the analysis area (see cumulative effects tables included as Attachment 3).

Alternatives 2, 3, and 4 represent a potential contribution to cumulative disturbance and prey base effects to bald eagles. However, the consequences of these potential cumulative effects are considered to be insignificant to the species because: it is expected that under a worse case scenario, the bald eagles at Diamond Lake would fail to successfully reproduce for one to two breeding seasons, given the positive status of the bald eagle population within Recovery Zone #13 and State-wide, this temporary lack of recruitment would not be considered a threat to the continued recovery of the bald eagle. Alternative 1 contributes to the cumulative effects in that it maintains the existing condition and leaves eagles vulnerable to exposure to algal toxins.

Conclusions

Alternative 1 represents the greatest sustained risk to bald eagles at Diamond Lake over time. Alternatives 2 and 3 have greater potential short-term adverse effects than Alternative 4 and higher potential for long-term habitat improvement through improved water quality than Alternatives 1 or 4. There are no meaningful or measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative effects of the proposed activities, it is determined that:

Alternative 1 "may affect and is likely to adversely affect" bald eagles through perpetuation of eagle exposure to toxic algae blooms.

Alternatives 2 and 3, as mitigated, "may affect and are likely to adversely affect" bald eagles through temporary substantial reductions in available prey base and potential effects on reproductive success.

Alternative 4, "may affect but is not likely to adversely affect" bald eagles by insignificant reductions in prey base and discountable potential disturbance effects.

Harlequin Duck (*Histrionicus histrionicus)*

Harlequins are sea ducks which migrate inland to breed in the mountains. They prefer large, rocky, swift streams or rivers, generally with many down trees, out-washed root wads, and similar debris about the edges of the stream course. Nest locations are adjacent to rapids or other turbulent water. The species feeds mainly on animal matter including mollusks, crustaceans, insects and fishes. Typical first observations of this duck in mountain streams occur between March to April. Nesting occurs from May to early June. The males return to the coast after the egg clutch is completed. The female and brood will remain in the stream/river system until late September. Breeding habitat is defined as 2nd order or larger streams with moderate gradients (1-13%), moderate amounts of overhanging vegetation and boulder/cobble substrates. In North America, their numbers appear to be declining as a result of habitat loss, oil spills and disturbance to nesting ducks by humans (Turbak 1999). However, at a state-wide scale it is difficult to determine population trends because historic population numbers are unknown.

Affected Environment

There are no known sitings of harlequin ducks within the project area. The closest observation of this species is approximately 8.9 miles west of the Lake Creek project area boundary on the North Umpqua River. Lake Creek represents low quality potential habitat for this species within the project area. Surveys for harlequins were conducted according to protocol on Lake Creek on May 27 and August 6, 2003. No harlequin ducks were detected. Survey area maps and field forms are on file at the Diamond Lake Ranger District.

Portions of the North Umpqua River that occur within the larger project analysis area are also known habitat for the harlequin duck. There are eleven recent (1985 to present) observations of harlequins along the North Umpqua River (and its tributaries) during the breeding season.

At the landscape scale, a 1993 comprehensive survey effort for harlequin ducks in Northwest Oregon identified 47 breeding pairs (Thompson et al. 1993); however, due to survey techniques this is probably an underestimate of the breeding population in the area (Dowlan 1996).

Environmental Impacts

Direct Impacts

Based on lack of detections during recent surveys, lack of historical observations and low quality of potential habitat for harlequin ducks within the project area, it is considered unlikely that harlequins would be utilizing Lake Creek during the lifetime of this project. However, because the species is known to occur on the Forest, it is reasonable to assume species presence for purposes of full disclosure.

Alternative 1 would have no anticipated direct impacts to harlequin ducks because it does not propose activities on Lake Creek.

Alternatives 2 and 3 propose multiple activities that could potentially impact harlequins and their habitat. Canal reconstruction activities adjacent to Lake Creek have the potential to disturb individual ducks or broods, if ducks were utilizing the area during implementation. Draw down of the lake would temporarily change potential habitat conditions in Lake Creek by increasing the flow. This would have minor habitat impacts because high flows would temporarily degrade macroinvertebrate prey habitat (see Fisheries and Hydrology reports for details). This impact is probably best characterized as a neutral impact to the species because harlequins would be utilizing their coastal winter habitat during the majority of the draw down period (late September to late March).

The temporary dewatering of Lake Creek during the rotenone treatment and subsequent low flows during the lake refill period,(described in detail in the project Hydrologist's Report), would eliminate potential habitat for harlequins on portions of the stream in the short-term. Potential Lake Creek habitat would likely be unuseable by harlequin ducks for one breeding seasons due to lack of flow and macroinvertebrate prey base. This potential impact is considered to be minor because of the availability of other higher quality habitat in the watershed and the low liklihood that harlequins actually breed on Lake Creek.

No rotenone treatment is planned for Lake Creek and as described above the creek would be dewatered during lake treatment. Thus, harlequin ducks would not be expected to ingest rotenone treated water or prey items; if they did, no adverse impacts would be expected (See "Toxicity of Rotenone to Wildlife" section). Proposed monitoring represents a minor, potential disturbance impact, if harlequin ducks were utilizing Lake Creek during monitoring activities; this is considered to be an insignificant and discountable impact. None of the other activities proposed under these alternative nor the "connected actions" associated with them have consequential impacts to harlequins or their habitat.

Alternative 4 would only potentially impact harlequin ducks through proposed monitoring activities. Monitoring is an occasional activity, and represents a temporary and minor disturbance impact to the species. This is considered to be an insignificant and discountable impact.

Indirect Impacts

Alternative 1 perpetuates ongoing monitoring activities and thus, represents a minor, potential disturbance impact to the species. Because harlequins are not expected to use Diamond Lake, risk of exposure to algal toxins is considered to be neglible.

None of the alternatives are expected to impact harlequin ducks or their habitat downstream of the project area (beyond Lake Creek) based on the following rationale. Aternative 1 would maintain the existing condition. Under Alternatives 2 and 3, rotenone treated water would be confined to Diamond Lake and thus, no downstream impacts to the harlequin prey base are anticipated. The water flow contribution of Lake Creek is a small percentage of the total North Umpqua River system flow, thus manipulations of this flow under Alternatives 2 and 3 would not be expected to change habitat conditions for harlequins on the North Umpqua River. Under Alternative 4, all proposed activities are confined to Diamond Lake and would essentially maintain the existing condition downstream.

Alternatives 1 and 4 would perpetuate the existing condition and would not be expected to change the quality of potential harlequin habitat in Lake Creek in the future. Based on conclusions drawn by the Project Hydrologist, changes in Lake Creek associated with Alternatives 2 and 3 would be short-term and

not expected to substantially change the future habitat conditions. It is expected that sustained high flows would create additional habitat complexity in Lake Creek over time (deep pools) that would benefit macroinvertebrate prey for harlequins. Subsequently, pools would fill in and a return to baseline levels of macroinvertebrates would occur. This represents a minor benefit or neutral impact to future harlequin habitat on Lake Creek.

Cumulative Impacts

Cumulative effects tables included as Attachment 3 document a broad range of past, present, and reasonably foreseeable actions that contribute to the cumulative effect of land management activities on the harlequin duck within the analysis area. Activities that manipulate historic stream flow regimes and result in increased human activity in proximity to stream habitat are contributors to a cumulative habitat loss and disturbance effect. Of note are past activities such as the construction of Highway 138 and the installation of PacifiCorp operations that affected harlequin duck habitat on the North Umpqua corridor; past, present, and future water quality monitoring efforts on Lake Creek and implementation of water rights at Diamond Lake within the project area; and presumed increases in recreational use on the North Umpqua River in the future.

Alternatives 2 and 3 represent a minor potential contribution to the cumulative disturbance and habitat impacts on the species. Alternatives 1 and 4 only contribute to the cumulative effects in that they maintain the existing condition.

The majority of known and suspected breeding habitat for harlequin ducks within the analysis area and on the Forest is contained in the Wild and Scenic North Umpqua River corridor that spans from Soda Springs Dam down to Rock Creek. According to the North Umpqua River Watershed Analysis (USDA April 2001, V.2) only an estimated 12% of the riparian habitat within this 33.8 mile stretch of the river has been converted from forest into paved roads, gravel roads, residential areas and other facilities. No future timber harvest and little future development is expected in this area. Additionally, tributaries to the North Umpqua River corridor that also contain harlequin habitat are protected under the NWFP through standard and guidelines for Riparian Reserves. Thus, availability of suitable habitat for harlequin ducks is not considered to be a limiting factor for the species and cumulative impacts are considered to be minor.

Conclusions

Alternatives 2 and 3 have a greater potential to impact harlequin ducks than Alternatives 1 and 4. However, impacts to the species are considered to be minor under all alternatives.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1,2,3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Bufflehead (*Bucephala albeola*)

Buffleheads are small "diving ducks" that can be found on small ponds to large lakes, and larger streams and rivers. They breed in tree cavities in coniferous-deciduous woodland near lakes and ponds. They usually nest in natural tree cavities or abandoned flicker holes. In freshwater, these ducks feed on

aquatic insects, snails, amphipods, small fishes and some aquatic vegetation. (American Ornithologists' Union 1983).

Affected Environment

Buffleheads are known to occur at Diamond Lake. They are considered to be an uncommon to fairly common spring migrant and an abundant fall migrant. They have been documented in small numbers during the summer at the sewage ponds and South Shore meadow area during Audubon Society surveys in 1996-2002. Buffleheads nested at the sewage ponds adjacent to Diamond Lake in 1989 and 1990 (Fix 1990).

According to Fix (1990) this species begins to arrive in numbers during October, peaking in early- to mid November. They tend to concentrate at the south end of the lake, but individuals and small groups may be seen anywhere on the lake in the fall months. They winter on Toketee Lake, and likely on other area lakes that do not completely freeze. Fix (1990) estimated that a maximum of approximately 1,000 buffleheads utilized Diamond Lake during early November of 1988 and 1989.

At the landscape scale, buffleheads are considered to be a common spring and fall migrant in Oregon. Marshall et al. (2003) describes the species as possibly the most ubiquitous diving duck in western Oregon during the late fall through early spring. However, the breeding population is considered sensitive by ODFW because of small size and limited nesting habitat.

Environmental Impacts

Direct Impacts

Alternative 1 would have no anticipated direct impacts on buffleheads.

Alternatives 2 and 3 have potential impacts on both individuals and habitat of this species. Survey data during the 1996-2002 breeding seasons, document only one observation of a single bufflehead on Diamond Lake proper near the South Shore meadows on 6/26/99 (Umpqua Valley Audubon database). Based on this information, spring and summer activities on Diamond Lake and Lake Creek (i.e., canal reconstruction, mechanical fish harvests, etc) would not be expected to impact buffleheads.

Buffleheads would likely be present on Diamond Lake in small numbers during the September rotenone treatment proposed under Alternatives 2 and 3. As described in the "Toxicity of Rotenone to Wildlife" section of this document, buffleheads are not expected to be harmed as a result of ingesting water or consuming dead prey. However, in the months of October and November when buffleheads are present in large numbers, rotenone treatment would substantially reduce available prey items in Diamond Lake for fall migrants of this species. The majority of migrating buffleheads would likely be displaced to the Klamath Basin, further along on their southern migration route (Pers. comm. Ron Maertz). This represents a potential adverse impact to both individuals and habitat. Because the duration of the impacts are short-term (one to two fall seasons), other suitable habitat is available to displaced birds and no deaths are expected to occur, consequences of this displacement effect to the species would not be expected to result in a loss of species viability or a trend toward Federal listing. None of the other activities proposed under these alternatives nor the "connected actions" associated with them have consequential impacts to buffleheads or their habitat.

Alternative 4 would have minor potential impacts to buffleheads. Proposed commercial fish harvesting operations occuring annually in the month of September have the potential to disturb a small number of buffleheads that might be using Diamond Lake proper at this time. It is also possible that individuals could be harmed by becoming entangled in a gill net. Other proposed activities would occur in the spring and summer and would not be expected to impact the species.

Indirect Impacts

Alternative 1 perpetuates the existing condition, forgoes the opportunity to address declining water quality and thus leaves small numbers of buffleheads vulnerable to exposure to toxic algae blooms in the future. Under this alternative, it is possible that buffleheads would become ill or die from ingestion of water containing algal toxins during or following a summer bloom (See Effects of Algal Toxins on Wildlife section of this document). Alternative 1 would also indirectly impact this species by perpetuating lake conditions that support a limited and declining future population of aquatic macroinvertebrates (see Fisheries report for details).

Alternatives 2 and 3 would be expected to result in a beneficial impact to the species by facilitating the return of a more abundant and diverse aquatic macroinvertebrate prey base for the species in the near future (beginning one or two years following rotenone treatment) when the lake recovers (see Fisheries report for details).

Impacts to the abundance and diversity of the future prey base for buffleheads at Diamond Lake are uncertain under Alternative 4 due to the fact that only a portion of the tui chub population would be removed and tui chub are very effective predators on macroinvertebrates. However, it is assumed that some positive impacts would be realized (see Fisheries report for details).

Cumulative Impacts

As documented above, concern for this species in Oregon is focused on the breeding population. Lack of suitable nesting cavities and high levels of human disturbance during the breeding season are considered to be the primary limiting factors for buffleheads in the state (Marshall et al. 2003). Sewage ponds where the species has nested (one pair) would not be impacted by the project. There is no documented breeding by buffleheads on Diamond Lake proper. Thus, none of the alternatives are expected to impact breeding buffleheads or nesting habitat. Based on this information, in combination with the knowledge that buffleheads are one of the most common fall migrants in western Oregon, potential cumulative effects associated with the proposed activities from this project considered in the context of all activities documented in the Cumulative effects tables in Attachment 3 would not be expected to result in a loss of species viability or a trend toward Federal listing.

Conclusions

Alternative 1 represents the greatest sustained risk to buffleheads at Diamond Lake over time through exposure to algal toxins. Alternatives 2 and 3 have greater potential short-term adverse impacts than Alternative 4 and higher potential for long-term habitat improvement through improved water quality and prey base than Alternatives 1 or 4. There are no meaningful or measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Yellow Rail (*Coturnicops noveboracensis*)

Yellow rails are secretive birds that inhabit shallowly flooded sedge meadows at 4,100- 5,000 feet in elevation. Water depth at male calling sites averages 2.9 inches and nests are typically hidden under live and dead vegetation (Marshall et al. 2003). The yellow rail mainly breeds east of the Rocky Mountains in the northern United States and southern Canada. However, there is an isolated population in the Klamath Basin in south-central Oregon (Popper and Stern 1996). This species was thought to have disappeared from Oregon in the early 1900's, but was rediscovered in 1982 (Stern et al. 1993). The majority of yellow rails in Oregon and the more optimal habitats occur at the Klamath National Wildlife Refuge and on BLM and Forest Service Lands in the Fourmile Creek and Jack Spring areas. Lundsten and Popper (2002) estimate that there are 235-285 breeding pairs in Oregon.

Affected Environment

There are no historic or recent sitings of yellow rails within the project area or on the Umpqua National Forest. The closest observation of this species is approximately 12 miles northeast of the project area at Big Marsh on the Deschutes National Forest.

Limited, low quality potential habitat for the species exists within the project area in the Silent Creek marshes at the southern end of Diamond Lake. Surveys for yellow rails were conducted according to protocol on June 26 and July 7, 2003. No yellow rails were detected. Survey area maps and field forms are on file at the Diamond Lake Ranger District.

At a landscape scale, the Oregon yellow rail population is generally considered stable because the majority of the population is located on federally-owned lands and birds are protected during the breeding season. However, because of the small size and limited distribution of the yellow rail state-wide, the birds are still considered at risk (Pers. comm. Ken Popper 2003).

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

Based on lack of historic occurrence anywhere on the Forest, lack of detections during recent surveys in the project area, and limited quantity and quality of potential habitat within the project area, it is not reasonable to assume that yellow rails would be present within the project area during the lifetime of this project. Thus, no direct, indirect, or cumulative impacts to individual yellow rails are expected under any of the proposed alternatives.

Alternatives 1 and 4 would have no direct, indirect or cumulative impacts to yellow rail habitat because both alternatives would effectively maintain and perpetuate the existing condition of habitat for the species.

Alternatives 2 and 3 propose a draw down that would temporarily dewater the Silent Creek marshes adjacent to Diamond Lake. Drying of the marshes would degrade the quality of potential yellow rail habitat in the short-term. Because existing potential habitat is considered to be of no meaningful benefit

to the species, and because the majority of the southwest Oregon population is protected during the breeding season, potential direct, indirect, and cumulative impacts associated with these alternatives is considered insignificant to the species. None of the other activities proposed under these alternative nor the "connected actions" associated with them have consequential impacts to yellow rails or their habitat.

Conclusions

Potential impacts to yellow rails are considered to be minor under all alternatives. Alternatives 2 and 3 have temporary habitat impacts and there is no meaningful or measureable differences between the two.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1 and 4 will have "no impact" on the yellow rail.
>
> Alternatives 2 and 3 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Oregon Spotted Frog (*Rana pretiosa*)

The spotted frog is nearly always found in or near a perennial water body such as a spring, pond, lake or sluggish stream. The species is most often associated with nonwoody wetland plant communities (species such as sedges, rushes, and grasses) (Leonard, et al. 1993). It was once common west of the Cascade Crest, but recently populations have shown a marked decline. The introduction of exotic species (i.e. bullfrogs, *Rana catesbiana*, and non-native fish species) and urban development are believed to be the primary causes of this decline. (There are no bull frogs in Diamond Lake). Although high elevation lakes in the Cascades are potential habitat for this species, spotted frogs have never been recorded in Douglas County.

Affected Environment

Diamond Lake contains very low quality potential habitat for the Oregon spotted frog, this species is not known or expected to occur in the project area. The species was not detected in Diamond Lake, Horse or Teal Lakes or Lake Creek during formal surveys by Hayes in 1996 and 1997. No documented historical records occur in or near the project area. According to Hayes (Pers. comm. 2003) all valid records of Oregon spotted frogs occuring south of Willamette Pass in Oregon are located in the Klamath Basin. Oregon spotted frogs only cross the Cascade Mountain crest north of Williamette Pass where the crest is lower, reflecting a biogeographic pattern repeated by several species. The liklihood of occupancy of Diamond Lake by spotted frogs is considered to be very low to none (Pers. comm. Marc Hayes). The closest observation of this species is a large population approximately 12 miles northeast of the project area at Big Marsh on the Deschutes National Forest.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

Based on lack of historic occurrence anywhere on the Forest or in Douglas County, lack of detections during recent surveys in the project area, and the opinion of Herpetologist Marc Hayes, it is not reasonable to assume that spotted frogs would be present within the project area during the lifetime of

this project. Thus, no direct, indirect, or cumulative impacts to individual spotted frogs are expected under any of the proposed alternatives.

Alternative 1 perpetuates degraded water quality and prey conditions in Diamond Lake, but as described for Alternatives 2 and 3 below, because the habitat is not expected to be occupied by spotted frogs now or in the future, this is considered to be a discountable and insignificant impact.

Activities associated with Alternatives 2 and 3 that modify conditions in and around Diamond Lake (including fish stocking) would degrade potential habitat in the short-term. Although these alternatives are expected to improve the future prey base, overall quality of habitat would not be expected to improve due to the continued presence of predatory fish. Because existing potential habitat is considered to be of no meaningful benefit to the species, and because it is considered unlikely that potential habitat would ever be naturally occupied by the species due the topographic barriers described above, the potential direct, indirect, and cumulative impacts associated with these alternatives are considered to be both insignificant and discountable. The "connected actions" associated with these alternatives have no consequential impacts to spotted frogs or their habitat.

Alternative 4 would have no direct, indirect or cumulative impacts to potential habitat because it would essentially maintain and perpetuate the existing condition of habitat for the species.

Conclusions

Potential impacts to spotted frogs are considered to be minor under all alternatives. Alternatives 1, 2 and 3 have potential habitat impacts. There is no meaningful difference between the three alternatives.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2 and 3 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".
>
> Alternatives 4 will have "no impact" on the spotted frog.

California Wolverine (*Gulo gulo luteus*)

The wolverine is considered to be one of the rarest mammals in North America (Ruggiero et al. 1994). The largest member of the mustelid (weasel) family, the wolverine inhabits the tundra, taiga and northern forests of Eurasia and North America. In the western United States, its distribution extends as far south as California, where it is listed as "threatened", and Colorado (listed as "endangered"). It is generally associated with remote, sparsely inhabited, high elevation subalpine and alpine forests at elevations ranging from 6,000 feet to above timberline. They have large home ranges (39 to 351 square miles) and travel long distances (commonly 18-25 miles) in daily hunting. They are thought to use higher elevation ranges in the summer to avoid high temperatures and human recreational activity (Ruggiero et al. 1994). Wolverines are found in a variety of habitats and do not appear to avoid open areas. Wolverines do tend to avoid human developments and extensive human settlements and major access routes may function as dispersal barriers for this species (Ruggiero et al. 1994).

A carnivore, the wolverine will eat almost anything it can catch, but is thought to primarily be a scavenger and feeds on large mammal carrion, especially in the winter months. Highest densities occur in areas with low human activity and adequate year-round food supplies.

Young are born in early spring (February – March) and average litter size is 2. Reproduction probably occurs every 2-3 years. Females are very susceptible to disturbance during this time. They den in caves, rock crevices, or hollow logs.

Affected Environment

There are two historic sightings of wolverine within the project area boundary, one in 1956 and one in 1971. Potential denning habitat for the species is located 2.7 miles east of the project area in the Mount Thielsen Wilderness. There is a 1995 wolverine sighting adjacent to this denning habitat.

Helicopter surveys conducted in 1997 by ODFW and the USFS located tracks and a potential wolverine den within the Wilderness, 4.8 miles northeast of the project area. However, as surveyors gained additional on-the-ground experience at track and den identification, they began to question the validity of this sighting; they now have a low level of confidence in the sighting and believe the tracks seen were likely American marten (Pers. comm., Raymond J. Davis).

Helicopter surveys for wolverine have occurred for three consecutive winters (2001-2003) in the Mt. Theilsen and Sky Lakes Wilderness areas (south of Crater Lake). No confirmed wolverine tracks or dens were located during these surveys. Additional surveys are planned for the next two years.

Although it is possible that the project area could lie within the home range of one or more wolverines, habitat effectiveness for this species is greatly reduced by the year-round, high levels of human use at and adjacent to Diamond Lake. In general, wolverine would be expected to avoid the project area rather than utilize it as habitat.

Population status and trends for wolverine at the landscape scale are best described as uncertain or unknown. Ruggiero et al. (1994) documents 23 records of wolverine in Oregon from 1981-1992 compared with 57 records from 1913-1980 and describes the current status in the state as unknown. The USFWS was recently petitioned to list the wolverine as threatened or endangered in the lower 48 states of the United States. The USFWS finding, published in the Federal Register (68 FR 60112) on October 21, 2003 concludes that the petition and other available information did not present substantial scientific or commercial information indicating that listing the wolverine in the contiguous United States may be warranted.

Environmental Impacts

Direct Impacts

Alternative 1 would have no anticipated direct impacts on wolverines or their habitat.
None of the alternatives would impact denning habitat or be expected to disturb denning wolverines. Increased levels of human use represent the only potential impact that warrants discussion.

High levels of human use reduce habitat effectiveness for wolverine. Existing high levels of year-round human use adjacent to Diamond Lake, reduce the liklihood that wolverine would utilize this area even if it was contained in a wolverine home range. However, because the species has been documented in the project area, potential impacts will be described for purposes of full disclosure.

Under Alternatives 2, 3, 4 implementation of the majority of the proposed activities (including the "connected actions") would result in increased levels of human use in and around Diamond Lake. If a wolverine attempted to approach Diamond Lake during the lifetime of the project, these activities in

combination with existing ambient noises levels, would be expected to compel the animal to avoid the area. This potential habitat effectiveness and disturbance impact is considered to be immeasureable (insignificant) and unlikely to occur (discountable).

Indirect Impacts

Alternatives 1 would only be expected to impact wolverine by perpetuating water qualitiy monitoring on Lake Creek. Increased human activity associated with monitoring would have the potential to temporarily displace any individuals that might be using the area. As described above, this potential disturbance impact is considered to be immeasureable (insignificant) and unlikely to occur (discountable). Risk of exposure to algal toxins is considered to be neglible.

Alternatives 2, 3, 4, are all designed to improve water quality and the recreational fishery at Diamond Lake. If successful, it is reasonable to assume that human use in the spring/summer/fall would increase in the future as a result of implementation. As such, all of the alternatives would further reduce the effectiveness of the forest surrounding Diamond Lake as suitable habitat for wolverines.

Cumulative Impacts

Past activities that resulted in the development of Diamond Lake as a high use, year-round recreation area led to habitat conditions that limit use of the project area by wolverines. Increased human use resulting from Alternatives 1, 2, 3, and 4, and ongoing and future management activities in the area represent a minor contribution to the cumulative effect of reduced habitat effectiveness for this species.

Due to the existing levels of human development and recreational use, the lack of denning habitat in the project area, and the lack of documented den sites during the recent surveys of the adjacent Mt. Thielsen Wilderness, the potential cumulative effect of reduced habitat effectiveness is considered to be insignificant to the species.

Conclusions

Potential impacts to wolverine are considered to be minor under all alternatives. Alternatives 1, 2, 3 and 4 have the potential to reduce habitat effectiveness through increased human use. There are no meaningful differences between the potential impacts of these alternatives on this species.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Pacific Fisher (*Martes pennanti*)

A medium-sized member of the weasel family, it is associated with low to mid-elevation (<4,000 ft.) late-successional/old growth forests in western Oregon, but is known to use closed-canopy forests of varying ages (USDA/USDI 1994 – Appendix J2-52). It is thought to avoid large (>3 acres) open areas. Fishers are closely associated with forested riparian areas, which they use for foraging, resting and as travel corridors (Heinemeyer and Jones 1994). Optimal conditions are defined as large patches of late-successional forest (≥245 acres) interconnected with other large patches. Within late-successional

forests, large snags and trees (≥20 inches d.b.h.) with hollows or cavities are important structures for maternal den sites (Thomas et al. 1993). The fisher is primarily a carnivore and its diet consists mostly of small mammals (e.g., rodents, shrews, squirrels, hares, porcupine and beaver), birds and carrion. Forest stands with high levels of coarse woody debris are thought to be good habitat for prey.

According to Aubry and Lewis (2003) prior to extensive European settlement, the fisher occupied most coniferous forest habitats in Washington, Oregon and California. Since that time human activities (such as trapping and poisoning) have resulted in the apparent extirpation of fishers throughout much of their historical range in the Pacific states. Extant populations of fishers in Oregon are restricted to two disjunct and genetically isolated populations in the southwestern portion of the state: one in the southern Cascade Range and one in the northern Siskiyou Mountains. The population in the southern Cascade Range is reintroduced and is descended from fishers that were translocated to Oregon from British Columbia and Minnesota between 1961-1981 (Aubrey and Lewis, 2003).

Aubrey and Lewis (2003) document that loss of fisher populations from central and northern Oregon and Washington has resulted in the isolation of extant populations in Oregon by >400 miles from those occurring in southern British Columbia. The authors conclude that the historical continuity in fisher distribution that once provided for genetic interchange among fisher populations in the Pacific states no longer exists.

Affected Environment

There are no known fisher den sites within or adjacent to the project area. There is a documented 1993 sighting of a fisher near the southern project area boundary adjacent to Silent Creek. There is also a reliable 1996 fisher sighting approximately 2.7 miles west of Lake Creek. Although the majority of the project area is higher elevation than is normally utilized by this species, it is considered to be potential habitat. Based on the elevation and habitat preferences it is expected the project area would be used by dispersing fishers.

At the landscape scale, the southern Cascade Range population of fishers is located approximately 18 miles southwest of the project area boundary. A July 3, 2003 finding by the USFWS published in the Federal Register documents that the West Coast population of the fisher may be a distinct population segment for which listing under the ESA may be warranted. A status review to determine if listing is warranted is currently underway (68 FR 41169).

Environmental Impacts

Direct Impacts

None of the alternatives would reduce available den sites for fisher and none of the alternatives would be expected to disturb denning individuals.

Alternatives 2 and 3 have the potential to impact fisher habitat through the temporary dewatering of portions of Lake Creek and the temporary drying of wetlands adjacent to Silent Creek. Fishers utilize forested riparian areas for foraging, resting, and travel corridors. The temporary dewatering of portions of Lake Creek and drying of wetlands around Silent Creek could reduce the suitability of this habitat for some fisher prey species. Consequences of this potential impact are considered to be minor, due to the limited scale of this impact relative to the availability of suitable habitat and prey in proximity to the project area. Potential monitoring impacts would be the same as described below for Alternatives 1 and

4. None of the other activities proposed under these alternatives nor the "connected actions" associated with them have consequential impacts to fisher or their habitat.

Alternatives 4 would only impact fisher through ongoing and proposed water quality monitoring on Lake Creek. Increased human activity associated with monitoring would have the potential to temporarily displace any individuals that might be using the area. Due to the rarity of the species, it is considered unlikely that this potential impact would actually occur. If it did occur, it would be inconsequential to the species.

Indirect Impacts

Alternative 1 would only be expected to impact fisher by perpetuating water quality monitoring on Lake Creek. Increased human activity associated with monitoring would have the potential to temporarily displace any individuals that might be using the area. As described above, this potential disturbance impact is considered to be immeasureable (insignificant) and unlikely to occur (discountable). Risk of exposure to algal toxins is considered to be neglible for this species.

None of the alternatives would impact future fisher habitat in the project area. There are no anticipated impacts to the fisher's future prey base associated with any of the alternatives.

Cumulative Impacts

Direct mortality from trapping and predator control efforts and habitat loss from timber harvest and human development led to the extirpation of fisher throughout much of its historical range in the Pacific States (Aubrey and Lewis, 2003). Past, present, and future activities that fragment late-successional habitat (timber harvest and road building), remove coarse woody debris (fuels reduction projects), and develop riparian areas (campgrounds etc.) are considered to be the primary activities that contribute to the potential cumulative impacts of land management on fishers in the analysis area (see cumulative effects tables in Attachment 3 for details).

Alternatives 2 and 3 represent a short-term, minor contribution to the cumulative habitat impact and Alternatives 1-4 represent an inconsequential contribution to a disturbance impact for this species. The high elevation and existing levels of human development in the analysis area limit its potential importance to fisher. There are no documented fisher den sites anywhere on the Forest. The ongoing and future management activities in the analysis area would occur primarily in existing developed areas. Based on this information, the potential cumulative impacts to fisher are considered insignificant to the species.

Conclusions

Potential impacts to fisher are considered to be minor under all alternatives. Alternatives 2 and 3 have a higher potential to impact the species than Alternatives 1 and 4. Alternatives 1 and 4 would only impact the species through increased human use in potential habitat.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Pacific Fringed Myotis (*Myotis thysanoides vespertinus*)

This bat is usually described as a cave-dwelling bat (Verts and Carraway 1998, Cristy and West 1993). However, fringed myotis are known to roost in rock crevices, bridges, buildings, large trees and snags (Cross et al. 1996, Weller and Zabel 2001). They mate from September to February and females form maternity colonies of up to several hundred individuals, which are usually in caves, but may occur in large hollow trees (Pat Ormsbee, pers. com.). Females produce only one young, usually born between late June and early July (Verts and Carraway 1998). Young begin flying about 17 days after birth and are fully capable and indistinguishable from adults by 21 days of age (O'Farrell and Studier 1980).

Weller and Zabel (2001) documented that habitat use by this species is influenced by the availability of large (>12 inch d.b.h.), tall snags for roosting. Preliminary data from a recent study in the central western Oregon Cascades (Arnett and Hayes 2002) suggests a similar response by *Myotis* spp. and also a numerical response related to snag and roost tree availability. Roosts tended to be near stream channels (Weller and Zabel 2001), which are used for travel and foraging corridors, and also occurred in portions of stands that had lower canopy closures (probably easier roost access and sun exposure / micro-climate relationships). Fringed myotis often utilized snags in semi-open areas and forest edges (Cross et al. 1996) and seemed to prefer snags over green trees for roosting. This species of bat uses multiple trees or snags as roost sites (Weller and Zabel 2001) and have been documented to use up to five different sites during an 18 day period (Cross et al. 1996).

Fringed myotis commonly feed on insects along forest edges and stream corridors. It is an aerial forager but is known to glean insects from foliage or the ground. Beetles, moths, and spiders, make up a large portion(approximately 94%) of their diet (Verts and Carraway 1998). The species is believed to migrate in the fall but little is known about the magnitude of movements or the migratory destination (O'Farrell and Studier 1980).

Affected Environment

There are ten documented occurrences of Pacific fringed myotis on or near the Umpqua National Forest. There are no documented observations of the species within the project area. However, the area contains suitable habitat; it is likely that they do occur, and species presence is assumed. The closest sighting of this species is a 1983 observation of a single bat roosting under a bridge, 14.3 miles to the west of the project area.

At a landscape scale, there is a strong concern that loss of snags and large decadent trees from the widespread conversion of old-growth forests to young, even-aged plantations in this region has significantly reduced the availability of potential roosts for this and other bats in the Pacific Northwest (USDA/USDI 1994 – Appendix J2-49).

Environmental Impacts

Direct Impacts

Alternatives 1 and 4 would have no direct impacts on this bat.

Alternatives 2 and 3 have potential impacts on both individuals and habitat of this species. These alternatives would dewater portions of Lake Creek for approximately 2 months in the late fall (mid September – mid November). These alternatives also propose a rotenone treatment that would eliminate

most aquatic insects from Diamond Lake in about mid September. The following ecological information about the fringed myotis bat is relevant: (1) young bats are generally fledged and indistinguisable from adults by August; (2) female bats are adding fat during the late summer and early fall to prepare for hibernation; (3)females and young would likely have permanently left the maternal colony by September; (4) fringed myotis bats probably migrate to lower elevations in the fall and are likely hibernating by November and (5) the majority of their prey items are terrestrial rather than aquatic insects (Verts and Carraway 1998, O'Farrell and Studier 1980).

There is too little data on the migration habits of this species to determine whether the bats would have migrated to lower elevations by mid September; for purposes of full disclosure, it is assumed that some fringed bats would still be utilizing the project area for foraging during the fall season. Based on these assumptions, dewatering of Lake Creek would temporarily degrade habitat for the species through the removal of drinking water and aquatic prey items along portions of the stream. Consequences of this potential impact are considered to be minor, due to the limited scale of this impact relative to the availability of suitable habitat downstream on Lake Creek and availability of terrestrial prey in and adjacent to the project area.

Bats utilizing Diamond Lake during and after the mid September rotenone treatment would be exposed to rotenone treated water. As described in the "Toxicity of Rotenone to Wildlife" section of this document, bats (mammals) are not expected to be harmed as a result of ingesting water or consuming dead prey. Removal of aquatic insects represents the greatest potential impact to fringed bats associated with these alternatives. Consequences of this impact are considered insignificant to the species because: fringed bats tend to prey heavily on terrestrial insects, young of the year would already be fledged, and there is available foraging habitat adjacent to the project area if bats were temporarily displaced as a result of the lack of aquatic prey. Fringed bats would not be present at the lake during the late fall, winter, or early spring. The aquatic prey base would begin recovery in the spring/summer following rotenone treatment, but the population would still be expected to be lower than the existing population. Thus, bats would likely still be reliant on terrestrial prey and adjacent habitat to supplement the limited aquatic prey base during the summer to fall season following treatment. These impacts to the aquatic prey base are expected to have insignificant consequences to the population of fringed myotis bats (Pers. comm., Dr. John Hayes, Pat Ormsbee). None of the other activities proposed under these alternative nor the "connected actions" associated with them have consequential impacts to fringed myotis bats or their habitat

Indirect Impacts

Because aquatic insects are not the primary prey for this species all of the potential impacts to prey are considered to be minor.

Alternative 1 would indirectly impact this species by perpetuating lake conditions that support a limited and declining future population of aquatic insects (see Fisheries report for details). It is also possible that bats would be harmed or killed by ingesting algal toxins during or following a bloom.

Alternatives 2 and 3 would be expected to result in a beneficial impact to the species by facilitating the return of a more abundant and diverse aquatic prey base for the species in the future when the lake recovers (see Fisheries report for details).

Impacts to the abundance and diversity of the future aquatic prey base for fringed myotis bats at Diamond Lake are uncertain under Alternative 4 due to the fact that only a portion of the tui chub

population would be removed and tui chub are very effective predators on aquatic macroinvertebrates. However, it is assumed that some positive impacts would be realized (see Fisheries report for details).

Cumulative Impacts

Loss of available large snag habitat across the landscape is considered to be the primary limiting factor for this species. Potential past, present, and future activities that remove large snags and late-successional habitat (i.e. timber harvest, hazard tree removal, human developments) are considered to be the primary activities that contribute to the potential cumulative impacts of land management on fringed bats in the analysis area (see cumulative effects tables in Attachment 3 for details).

None of the alternatives would remove large snags or trees from the project area; thus none contribute significantly to the cumulative impacts to this species. With the exception of hazard tree removal in developed areas around Diamond Lake, little loss of snag habitat within the project area is expected in the future. The project area is bounded by Mt. Bailey Roadless Area to the west, Mt. Thielsen Wilderness to the east, and Crater Lake National Park to the south; due to the management objectives of these areas, little loss of large snag or late-successional habitat is expected on the majority of lands adjacent to project area. Riparian Reserves would also limit future habitat impacts to the north. Based on this information, the potential cumulative impacts to fringed bats are considered insignificant to the species under all alternatives.

Conclusions

Alternative 1 represents the greatest sustained risk to the fringed myotis bat over time. Alternatives 2 and 3 have greater potential short-term adverse effects than Alternative 4 and higher potential for long-term habitat improvement through improved water quality and prey base than Alternatives 1 or 4. There are no meaningful or measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Pacific Shrew (*Sorex pacificus cascadensis*)

One of the largest shrews (5.5 inches total length), it was formerly considered a subspecies of the vagrant shrew (*S. vagrans*). The Pacific shrew is found in humid forests, marshes, and thickets and is considered a riparian species (Gomez and Anthony 1998) but has been found as far as 20 meters away from stream banks (Anthony et al. 1987). It is more commonly found in early-successional forests and less often in late-successional stands. It requires down logs, brushy thickets, or ground debris for cover and feeding. Prey items include snails, slugs, centipedes, insect larvae, earthworms and some vegetable matter. Shrews hunt mostly at night. Prey is cached near nests to be used during daylight hours when shrews are less active. Nests are made of dry grass or leaves and are placed in a stump or down log. Average litter size is 4-5 and there may be more than one litter per season (February - September).

Affected Environment

There are no known observations of the Pacific shrew in the project area. However, the project area is considered to be suitable habitat and species presence is assumed. (Surveys were not conducted nor

recommended for this species because of the high incidence of shrew mortality associated with known survey methods). The closest observation of the species is approximately 3.6 miles southwest of the project area in a DEMO Unit at Watson Falls.

Recent surveys indicate that the Pacific shrew is well-distributed on the Umpqua National Forest. There are 31 documented observations of the shrew on the Forest and they occur on all four Ranger Districts.

Environmental Impacts

Direct Impacts

Alternatives 1 and 4 would have no direct impacts to the species.

Alternatives 2 and 3 have the potential to impact shrews and their habitat through the temporary dewatering of portions of Lake Creek and the temporary drying of wetlands adjacent to Silent Creek. These activites could reduce the suitability of this habitat for some shrew prey species in the short-term. As a result, it is possible that individual shrews could be temporarily displaced or compelled to forage over wider areas during this time. A number of factors would likely mitigate the consequences and extent of this potential impact: moisture-retaining microrefugia (down logs and clumps of senescent vegetation at the base of shrubs and trees) adjacent to the creek and within the wetlands would be expected to support a number of prey species; fall and winter precipitation would serve to add and retain moisture in the impacted area for much of the time; and adjacent suitable habitat and prey would be available to support the species. Thus, potential impacts are believed insignificant to the species. None of the other activities proposed under these alternatives nor the "connected actions" associated with them have consequential impacts to shrews or their habitat.

Indirect Impacts

Alternative 1 perpetuates the existing condition of water quality at Diamond Lake and thus perpetuates toxic algae blooms. It is possible that shrews could be harmed or killed by ingesting algal toxins in Diamond Lake. The liklihood of shrews frequently watering in Diamond Lake proper is considered to be very low.

There are no anticipated indirect impacts associated with any of the other alternatives because none of the alternatives are expected to modify the condition of future habitat for the species.

Cumulative Impacts

Past, present, and future activities (i.e. fuels reduction and human developments in riparian habitat) that remove vegetation and down woody debris from suitable undeveloped riparian habitats are considered to be the primary activities that contribute to the potential cumulative impacts of land management on Pacific shrews in the analysis area (see cumulative effects tables in Attachment 3 for details).

Alternatives 2 and 3 represent a short-term, limited-scale contribution to the cumulative habitat impact for this species. Death of individuals would not be expected as a result of proposed activities. Alternative 1 represents a minor risk to individuals of this species. Recent surveys indicate that the species may actually be locally common. Little manipulation within undeveloped ripararian habitat is expected in the future within the analysis area. Based on all of the above, the potential cumulative impact is not considered significant to the species under any alternative.

Conclusions

Alternatives 2 and 3 have temporary habitat impacts to Pacific shrews and there is no meaningful or measureable differences between these two alternatives. Alternative 1 represents a perceived low risk to the species through exposure to algal toxins.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, and 3 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".
>
> Alternative 4 would have "no impact" on the Pacific shrew.

SURVEY & MANAGE SPECIES

The Forest Plan requires protection of certain wildlife species, which may not be fully protected by other standard and guidelines of the plan, especially when projects occur outside of Late Successional Reserves (LSR's) or Riparian Reserves. Recent amendments to the Northwest Forest Plan redefined Survey and Manage categories based on new information and species characteristics (USDA/USDI 2001). On this District five survey and manage wildlife species are currently considered: red tree vole, great gray owl, Oregon Megomphix (snail), Crater Lake tight coil (snail), and the Chace Sideband (snail). There are no known sites of the Oregon Megomphix in the project area and surveys are no longer required for this species (USDA/USDI 2001). Surveys are not required or recommended for the red tree vole because proposed activities are not habitat disturbing activities that have the potential to cause a significant negative effect on the species habitat or the persistence of the species at the site (Survey Protocol for the Red Tree Vole, V. 2.1, 2002). The remaining species are discussed in detail below.

Great Gray Owl (*Strix nebulosa*)

This owl is one of the largest owls in North America. Oregon and Northern California populations are considered to be on the southern edge of its range. It nests in late-successional forests (>60% canopy closure), but forages in early-successional habitat (e.g., meadows, clearcuts). Within the range of the northern spotted owl, it is most common in lodgepole pine forests adjacent to meadows, but is also found in other coniferous forest types. Great gray owls in Oregon prey most often on voles (45-55% of all individuals) and pocket gophers (10-61%) (Marshall et al. 2003). Although little is known about the existing population numbers or changes in numbers over time, it is believed that populations of great gray owls in this state may have declined in recent years due to habitat loss resulting from harvest of old-growth forests as well as urban sprawl in Deschutes County (Marshall et al. 2003).

Affected Environment

There are no confirmed great gray owl nests in or adjacent to the project area. The closest documented nest site for the species is approximately 6.5 miles to the west. Silent Creek and Kelsay Valley wetlands, as well as scattered riparian meadows along Lake Creek are potential foraging habitat for great gray owls within or closely adjacent to the project area.

Protocol surveys are not required for this project because there are no ground disturbing activities proposed in great gray owl nesting habitat (USDA/USDI Survey Protocol 1995 revised 1997). However, multiple surveys have been conducted for great gray owls in and adjacent to the Diamond Lake area in recent years. Multi-visit surveys were conducted in the Lemolo Lake/Lake Creek area in 1994, 1996, 1997, 1998, and 2003. Several detections of great gray owls were made within and closely adjacent to the project area, near the mouth of Lake Creek, during August of 1994. Nighttime auditory responses were received from an adult female (1996), an adult male (1998), and a juvenile (2003) during these separate survey efforts in the vicinity of Lemolo Lake and lower Lake Creek. Anecdotal sightings of great gray owls in the same general area are also documented from 1979 and 1983. Based on the above information, it is assumed that great gray owls utilize meadows within and adjacent to the project area for foraging and possibly nest in surrounding forests.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

None of the alternatives would remove or degrade potential nesting habitat for great gray owls. Alternatives 1 and 4 would have no anticipated impact on great gray owls or their habitat. (Risk of great gray owls consuming algal toxins is neglible).

Alternatives 2 and 3 have the potential to temporarily modify foraging habitat in a neutral or beneficial manner. Primary prey items for great gray owls (pocket gophers and voles) occupy meadow habitats adjacent to forests. Most of these animals utilize ground burrows and would not use areas that were so wet that burrows would collapse or become filled with water. The temporary dewatering of Lake Creek would not be expected to result in a noticeable drying affect on meadows adjacent to Lake Creek that are downstream from its confluence with Theilsen creek. Thus, in areas where great gray owls are known to forage, these alternatives would be expected to have a neutral impact on prey habitat. The draw down of Diamond Lake is expected to result in the temporary drying of the wet meadows at the south end of the lake. Drying of areas that are normally inundated with water would improve habitat for voles and pocket gophers and thus could indirectly benefit great gray owls in the short-term. When considered in the context of past, present, and reasonable forseeable activities in the area, because these alternatives do not modify nesting habitat and the scale and duration of the neutral or beneficial impact is limited, potential impacts are considered to be inconsequencial to the species.

Conclusions

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1 and 4 would have "no impact" on great gray owls.
>
> Alternatives 2 and 3 would have "neutral or beneficial impacts on individuals or habitat in the short-term". There is no difference between the alternatives' potential impacts to the species.

Crater Lake Tightcoil Snail (*Pristiloma arcticum crateris*)

This tiny snail may be found in perennially wet situations in mature conifer forests, among rushes, mosses, and other surface vegetation or under rocks and woody debris within 33 feet of open water in wetlands, springs, seeps, and riparian areas, generally in areas which remain under snow for long periods in the winter. Riparian habitats in the Eastern Oregon Cascades may be limited to the extent of permanent surface moisture, which is often much less than 33 feet from open water (USDA/USDIa 2003).

Affected Environment

Wetland habitat in the Diamond Lake project area is potential habitat for this species. Two survey visits for the Crater Lake tightcoil were conducted within suitable habitat in the project area in 2003. Survey data are on file at the Diamond Lake Ranger District. This species was documented at five locations within the planning area adjacent to Lake Creek. Additional potential habitat for this species exists within the same 6th field watershed.

The Crater Lake tightcoil has been located at several locations on the Diamond Lake Ranger District in springs and wetland habitat types. Numerous individuals (greater than 20) were located at the Crystal Springs site.

Environmental Impacts

According to the 2002 Annual Species Review for Survey and Manage Species, the Crater Lake Tightcoil is categorized as a Category A^2 species(USDA/USDI 2003b). Species in this category, are considered rare, require pre-disturbance surveys, and require management of all known sites.

The Management Recommendation for the Crater Lake tightcoil that is relevant to this project is:

> Avoid activities that would lower the water table at the site, thus reducing soil moisture below that required by the species, or possibly altering vegetative communities (USDA/USDI 1999).

The January 2001, ROD and Standards and Guidelines for Amendments to the Survey and Manage, Protection Buffer, and other Mitigation Measures Standards and Guidelines(USDA/USDI 2001) allows occasional exemptions to the manage all known sites requirement as documented below:

> Professional judgement, coupled with locally specific information and advice from taxa specialists about the species, may be used to identify occasional sites not needed for persistence. These exceptions will be reviewed by the REO (S&G's pg. 8).

Direct, Indirect, and Cumulative Impacts

Alternatives 1 and 4 would have no impact on the Crater Lake tightcoil.

Alternatives 2 and 3 have potential impacts on individuals and habitat of this species. Under these alternatives, portions of Lake Creek between Diamond Lake and the confluence of Lake Creek and Thielsen Creek would be effectively dewatered for the time period beginning around the middle of September and ending in approximately early November. Subsequently, this same section of Lake Creek would be maintained at low flows until late spring or early summer (See Hydrologist Report for details).

For the portions of Lake Creek extending from the Thielsen Creek confluence to Lemolo Lake, Lake Creek flow would be approximately 15-20% of normal seasonal flow during the period of no outflow from Diamond Lake and would then increase for the winter to spring/summer period when a minimum of 10 cfs of water would be allowed to exit Diamond Lake.

Distribution of the Crater Lake tightcoil sites along Lake Creek is as follows: three sites are located below the confluence with Lake Creek (sites 7, 8, 26); one site is located near two small tributaries that would not be influenced by the draw down (site 18); and one site is located before the Thielsen Creek confluence with no tributary influence (site 16). It is expected that sites (7, 8,18, and 26) would experience minor changes in the ground water and limited changes in the soil moisture. The microclimate ranges tolerated by these snails is not known, so it is not possible to confidently conclude that the draw down would have "no impact" on the species at this site. However, other mitigating factors include: rain and snow would be contributing moisture to these sites during much of the draw down period and moisture-holding microsites such as down logs, and riparian vegetation would remain intact and available for snails and/or eggs.

It is expected that site 16 would experience major changes in the groundwater and corresponding changes in the soil moisture. Thus, it is possible that snails or eggs could become dessicated at this site. Natural mitigating factors (precipitation and microhabitats) would also be available at this site.

In summary, Alternatives 2 and 3 would result in an unquantified level of temporary habitat degradation; minor in four areas and more substantial in one area. It is possible that snail or egg survival could be negatively impacted by the dewatering of Lake Creek, particularly at one of the five sites. Because so little is known about the microclimate tolerances of this species, pre- and post- draw down monitoring of soil moisture and species presence is recommended. To reduce the consequences of potential loss of individual snails or eggs the following mitigation is recommended:

- If post-project surveys reflect that the species appears to be absent at any of the sites, translocate a number of individuals from adjacent known sites with multiple adults (i.e. Crystal Springs) to repopulate the site.

Additional spot surveys of suitable habitat in proximity to the project area are also planned to assess prevalence and distribution of the species in the watershed.

Conclusions

Alternatives 1 and 4 would have "no impact" on the Crater Lake tightcoil.

Alternatives 2 and 3 may impact individuals and habitat of this species. Consultation with Nancy Duncan, Regional Mollusk Taxa Lead has occurred; Duncan reviewed the project and concluded that these alternatives, as mitigated, would not affect persistence of the species (Duncan 2004). On 02-17-04, the Interagency Survey and Manage Group[12] responsible for approving exemptions on survey and manage issues, reviewed the project, concurred with Duncan's determination, and exempted the Forest from the manage known site requirements for this project (Huff 2004).

Chace Sideband (*Monadenia Shastelix chaceana)*

[12] The Interagency Survey and Manage Group is the entity that has the authority to approve exemptions to survey and manage management guidelines. They are the current Regional Ecosytem Office (REO) panel.

Habitat for this snail is usually found within 98 feet of rocky areas, talus deposits and in associated riparian areas in the Klamath physiograph province and adjacent portions of the south-western Oregon Cascades. Areas of herbaceous vegetation in these rocky landscapes adjacent to forested habitats are preferred. Areas that contain moist, shaded rock surfaces are preferred for daily refuges. In more mesic, forested habitats, especially in the Oregon Cascades, the species is associated with large woody debris and the typical rocky habitat is not required. Forest habitats without either rock features or large woody debris are not currently considered to be suitable habitat for this species (USDA/USDIa 2003).

Affected Environment

This snail is not known to occur within the project area or anywhere on the Diamond Lake Ranger District. The species does occur and appears to be fairly common in suitable habitat on the adjacent Tiller Ranger District. The closest sighting of this species is 17 miles southwest of the project area boundary. The Diamond Lake project area contains a very limited amount of low quality habitat for the species. Two survey visits for the Chace sideband were conducted within suitable habitat in the project area in 2003. Survey data are on file at the Diamond Lake Ranger District. This species was not detected during surveys.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

The project area does not occur within the known range of the species and surveys did not detect the species within the project area. There are no anticipated impacts associated with this project.

Conclusions

Alternatives 1, 2, 3, and 4 will have "no impact" on the Chace sideband snail.

MANAGEMENT INDICATOR SPECIES

The Umpqua National Forest Land and Resource Management Plan (1990) identifies the following species/groups as Management Indicator Species (MIS) for the Forest: northern spotted owl, pileated woodpecker, marten, bald eagle, peregrine falcon, Roosevelt Elk, blacktail deer, and cavity nesters. The bald eagle, peregrine falcon, and northern spotted owl were addressed in the PETS section of this document. Marten are addressed under "Other Mammals" below.

None of these alternatives would modify habitat for pileated woodpeckers and cavity nesters. There are no anticipated negative impacts to these species or habitat associated with this project and thus they will not be discussed further.

Deer and elk are known to utilize the project area. None of the alternatives would degrade habitat for these species. However, deer and elk likely utilize Diamond Lake as drinking water and thus, there are potential impacts to individuals for two of the project alternatives:

Alternative 1 forgoes the opportunity to address declining water quality and thus, leaves deer and elk vulnerable to exposure to toxic algae blooms. As documented in the "Effects of Toxic Algae Blooms on Wildlife" section of this document, algal toxins are known to cause mortality in mammals. Because deer and elk are expected to consume relatively large quantities of water during the summer months, it is anticipated that some individuals may become ill or die from ingestion of water containing algal toxins

during or following a summer bloom at some point in the future. Because area deer and elk populations are large, impacts would not be expected to lead to a trend toward Federal listing or cause a loss of viability of these species.

Under Alternatives 2 and 3, deer and elk utilizing Diamond Lake during and after the mid September rotenone treatment would be exposed to rotenone treated water. As described in the "Toxicity of Rotenone to Wildlife" section of this document, deer and elk are not expected to be harmed as a result of ingesting water.

LANDBIRD CONSERVATION PLAN CONSISTENCY

Continental and local declines in numerous bird populations have lead to concerns for the future of migratory and resident landbirds. The Forest Service (USDA 2000) and the Partners in Flight Conservation Program have developed a conservation plan to maintain and restore forest habitats necessary to sustain long-term, healthy bird populations. This plan focuses on 28 bird species (see Attachment 2) representing a range of habitats from stand initiation to old forest and provides recommendations for forest management at both the stand and landscape-scale.

The Landbird Conservation Plan is a habitat-based conservation effort. The types of activities proposed under this project are not addressed in the Plan. Alternative 4 would have no impact on landbirds or habitat.

Alternative 1 forgoes the opportunity to address declining water quality and thus, leaves landbirds vulnerable to exposure to toxic algae blooms. As documented in the "Effects of Toxic Algae Blooms on Wildlife" section of this document, algal toxins are known to cause mortality in songbirds. Thus, under this alternative, it is possible that some landbirds would be become ill or die from ingestion of water containing algal toxins during or following a summer bloom at some point in the future. The extent of this potential impact to landbirds over time is unknown.

Alternatives 2 and 3 have the potential to temporarily modify habitat for the Lincoln's Sparrow through the drying of wetlands within the project area. Lincoln's sparrows have been detected at the sewage ponds and occasionally during spring/summer surveys near the Silent Creek wetlands. This short-term impact is considered inconsequential to the species, due to its limited scale and duration, as well as the anticipated low numbers of individuals potentially impacted. There are no management recommendations for this species in the Landbird Conservation Plan other than conducting monitoring and research to determine status, distribution, and habitat relationships for the species. Pre and post project monitoring of the Silent Creek wetlands are recommended for these Alternatives.

Alternatives 2 and 3 would also result in a temporary loss of aquatic insects in Diamond Lake during the fall of the proposed rotenone treatment. Aquatic insect populations would begin recovery in the spring and summer following treatment and would subsequently be expected to exceed present numbers and species diversity in the years that follow. Landbirds that prey heavily on aquatic insects could be temporarily displaced to adjacent areas during the fall when aquatic insects are limited within the project area. Young of the year would already be fledged by this time, limiting the consequences of this impact to landbirds. In the long-term, Alternatives 2 and 3 would be expected to beneficially impact those species that utilize aquatic insects as prey. For a complete species list of land birds, annual bird survey data from the Umpqua Valley Audubon Society (1996-2003) is on file at the Diamond Lake Ranger District. Following consideration of potential impacts, it is determined that these alternatives may temporarily impact landbird habitat, but are not expected to contribute to a trend toward Federal

listing, or cause a loss of viability of the species. These alternatives are considered to be consistent with the Landbird Conservation Plan.

AQUATIC CONSERVATION STRATEGY CONSISTENCY

The Aquatic Conservation Strategy (ACS) is aimed at restoring and maintaining the ecological health of watersheds. Its goal is to retain, restore, and protect ecological processes and landforms that contribute habitat elements to streams and promote good habitat conditions for fish and other aquatic and riparian dependent organisms. ACS objectives are discussed in detail in other sections of this document. The ACS objective most relevant to this report is #9 – maintain and restore habitat to support well-distributed populations of native plant, invertebrate, and vertebrate riparian-dependent species. For wildlife, ACS consistency is addressed primarily in the context of riparian-dependent mollusks and vertebrate species. Species specific impacts for riparian associated wildlife are discussed in detail throughout this section. Thus, the following represents a broad, general summary that addresses multiple scales. The landscape or watershed scale is considered to be the most appropriate scale for meeting ACS objectives.

Alternative 1 would maintain existing habitat for riparian associated wildlife species. However, because toxic algal blooms place several species at risk, no action is considered inconsistent with ACS objective #9. This alternative fails to address declining water quality and loss of aquatic invertebrate diversity and abundance in Diamond Lake and as such has potential long-term negative impacts to some riparian dependent species. Thus, this alternative may retard attainment of this ACS objective at both the project scale and at the landscape scale by perpetuating downstream impacts on water quality.

Alternatives 2 and 3 would have temporary impacts to riparian habitat on Lake Creek and in Diamond Lake at the project scale. In the longer term, these alternatives would be expected to have a neutral affect on Lake Creek and its associated wildlife, and would be expected to improve the water quality and species diversity and abundance of the aquatic prey base in Diamond Lake. In this context, at both the project and the landscape scale, these alternatives are consistent with habitat restoration objective #9.

Alternative 4 would generally maintain existing habitat conditions for riparian associated wildlife species in Diamond Lake and Lake Creek. In the short-term, this alternative would have a primarily neutral influence on attainment of ACS objective #9. In the longer term, at both the project and the landscape scale, this alternative is designed to improve habitat conditions in Diamond Lake and as such, is consistent with this ACS objective.

OTHER POTENTIALLY IMPACTED SPECIES/SPECIES GROUPS

Analysis of all the following species or species groups is not necessarily required under the Forest Service Biological Evaluation process. However, potential impacts to these species/groups are described for purposes of full disclosure.

Osprey (*Pandion haliatetus)*

Ospreys are large birds of prey that breed statewide except in dry treeless southeastern regions and Columbia Basin grasslands. In Oregon, the species generally nests on top of large live trees, snags, or utility poles located within 2 miles of water with an accessible fish population. Ospreys feed almost exclusively on live fish, but dead fish and other non-fish food items are occasionally utilized. The species experienced a nationwide decline in the 1950's and 60's associated with the widespread use of DDT. DDT was banned in the United States in 1972 and osprey populations have now recovered to historic levels in Oregon and throughout most of their range (Marshall et al. 2003).

Affected Environment

Ospreys utilize Diamond Lake and Lake Creek primarily during the nesting season. The birds generally arrive in the area in early April, breed and nest through the summer, and then begin fall migration in mid September (Pers comm., Ron Maertz, 2003).

The Diamond Lake Restoration project area has likely supported some number of nesting osprey since shortly after 1910 when the lake was first stocked with fish. There is no available data documenting how many osprey nests historically occurred in the vicinity of the lake nor how osprey responded to the temporarily fishless condition of Diamond Lake following the 1954 rotenone treatment. Fix (1990) summarized his birding observations on the Diamond Lake Ranger District over the seven year time period from 1984-1990. Fix characterized osprey at Diamond Lake as a fairly common summer resident with high nesting success. Anecdotal observations by long-time residents of Diamond Lake indicate that osprey use at the lake appeared to be declining by 1996 (McAuliffe, Correspondence to ODFW, 1996). Surveys completed by the Umpqua Valley Audubon Society from 1996-2002 appear to indicate that the osprey population at Diamond Lake has been relatively stable over the past eight years (Pers. comm., Alice Parker, 2003).

ODFW completed an aerial survey on June 30, 2003 to document osprey nests in and adjacent to the project area. Thirteen osprey nests were observed. Ten nests were located adjacent to Diamond Lake and the other three were along Lake Creek. Six of the osprey nests were active. Reproductive success of these nests is unknown.

Environmental Impacts

Ospreys at Diamond Lake have adapted to a high level of year-round human use. Thus, potential disturbance impacts that don't result in habitat or prey modification are considered very unlikely to occur under any alternatives and will not be discussed.

Direct, Indirect, and Cumulative Impacts

Alternative 1 perpetuates the existing condition, forgoes the opportunity to address declining water quality and thus leaves osprey vulnerable to exposure to toxic algae blooms in the future. Under this alternative, it is possible that osprey would become ill or die from ingestion of water containing algal toxins during or following a summer bloom. The extent of this potential impact to osprey over time is unknown.

Alternatives 2 and 3 would have potential impacts to osprey and their habitat. Osprey begin fall migration around mid September in this area. Both historic and recent survey efforts indicate low use of Diamond Lake during the fall season (Fix 1990; Audubon Surveys 1996-2002). However, it is assumed that a small number of indivduals would be present at Diamond Lake during a mid-September rotenone treatment. Osprey would be expected to ingest rotenone treated water and consume rotenone killed fish. However, as described in the "Toxicity of Rotenone to Wildlife" section of this document, they are not expected to be harmed as a result.

Rotenone treatment would temporarily eliminate the fish prey base for this species at Diamond Lake. However, immediately following treatment, birds still present at the lake would likley feed on fish carcasses for a short-time and then would begin or continue migration as the prey base declined and the season progressed. Loss of prey base would likely have the greatest potential impacts on osprey during the following spring and summer when birds returned to the lake to nest. During this breeding season, lack of a fish prey base could compromise nesting success for the species. This potential impact would be mitigated by the supplemental feeding program described for bald eagles. However, it is still expected that reproductive success could be reduced for some of the six pairs of osprey currently nesting at Diamond Lake for one to two breeding seasons. Monitoring of reproductive success is recommended during the supplemental feeding program and for two years following restoration of the fish prey base.

As described in detail in the bald eagle section of this document, Alternatives 2 and 3 would be expected to improve future habitat in the planning area by restocking with trout. Increases in the availability of a larger prey item (trout) could result in a return to higher numbers of nesting osprey at Diamond Lake in the future. Alternative 3 would be expected to provide a higher number or larger prey items more quickly than Alternative 2 because Alternative 3 proposes stocking with legal-sized fish while Alternative 2 is primarily a fingerling based stocking strategy.

For Alternatives 2 and 3, when considered in the context of past, present, and reasonable forseeable activities in the project area, it is expected that potential impacts would have insignificant consequences to the species because: potential negative impacts are limited to one or two breeding seasons followed by a long-term improvement in habitat; the supplemental feeding program would reduce the intensity of the impact, populations of osprey on the Forest and state-wide are stable, and ongoing and reasonably forseeable actions that would modify osprey habitat are limited.

Alternative 4 would utilize commercial fish operations for approximately two months in June and July and one month in September on an annual basis to harvest tui chub from Diamond Lake. It is possible that osprey could be harmed by becoming entangled in gill nets during commercial fishing operations (Pers. com. Dave Loomis). It is considered unlikely that this potential impact would occur frequently enough to represent a significant impact to the species. Commercial fishing would also reduce the available prey base for osprey during the breeding season. These activities would disrupt foraging during the breeding season, but are not expected to hinder reproductive success because commercial fishing areas would be staggered, allowing undisturbed access to the majority of the lake at a given point in time and adequate prey base would likely remain in Diamond Lake throughout the lifetime of the project. This is considered to be an insignificant effect to the species. When considered in the context of past, present, and reasonable forseeable activities in the project area, potential impacts associated with this alternative are expected to have insignificant consequences to the species because: impacts are limited in scale and intensity; populations of osprey on the Forest and state-wide are stable; and ongoing and reasonably forseeable actions that would modify osprey habitat are limited.

Conclusions

Alternative 1 represents the greatest sustained risk to osprey at Diamond Lake over time. Alternatives 2 and 3 have greater potential short-term adverse effects than Alternative 4 and higher potential for long-term habitat improvement through improved water quality than Alternatives 1 or 4. There are no measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Waterbirds

Affected Environment

Diamond Lake proper provides nesting habitat for a number of waterfowl, shorebirds, and other water associated bird species, but is probably most important as a fall migration stop for waterfowl. Additionally, the sewage ponds just northeast of Diamond Lake are considered to be important nesting and migration stopover habitat for this species group in the summer and fall. Based on extensive birding experience, Fix (1990) characterized waterbird utilization of Diamond Lake from 1984-1990 as follows:

> "Diamond Lake is remarkable for supporting heavy use by both humans and waterfowl. From October into December, a fine concentration of dabbling and diving ducks, grebes, coots, and gulls may be found assembled on the south portion of the lake. Submergent vegetation offers a strong attraction for these birds, and they feed heavily in preparation for the flight to wintering grounds elsewhere. Thousands of American Coots, hundreds of American Wigeon and Lesser Scaup, and dozens of Common and Hooded Mergansers dot the lake at this time. Loons, Red-necked Grebe, Clark's Grebe, Surf and White-winged Scoters, Red-breasted Merganser, Eurasian Wigeon, and Herring and Bonaparte's Gulls have been seen among this flock.
>
> The sheltered northwest corner of the lake supports a small flock of waterfowl concurrently, chiefly Barrow's Goldeneyes, Buffleheads, Eared Grebes, and the occassional loon.
>
> The lake is slow birding during much of the rest of the year. Small numbers of migrant waterfowl appear on the lake during mid- and late spring. Common loons and Horned Grebes are probably regular at this time. Barrow's Goldeneye is by far the most common nesting duck, and family groups may be encountered anywhere along the lakeshore from June into September."

In 2000-2002, from 10-25 bird species that rely solely or primarily on fish or aquatic insect prey were detected during point-count surveys by the Umpqua Valley Audubon Society at the south end of Diamond Lake. All of the species documented in Table 3 were present during the 2000, 2001, or 2002 survey seasons in numbers greater than 10. Fall surveys did not occur after mid to late September.

Table 3 Waterbirds detected in numbers greater than 10 during the 2000-2002 surveys at the South Shore Picnic Area and South Shore Meadows Survey Points on Diamond Lake.

Species	Spring/ Summer Survey Date	Highest Number of Individuals Documented in Spring/Summer	Fall Survey Date	Highest Number of Individuals Documented in Fall	Survey Location
Pied-billed grebe	8/23/00	11	9/11/00	51	SS Meadow
Western grebe	8/22/00	55	9/11/00	179	SS Meadow
California gull	8/23/00	29	9/11/00	24	SS Meadow
No species were detected in numbers greater than 10 in the 2001 surveys					SS Meadow

Species	Spring/ Summer Survey Date	Highest Number of Individuals Documented in Spring/Summer	Fall Survey Date	Highest Number of Individuals Documented in Fall	Survey Location
Common merganser	7/25/02	128	-----	-----	SS Meadow
Pied-billed grebe	8/30/00	16	9/13/00	22	SS Picnic Area
Western grebe	7/19/00	120	9/13/00	174	SS Picnic Area
American wigeon	-----	-----	9/28/00	30	SS Picnic Area
Common merganser	-----	-----	9/13/00	87	SS Picnic Area
American Coot	-----	-----	9/28/00	360	SS Picnic Area
California gull	8/10/00	17	9/28/00	31	SS Picnic Area
Western grebe	8/10/01	195	-----	-----	SS Picnic Area
Clark's grebe	6/18/01	110	-----	-----	SS Picnic Area
Common merganser	6/2/01	10	-----	-----	SS Picnic Area
California gull	8/10/01	35	9/15/01	17	SS Picnic Area
Western grebe	8/8/02	428	No September survey data was available for the South Shore Picnic Area.		
Clark's grebe	7/11/02	21			
Common merganser	7/31/02	161			
California gull	6/20/02	44			
Double-crested cormorant	8/8/02	12			
Tree swallow*	8/8/02	29			
Violet green swallow*	7/31/02	17			
Barn swallow*	7/31/02	57			

***** These species are not dependent on aquatic insects but would utilize them heavily at Diamond Lake.

Other waterbirds known to use Diamond Lake, which are closely tied to a fish prey base but do not occur in high numbers are: the great blue heron and belted-kingfisher. For a complete species list of waterbirds, annual bird survey data from the Umpqua Valley Audubon Society (1996-2003) is on file at the Diamond Lake Ranger District.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

Alternative 1 forgoes the opportunity to address declining water quality and thus, leaves waterbirds vulnerable to exposure to toxic algae blooms. As documented in the "Effects of Toxic Algae Blooms on Wildlife" section of this document, algal toxins are known to cause mortality in waterbirds. Thus, under this alternative, it is expected that some waterbirds would become ill or die from ingestion of water containing algal toxins during or following a summer bloom at some point in the future. The extent of this potential impact to water birds over time is unknown, however, large populations make loss of viability

of these species improbable. Alternative 1 would also indirectly impact this species by perpetuating lake conditions that support a limited and declining future population of aquatic macroinvertebrates(see Fisheries report for details).

Alternatives 2 and 3 would have potential impacts to waterbirds and their habitat. Waterbirds would be expected to ingest rotenone treated water and consume rotenone killed prey species. However, as described in the "Toxicity of Rotenone to Wildlife" section of this document, they are not expected to be harmed as a result. Waterfowl, shorebirds, and others that forage primarily on fish or aquatic insects and traditionally utilize Diamond Lake as a fall migration stop over would likely not have an adequate prey base in the late fall and early winter following a rotenone treatment. These birds would probably be displaced to habitat further south on their migration routes (Pers comm. Alice Parker). It is possible that some weaker individuals might not survive the extended migration. Similarly, in the spring/summer following treatment, the lake ecosystem would not have recovered sufficiently to support the water species that it traditionally supports. Again some displacement to adjacent habitats would be expected. These habitat and displacement impacts are short-term impacts and would be expected to occur for two fall seasons and one to two spring/summer seasons.

In the near future when the lake recovers, Alternatives 2 and 3 would be expected to result in a beneficial indirect impact to waterbirds by facilitating the return of a more abundant and diverse aquatic macroinvertebrate prey base for insectivorous species, as well as a fish prey base for piscivorous birds (see Fisheries report for details).

For Alternatives 2 and 3, when considered in the context of past, present, and reasonable forseeable activities in the project area, it is expected that potential impacts would have insignificant consequences to waterbird species because: potential negative impacts are limited to one or two breeding and migration seasons followed by a long-term improvement in habitat; availability of alternative habitat further along on the bird's migration routes would reduce the intensity of the impact, the majority of these species occur in very large numbers, and ongoing and reasonably forseeable actions that would modify habitat within the project area are limited.

Alternative 4 would utilize commercial fish operations for approximately two months in June and July and one month in September on an annual basis to harvest tui chub from Diamond Lake. It is expected that some waterbirds could be harmed or killed by becoming entangled in gill nets during commercial fishing operations (Pers. comm. Dave Loomis). Because these species generally occur in very large numbers across their range it is considered unlikely that this potential impact would occur frequently enough to represent a significant impact to the species. Commercial fishing would also reduce the available prey base for piscivorous species during the breeding season. These activities would disrupt foraging during the breeding season, but are not expected to hinder reproductive success because commercial fishing areas would be staggered, allowing undisturbed access to the majority of the lake at a given point in time and adequate prey base would likely remain in Diamond Lake throughout the lifetime of the project. This is considered to be an insignificant effect to these species. When considered in the context of past, present, and reasonable forseeable activities in the project area, potential impacts associated with this alternative are expected to have insignificant consequences to the species because: impacts are limited in scale and intensity; these species generally occur in very large numbers across their range, and ongoing and reasonably forseeable actions that would modify habitat within the project area are limited.

Conclusions

Alternative 1 represents the greatest sustained risk to waterbirds at Diamond Lake over time through exposure to algal toxins. Alternatives 2 and 3 have greater potential short-term adverse impacts than Alternative 4 and higher potential for long-term habitat improvement through improved water quality and prey base than Alternatives 1 or 4. There are no meaningful or measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of the species".

Reptiles and Amphibians (Herps)

Affected Environment

No surveys are required for amphibians or reptiles that are not included on the Regional Forester Sensitive Species list or Survey and Manage list. However, systematic surveys of habitat in Diamond Lake and Lake Creek were completed in 1996 and 1997.

Professional herpetologist, Marc Hayes assembled hisorical data and conducted surveys of the aquatic amphibian and reptile fauna of Diamond Lake in 1996 (Hayes 1997). The following seven species were documented:

Western toad (*Bufo boreas*)
Pacific chorus frog *(Pseudacris regilla)*
Cascades frog (*Rana cascadae)*
Northwestern salamader *(Ambystoma gracile)*
Long-toed salamander *(Ambystoma macrodactylum)*
Rough-skinned newt *(Taricha granulosa)*
Common garter snake (*Thamnophis sirtalis)*

Surveys of Lake Creek conducted by Hayes in 1997 documented the following species (Hayes 1998):

Western toad (*Bufo boreas*)
Pacific chorus frog *(Pseudacris regilla)*
Cascades frog (*Rana cascadae)*
Northwestern salamader *(Ambystoma gracile)*
Rough-skinned newt *(Taricha granulosa)*
Common garter snake (*Thamnophis sirtalis)*
Northwestern garter snake (*Thamnophis ordinoides)*

The majority of these species are common on this Forest and in Oregon and are not included on ODFW or Oregon Natural Heritage Program (ONHP) species of concern lists. The Cascade frog is coded as "Sensitive-Vulnerable" by ODFW; and "not rare, apparently secure throughout range" and "rare, threatened or uncommon in Oregon" by ONHP. The western toad is coded "Sensitive-Vulnerable" by ODFW and "not rare, apparently secure throughout range and in Oregon" by ONHP.

Hayes (1997, 1998) notes that both Diamond Lake and Lake Creek are currently poor quality habitat for amphibians for a variety of reasons: predatory fish, high pH, low prey availability, lack of protected still

water habitats, etc. The author notes that most amphibian recruitment occurs off Diamond Lake proper and concludes that collectively, the data indicate that Diamond Lake is a sink for amphibians.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

Alternative 1 perpetuates the existing condition, forgoes the opportunity to address declining water quality and thus leaves herps vulnerable to exposure to toxic algae blooms in the future. Under this alternative, it is possible that some herps would become ill or die through ingestion, absorption, or respiration of algal toxins during or following a summer bloom. The extent of this potential impact to herps over time is not known.

Alternatives 2 and 3 would have potential impacts to aquatic herps and their habitat. Both increased flows and dewatering of portions of Lake Creek associated with the draw down of Diamond Lake would impact herps on Lake Creek. Hayes (1998) documented that the overall numbers of herps recorded along the channel of Lake Creek were extremely low. He noted that a number of factors likely contribute to these low numbers, including: presence of predacious fish, lack of stillwater habitat, and low water quality. Hayes described that well over 99% of the amphibian and reptile observations made during surveys of Lake Creek were recorded at off-channel sites lacking a direct surface connection to Lake Creek and that nearly all of the observations were made at two off-channel sites below Highway 138: Long Marsh and Pit Lakes. Changes in flow on Lake Creek would have no measureable impact on Long Marsh and Pit Lakes (Pers. comm. Steve Hofford). Additionally, both the increased and decreased flows on Lake Creek would occur primarily in the late fall through winter season when effects to most amphibians would be reduced. Based on the above information, it is believed that a limited number of individuals would be impacted by these activities.

Hayes (1998) notes the possibility of negative impacts to amphibian habitat associated with the draw down, but does not reach definitive conclusions. Due to the low quality of existing habitat and low potential for the habitat to serve as other than "sink" habitat in the future, these habitat impacts are considered to be insignificant to the herptofauna of Lake Creek.

The draw down could also affect amphibians through potential impacts to Horse and Teal Lakes just south of Diamond Lake. Several factors such as snow melt and precipitation make it difficult to predict with accuracy, however, it is considered likely that by the late spring or early summer, there may not be available open water to support amphibian reproduction in these lakes (see Groundwater Report for details). This potential impact may be the most serious impact to amphibians because these areas support the most amphibian reproduction in the near vicinity of Diamond Lake (Hayes 1997).

The proposed September rotenone treatment has the potential to result in direct mortality to some individual herps that utilize Diamond Lake (particularly gill-breathing life forms). Hayes (1997) notes that for the seven species documented during the 1996 surveys (western toad, pacific chorus frog, Cascades frog, northwestern salamader, long-toed salamander, rough-skinned newt and common garter snake), amphibian use of Diamond Lake appears to be limited for all species except the rough-skinned newt. In particular, three amphibians, western toad, Cascades frog, and long-toed salamanders showed no evidence of reproduction in Diamond Lake in 1996 (Hayes 1997).

Hayes (1997) documents that "Mortality from rotenone treatment would probably be restricted to individuals that remain in the drawdown application pool from the already low late-summer numbers likely to be present around the lake. Based on life histories of amphibians present, except for the

northwestern salamander and rough-skinned newt, numbers of individuals subject to mortality are likely to be few to nil (pg. 1)". No direct mortality from rotenone treatment would be expected in Lake Creek because treated water would be confined to Diamond Lake. Rotenone treatment would also temporarily eliminate the aquatic insect prey base in the lake. Although little or no mortality would be expected for garter snakes (reptiles), they would be indirectly impacted through a loss of amphibian prey base.

Because rotenone treatment would result in the loss of some amphibians in Diamond Lake and because Horse and Teal Lakes, the areas considered most likely to support recolonization of the lake following treatment (Hayes 1997) would be impacted under these alternatives, post project monitoring for amphibians is recommended for Diamond, Horse, and Teal Lakes. If amphibian populations and species diversity do not recover naturally the following mitigation measure is recommended:

- Transplant individual amphibians from Long Marsh, Pitt Lakes, and Three Lakes (known long-toed salamander breeding area) into suitable habitat in Diamond, Horse, and Teal Lakes to facilitate recolonization of amphibians in these areas.

When considered in the context of past, present, and reasonable forseeable activities in the project area, it is determined that Alternatives 2 and 3 may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of any species. This conclusion is based on the following rationale: although numbers are likely lower the Diamond lake vicinity still retains the entire aquatic amphibian and reptile fauna it had historically and that would be anticipated at this elevation (Hayes 1997); low levels of direct mortality are expected for most species; most species are either common on the landscape or potential impacts to the species are minimal (i.e. western toad and Cascade frog); negative impacts to aquatic prey base are short-term and potential improvement of prey base in the long-term is expected; and sources of individuals for passive and active recolonization exist in the immediate vicinity (Pitt Lakes and Long Marsh).

Alternative 4 would have minor potential impacts to aquatic herps. Individuals could be harmed or killed during commercial fishing operations in the lake. Dragging nets or seines through aquatic vegetation could damage egg masses and further limit reproduction in the lake. When considered in the context of past, present, and reasonable forseeable activities in the project area it is determined that Alternative 4 may impact individuals or habitat, but is not likely to contribute to a trend toward federal listing or loss of viability of any species. This conclusion is based on the following rationale: although numbers are likely lower, the Diamond lake vicinity still retains the entire aquatic amphibian and reptile fauna it had historically and would be anticipated at this elevation(Hayes 1997); low levels of direct mortality are expected for most species; low levels of direct mortality are expected for most species; and most species are either common on the landscape or potential impacts to the species are insignificant.

Conclusions

Alternatives 1, 2 and 3 have a higher potential to adversely affect herps than Alterantive 4. Alternative 1 represents a sustained risk to the species and predicted losses of some number of individuals. Alternatives 2 and 3 represent a short-term impact to the species and known losses of some number of individuals.

Alternatives 2 and 3 have higher potential for long-term habitat improvement through improved water quality and prey base than Alternatives 1 or 4. However these differences may not be meaningful to this species groups because proposed fish stocking under all alternatives lowers the habitat effectiveness of Diamond Lake for amphibians.

Following consideration of the direct, indirect and cumulative effects of the proposed activities, it is determined that:

> Alternatives 2 and 3, as mitigated, "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of these species".
>
> Alternatives 1 and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of these species".

Bats

Affected Environment

Diamond Lake and the surrounding terrestrial environments are potential habitat for a variety of bats. ODFW biologist Terry Farrell compiled a list of ten bat species that are known or suspected to occur in the Diamond Lake area (Pers. comm., Terry Farrell). This species list was validated by two other bat biologists (Pers. comms., Dr. John Hayes, Pat Ormsbee). All of these bats are insectivorous and opportunistic, although some species seem to be more selective of moths, beetles, or flies. These species all tend to capture their prey while in flight and most are thought to be associated with forest openings and/or water (Verts and Carraway 1998).

A list of the ten species, along with abundance and a brief habitat and prey description, follows: (The fringed myotis bat was addressed earlier in this document)

a) Little Brown Bat *(Myotis lucifugus)*– Common and widespread. Inhabits forests generally near water. Diet consists mostly of true flies, especially chironomids, with termites and caddisflies also being consumed.

b) Yuma Myotis (*Myotis yumanensis)*– Uncommon to rare. This species is strongly associated with habitats near water. Typical forage consists mostly of true flies with lower numbers of termites and moths consumed as well.

c) Long-eared Myotis (*Myotis evotis*)– Uncommon in western Oregon. Conifer forest associated. This species forages by picking their prey from the surfaces of various types of substrate (bark, leaves, rocks, the ground, etc.). Prey for this "hovering gleaner" includes mostly moths and beetles, with lower numbers of spiders, true flies, and other insects.

d) Fringed Myotis (*Myotis thysanodes*)– Probably uncommon in Oregon. Associated with caves/mines in forests. Their diet consists mostly of moths and spiders, with some beetles and true flies also preyed upon.

e) Long-legged Myotis (*Myotis volans*)– Common in Oregon. Strongly associated with mature conifer forests. Feeds almost exclusively on moths, although is known to consume spiders, termites, and other insects.

f) California Myotis (*Myotis californicus*)– Common in western Oregon. Old growth associated, often near water, they use bark for roosting. Prey includes mostly true flies (Diptera), with lower percentages of moths, caddisflies, spiders, and termites.

g) Silver-haired Bat (*Lasionycteris noctivagans*)– Abundance poorly known, likely uncommon. Strongly associated with mature forests. This species' diet consists mostly of moths, termites, and

true flies, however they utilize a number arthropod taxa in smaller percentages.

h) Big Brown Bat (*Eptesicus fuscus*)– Common and widespread. Associated with coniferous and deciduous forests. This species consumes mostly beetles and moths, although also will opportunistically forage on true flies, termites, and a variety of other insects.

i) Hoary Bat *(Lasiurus cinereus)*– Uncommon in western Oregon. Strongly associated with coniferous or mixed stands. Prey consists almost exclusively of moths although they are known to eat true flies and other insects.

j) Townsend's Bat *(Plecotus townsendii*) – Uncommon. Associated with caves and mines in forested areas. This bat feeds selectively on moths with very little variation in prey type.

Little is known about the migratory habits of most of these bats species. Silver-haired and hoary bats in Oregon are known to migrate in the fall to southern California and Mexico. The remaining species likely migrate in the fall at least to lower elevations (Pers. comm. Dr. John Hayes) and all generally hibernate in winter. However, individuals of some species may awaken and feed periodically during periods of warm winter weather at low elevations.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

Alternative 1 would indirectly impact these species by perpetuating lake conditions that support a limited and declining future population of aquatic insects (see Fisheries report for details). It is also possible that bats would be harmed or killed by ingesting algal toxins during or following a bloom.

Alternatives 2 and 3 have potential impacts on both individuals and habitat of these species. These alternatives would dewater portions of Lake Creek for approximately 2 months in the late fall (mid September – mid November) and low water conditions would persist for several months, reducing available aquatic prey in the dewatered/low water areas. These alternatives also propose a rotenone treatment that would eliminate most aquatic insects from Diamond Lake in about mid September. Although all of these bats are probably starting to move to lower elevations by mid September, species presence is assumed. Additionally, although many bat species prey heavily on terrestrial insects (moths, beetles, etc.), all will forage on aquatic insects to some extent and thus would be potentially impacted to a greater or lesser degree by a loss of aquatic prey base.

Potential direct, indirect and cumulative impacts to the other nine bat species described above would be essentially the same as those described for the fringed myotis bat earlier in this document (See fringed myotis section for details). Species such as the Yuma myotis and the little brown bat that are more reliant on aquatic insects as a primary forage item are likely to incurr greater impacts than species such as the long-legged myotis or the Townsend's bat that feed almost exclusively on moths. However, for all of the above species impacts to the aquatic prey base are expected to have insignificant consequences to their populations because: bats are opportunistic, generalist feeders and are not likely dependent on a single source or location for food; there is available foraging habitat adjacent to the project area if bats were temporarily displaced as a result of the lack of aquatic prey; and many bats have likely already dropped down to lower elevations during this time of year (Pers. comm., Dr. John Hayes, Pat Ormsbee).

Indirect impacts to the abundance and diversity of the future aquatic prey base for these bats at Diamond Lake are uncertain under Alternative 4 due to the fact that only a portion of the tui chub

population would be removed and tui chub are very effective predators on aquatic macroinvertebrates. However, it is assumed that some positive impacts would be realized (see Fisheries report for details).

Conclusions

Alternative 1 represents the greatest sustained risk to these bats over time. Alternatives 2 and 3 have greater potential short-term adverse effects than Alternative 4 and higher potential for long-term habitat improvement through improved water quality and prey base than Alternatives 1 or 4. There are no meaningful or measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of these species".

Other Mammals

Affected Environment

The Diamond Lake area has a number of mammal species that are known to occur in the area, but do not receive special consideration for their management. Some of these species may be affected by the Diamond Lake Restoration Project and include the American beaver, common raccoon, American marten, ermine, long-tailed weasel, mink, and river otter. Most of these species are aquatic, semi-aquatic, or riparian associated. The following list, compiled from wildlife sighting information and Verts and Carraway (1998) identifies some of their habitat and forage characteristics:

a) American beaver (*Castor canadensis*) – Common and widespread. Associated with aquatic and riparian habitats. Forages on herbaceous and woody vegetation that grows near water.

b) Common raccoon (*Procyon lotor*) – Common and widespread. Strongly associated with water and/or forested habitats. May also be associated closely with areas of human activity. A dietary generalist, raccoons eat almost anything organic.

c) American marten (*Martes americana*) – Uncommon and restricted to higher elevations in Oregon. Martens are associated with contiguous forests that have high canopy closure. Forage consists mostly of mammals, although birds, insects, and fruit are known to be consumed seasonally.

d) Ermine (*Mustela erminea*) – Uncommon and widespread. Ermine are associated with early successional habitats as well as forests. Preys upon small mammals that are typically no larger than mouse-sized and occasionally on birds and earthworms.

e) Long-tailed weasel (*Mustela frenata*) – Uncommon and widespread. Long-tailed weasels occupy a wide variety of habitats ranging from mature forests to alpine tundra. Diet consists mostly of small mammals up to rabbit sized, although they are considered opportunists that will eat most vertebrate species encountered.

f) Mink (*Mustela vison*) – Uncommon and widespread. Mink are strongly associated with water and

wetlands. Prey consists mostly of fish, mammals, and crayfish although birds and reptiles are eaten as well.

g) River otter (*Lutra canadensis*) – Uncommon and widespread. River otters are aquatic obligates and are strongly associated with water habitats. Their prey consists mostly of fish, although they are known to consume crustaceans, amphibians, birds, and mollusks as well.

Environmental Impacts

Direct, Indirect, and Cumulative Impacts

Alternative 1 perpetuates the existing condition and forgoes the opportunity to address declining water quality in Diamond Lake. For species such as beaver, raccoon, mink and river otter that spend a significant portion of their lives in water or prey primarily on aquatic species, it is possible that some individuals would become ill or die from exposure to algal toxins during or following a summer bloom. The extent of this potential impact over time is unknown. There are no anticipated impacts to other mammals that are not aquatic associates.

Alternatives 2 and 3 have potential impacts to individuals and habitats of some of these species. Beaver, raccoon, mink, and river otter spend a significant portion of their lives in water or prey primarily on aquatic species. These species have the greatest potential to be affected by proposed activities. All of the above species would be expected to ingest rotenone treated water and consume rotenone killed prey species. However, as described in the "Toxicity of Rotenone to Wildlife" section of this document, they are not expected to be harmed as a result. Rotenone treatment would eliminate aquatic prey species for river otter, raccoons, and mink in Diamond Lake proper for one to two summers. It is expected that individuals of these species would be temporarily displaced to adjacent habitats within the project area (i.e. Silent and Lake Creeks and tributaries). In the near future, Alternatives 2 and 3 would be expected to result in a beneficial indirect impact to these species by facilitating the return of a more abundant and diverse aquatic macroinvertebrate prey base as well as a fish prey base.

Minor impacts to beavers would be expected as a result of the draw down. During the winter of the draw down, receding water levels would create an increased distance between the lodges, the beaver's winter food stash, and the lake water. It is doubtful that these habitat modifications would harm the beavers, but it likely represents an additional energetic expense for individuals.

The dewatering and low flow periods on Lake Creek associated with the proposed draw down represent a temporary modification of habitat and prey base for all of the seven species identified above. Although individuals could be affected, consequences to these species are considered to be minor due to the limited scale of the action and the availability of adjacent habitat within the project area.

For Alternatives 2 and 3, when considered in the context of past, present, and reasonable forseeable activities in the project area, it is expected that potential impacts would have insignificant consequences to these mammal species because: potential negative impacts are short-term followed by a long-term improvement in habitat; availability of alternative habitat within and adjacent to the project area would reduce the intensity of the impact; and the number of individuals potentially impacted is expected to be limited.

Alternative 4 would utilize commercial fish operations for approximately two months in June and July and one month in September on an annual basis to harvest tui chub from Diamond Lake. It is expected that occassionally beaver, river otter, and possibly mink could be harmed or killed by becoming

entangled in gill nets during commercial fishing operations (Pers. comm., Dave Loomis). It is considered unlikely that this potential impact would occur frequently enough to represent a significant impact to these species. Commercial fishing would also reduce the available prey base for piscivorous species. Because commercial fishing areas would be staggered allowing undisturbed access to the majority of the lake at a given point in time and adequate prey base would likely remain in Diamond Lake throughout the lifetime of the project. This is considered to be an insignificant effect to these species. When considered in the context of past, present, and reasonable forseeable activities in the project area, potential impacts associated with this alternative are expected to have insignificant consequences to the species because impacts are limited in scale and intensity and the number of individuals potentially impacted is expected to be limited.

Conclusions

Alternative 1 represents the greatest sustained risk to some of these mammal species over time. Alternatives 2 and 3 have greater potential short-term adverse effects than Alternative 4 and higher potential for long-term habitat improvement for some species through improved water quality and prey base than Alternatives 1 or 4. There are no meaningful or measureable differences between Alternatives 2 and 3.

Following consideration of the direct, indirect and cumulative impacts of the proposed activities, it is determined that:

> Alternatives 1, 2, 3, and 4 "may impact individuals or habitat, but are not likely to contribute to a trend toward federal listing or loss of viability of these species".

MITIGATIONS & MONITORING

Certain actions can be taken to reduce potential impacts or effects to PETS species and other wildlife and facilitate maintenance of viable populations of existing native wildlife in the planning area. Mitigations and monitoring recommended for reducing impacts and maintaining viable wildlife populations are described below. These recommendations would apply to Alternatives 2 and 3.

1. Implement a supplemental bald eagle and osprey feeding program during the time period when the fish population in Diamond Lake is non-existent or limited. (A detailed plan would be developed jointly by the USFWS, ODFW, and the USFS).

2. Monitor osprey and bald eagle reproductive success during the supplemental feeding program and for two years following restoration of the fish prey base. (Eagle reproductive success would be monitored annually until the species is delisted).

3. Complete post-project monitoring for amphibians in Diamond, Horse, and Teal Lakes. If amphibian populations and species diversity do not recover naturally, transplant individual amphibians from Long Marsh, Pitt Lakes, and Three Lakes (known long-toed salamander breeding area) into suitable habitat in Diamond, Horse, and Teal Lakes to facilitate recolonization of amphibians in these areas.

4. Conduct pre- and post- draw down monitoring of soil moisture and species presence at known sites of the Crater Lake tightcoil snail. If post-project surveys reflect that the species appears to be absent at any of the sites, translocate a number of individuals from adjacent known sites with multiple adults (i.e. Crystal Springs) to repopulate the site.

5. Conduct pre- and post- draw down monitoring of Silent Creek wetlands to facilitate understanding of how this type of temporary habitat manipulation impacts utilization of habitat by Lincoln's sparrows.

SUMMARY

Effects/Impacts determinations are documented in Table 4 for Threatened, Endangered and Sensitive Wildlife Species.

Table 4. Determination of effects to Threatened, Endangered, and Sensitive Wildlife Species.

	SPECIES	DETERMINATION OF EFFECT BY ALTERNATIVE*			
		1	2	3	4
BIRDS	Northern Spotted Owl	NE	LAA	LAA	LAA
	Bald Eagle	LAA	LAA	LAA	NLAA
	Peregrine Falcon	NI	NI	NI	NI
	Harlequin Duck	MIIH	MIIH	MIIH	MIIH
	Bufflehead	MIIH	MIIH	MIIH	MIIH
	Yellow Rail	NI	MIIH	MIIH	NI
AMPHIBIANS	Oregon Spotted Frog	MIIH	MIIH	MIIH	NI
	Foothill Yellow-legged Frog	NI	NI	NI	NI
	Southern Torrent Salamander	NI	NI	NI	NI
REPTILES	Western Pond Turtle	NI	NI	NI	NI
	Common Kingsnake	NI	NI	NI	NI
MAMMALS	Canada Lynx	NE	NE	NE	NE
	California Wolverine	MIIH	MIIH	MIIH	MIIH
	Pacific Fisher	MIIH	MIIH	MIIH	MIIH
	Pacific Fringed Bat	MIIH	MIIH	MIIH	MIIH
	Pacific Pallid Bat	NI	NI	NI	NI
	Pacific Shrew	NI	MIIH	MIIH	NI

** Threatened and endangered species determination calls follow nomenclature established by the US Fish and Wildlife Service (**NE**= No Effect, **NLAA**= Not Likely to Adversely Affect, **LAA**= Likely to Adversely Affect). Sensitive species determinations*

*follow nomenclature established in the Forest Service Handbook (**NI**= no Impact, **MIIH**= May Impact Individuals or Habitat but will not Likely Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species, **WIFV** = Will Impact Individuals or Habitat with a Consequence that the Action May Contribute to a Trend Towards Federal Listing or Cause a Loss of Viability to the Population or Species).*

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