THE

AMPHIBIANS AND REPTILES

OF THE

LITTLE WHITE SALMON NATIONAL FISH HATCHERY

A REPORT TO THE UNITED STATES FISH AND WILDLIFE SERVICE

BY

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INTRODUCTION AND PURPOSE

Oregon white oak (*Quercus garryana*) woodlands are a valuable part of Washington State's ecosystem, providing habitat used by ≥ 200 vertebrate species, as well as a number of invertebrates endemic to this habitat type (*see review by* Larsen and Morgan 1998). White oak woodlands in Washington State were historically maintained by fire; with the advent of fire suppression following European settlement, oak habitat within the state has declined, primarily as a result of encroachment by Douglas-fir (*Pseudotsuga menziesii*; Larsen and Morgan 1998). For this reason, preservation of remaining white-oak woodlands is a key priority for land managers in Washington State. However, information on current conditions within existing white oak woodlands is required prior to development of a management plan.

The purpose of this project is to identify the reptile and amphibian species inhabiting white oak woodlands owned by the US Fish and Wildlife Service (USFWS) at the Little White Salmon National Fish Hatchery (LWS NFH), Skamania Co., Washington. This information will be used in developing a management plan to preserve the biological diversity of this area.

METHODS

Summary

To identify which reptile and amphibian species inhabited the LWS NFH, the hatchery property and selected surrounding areas were surveyed from April through June of 2006 (Table 1). In general, surveys were conducted in such a manner as to encompass the widest range of habitat and weather conditions possible during the survey interval. Instead of attempting to capture large numbers of animals, survey efforts were directed toward two main goals: 1) identifying which reptile and amphibian species were present on hatchery property and 2) determining how these species were distributed across hatchery property, both temporally and spatially (e.g., identifying which habitats were used by these species, as well as understanding the conditions under which each could be found). An effort was made to accomplish these goals with a minimum of habitat disturbance, in order to make surveys as repeatable as possible.

A. Survey methods

A number of different methods were used during the course of the project. Methods ranged from general searches of a given area to specialized tactics intended to target a single species (or group of species with similar habitat and behavior characteristics). These methods were as follows:

Visual encounter surveys:

By far the most common method used during the survey, visual encounter surveys consisted of simply walking through a given area, looking for amphibians and reptiles.

Any cover encountered with the potential to harbor target animals (e.g., logs, rocks, grass clumps, trash, puddles, rock crevices, leaf litter, etc.) was also searched (or looked under). Visual encounter surveys were conducted throughout the daylight hours, and occasionally after dark. Although the entire hatchery property was covered to some degree, surveys were concentrated on areas that either had the potential to harbor the most species (e.g., areas near roads, near water, at the junction of several habitat types, or near an abundance of artificial cover); or were the preferred habitat for specialized species (e.g., open fields for racers, springs for torrent and giant salamanders, oak hills for skinks, king snakes and rubber boas). A potato fork was used to turn logs and rocks in areas with thick poison-oak; it was also used to dig through loose talus.

Some habitats, such as trash, stumps, and rocks along roads and in dense woods and the equipment storage area near the hatchery complex, were searched repeatedly during the project. More sensitive habitats, such as seeps, talus piles, and moss-covered rocks on exposed oak hills, were usually surveyed just once in order to minimize disturbance to the specific microclimate present in these habitat types. Such microclimates may take months or years to form, and heavy disturbance of these habitats over a short period of time may result in an inability to find animals on repeated visits.

Table 1. Dates and times of surveys for amphibians and reptiles conducted on the LWS NFH

Date	Start	End	Total (hours:minutes)
25-Apr-06	14:00	22:23	8:23
26-Apr-06	8:40	15:10	6:30
2-May-06	8:45	19:35	10:50
3-May-06	8:10	18:21	10:11
4-May-06	8:15	11:30	3:15
2-Jun-06	15:20	19:10	3:50
3-Jun-06	9:00	14:30	5:30
7-Jun-06	15:30	19:04	3:34
7-Jun-06	21:20	22:00	0:40
8-Jun-06	8:40	18:50	10:10
9-Jun-06	10:40	19:00	8:20
10-Jun-06	11:40	16:00	4:20
28-Jun-06	22:00	23:40	1:40
29-Jun-06	8:30	22:20	13:50
30-Jun-06	9:30	13:35	4:05
30-Jun-06	21:00	22:55	1:55
1-Jul-06	10:30	11:30	1:00
11-Jul-06	9:16	21:00	11:44
12-Jul-06	8:40	11:14	2:34

Stream and seep surveys:

Streams were surveyed by walking their length, visually examining the channel and bank for amphibians and reptiles. Cover along the stream's banks (bushes, rocks, logs, etc.) was searched as necessary. Kick-netting was used to detect aquatic forms living on or in the stream's substrate. With this method, a net was placed perpendicular to the direction of flow, and the substrate for a meter or so upstream of the net was disturbed by kicking or raking with a stick or potato fork. This action dislodged animals from the substrate, which were then swept into the net by the current. To survey seeps, cover

objects such as rocks and talus within the moist area of the seep (the spray zone for those emerging over steep hillsides) were lifted or moved by hand or with the use of a potato fork.

Amphibians captured during these surveys were briefly held in water-filled containers for examination, then gently measured and released. To reduce impacts to potentially sensitive stream and seep habitats, substrate-disturbing methods such as kick-netting were generally kept to the minimum amount required to determine the occurrence of target species within the system. Usually, to achieve this goal, only a few kick-net samples were required for each stream.

Cover placement:

The use of artificial cover, primarily in the form of corrugated tin and plywood, was used to enhance detection of several secretive species of lizards and snakes. At the beginning of the survey, cover was placed in areas where it was expected to be most useful (areas closed to the public, near key habitat features such as water or on the borders of open fields, and in areas with relatively high sun exposure). As artificial cover was moved around throughout the project, for a variety of reasons, no attempt will made here to describe the specific location of cover objects.

Cover placement was centered around the LWS hatchery complex, the field north of the LWS employee housing, and the field on Carol Sather's property, on Chenowith Road. At Carol's, most cover was placed in or near the clearing in the woods on the east end of the field. A few pieces of cover were placed along the Cook-Underwood Road between the Willard and LWS hatcheries, on USFWS property; these were in the vicinity of milepost #2 on the Cook-Underwood Road and on an oak-dominated hill near the Skamania County water storage tank, just east of the junction of the Indian Access Road and the Cook-Underwood Road.

Miscellaneous methods:

Funnel traps

During the survey, funnel traps were primarily used to detect aquatic salamanders. Three funnel traps (modified wire crayfish traps baited with cat food) were used in the Little White Salmon River between the hatchery bridge and the upstream water intake, near the river's margin, where cover was greatest and current slowest. A fourth trap, not baited with cat food, was placed in the pool just above the collection screen on the Office Springs, at the north end of the central LWS complex. A fifth trap, made of nylon mesh, was placed in the spring pool at the north side of the Cook-Underwood Road, just east of the road's junction with the creek which feeds the Office Springs. This trap was unbaited but was concealed with rocks, logs, and vegetation; however, it was taken before it was checked.

Kayak surveys

The shore of Drano Lake was surveyed by kayak in order to find animals and to assess the composition of habitat along the lake's edge. Three surveys were performed, two during the daytime and one at night.

Road-riding

This method involved slowly driving a road in the evening or after dark and watching for crossing animals. Road-riding can be quite effective if the surrounding habitat is favorable and weather conditions are good.

The best conditions for amphibians to be found on the road are during overcast, rainy days or on wet nights with no wind and air temperatures of >45°F (preferably $\geq$50°F). The best times of the year to see amphibians in western Washington and Oregon are during late winter and early spring, from January through April, and again in the fall, with the onset of the first good rains (usually in mid- or late October), when many juvenile and newly transformed amphibians disperse. Most amphibians move overland very little during the hot months of the summer.

The best conditions for reptiles to be found on the road occur on still evenings from dusk until approximately 2300 (11:00 PM) or so, following a hot ($\geq$90°F) day, when the air has cooled but the pavement is still warm to the touch.

At the LWS NFH, road-riding was used every day surveys were conducted, as well as on a few additional days (see field notes). Primary target roads consisted of the hatchery road, the Indian Access Road, the Cook-Underwood Road, and that portion of SR-14 between its junction with the Cook-Underwood Road and the east end of Drano Lake.

B. Capture and measurement

Animals encountered in the field were captured and measured whenever possible. Aquatic salamanders and their larvae, as well as frog eggs and larvae, were captured using a jar, dip net, or by hand. Terrestrial salamanders were captured by hand. Lizards were captured by hand or with a “lizard noose”. This noose consisted of a piece of light monofilament fishing line attached to the end of a thin bamboo pole; at the end of the line, a loop had been formed using a very loose slipknot. By slipping the loop over a lizard’s head and quickly lifting, even small, wary lizards could be captured with relative ease and an apparent minimum of stress to the lizard. Snakes were captured by hand. Snakes and large lizards were held in cloth bags until measurement; small lizards, frogs, and salamanders were placed in jars or plastic containers with air holes.

Captured animals were generally measured immediately and released. Standard measurements included length, weight, species, and sex (Table 2). Location and habitat information was also recorded for each individual, and a voucher photograph of at least one individual of each species was taken. Occasionally, field conditions necessitated keeping an animal overnight in order to get an accurate photograph; the animals were returned to their capture location the next day. Locations of animals were recorded both in relation to surrounding features and in UTMs (NAD 83) via a GPS (Garmin Etrex Vista C). Physical features of habitats, including substrate and vegetative characteristics, were also recorded (Table 2).

Table 2. Capture Data

Variable	Description
Date	Day of survey (Julian date)
Time	Time of capture (24:00 format)
Species	Species of amphibian or reptile encountered
Life stage	Life stage of animal: egg, larva, juvenile, or adult
Sex	Sex of animal: male, female, or unknown
Snout-vent length	Distance from animal's snout to its vent, in a straight line (in millimeters)
Tail length	Distance from animal's vent to tip of its tail (in millimeters)
Mass	Mass of the animal, in grams
Condition	Qualitative assessment of the overall vigor and health of the animal
Location	Location within the survey area
Habitat	Physical and vegetative characteristics of animal's capture location
Waypoint #	Number referencing the UTM (NAD 83) coordinates of the capture location
Notes	Any additional information on animal's condition, capture location or time, weather, etc.

C. Habitat assessment

A brief account of the physical and vegetative characteristics of the LWS NFH property is included here (see below) in order to assist in interpreting patterns of amphibian and reptile occurrence. This assessment is primarily qualitative in nature and is based on observations made during the study.

D. Other animals

The presence of other animals was recorded opportunistically (and sporadically) as they were encountered. Although the region around the hatchery is one of great biological diversity, an inventory of all taxonomic groups encountered was far beyond the scope of this project. Thus, the occurrence of most other vertebrate and invertebrate species was recorded only if it was considered to have the potential to affect the distribution of amphibians and reptiles within the survey area (see field notes).

Results

Summary

Approximately 112 hours, over portions of 19 days, were spent actually searching for amphibians and reptiles on the LWS NFH. Two hundred and eighty-one individual observations of reptiles and amphibians, comprising 16 different species, were recorded over the course of the survey.

Fifteen native species of reptiles and amphibians were found to occur on the LWS NFH; the possibility exists for the hatchery to harbor several more (*see* Discussion *and* Appendix B: Species not observed). The 15 species observed included 3 salamanders, 1 frog, 4 lizards, and 7 snakes. A single specimen of a non-native turtle species (three-toed box turtle, *Terrapene carolina triunguis*) was found near the Mill A school; this specimen represents an isolated occurrence and not an established population. Distribution of amphibians and reptiles across the LWS NFH largely reflects individual species' habitat requirements, and subsequently the physical and vegetative composition of hatchery property.

Physical and biological description

The lands owned by the LWS NFH are comprised of five main habitat types: oak woodlands, coniferous forest, forested water features, complex/housing, and Drano Lake. Each of these, as well as the property owned by Carol Sather, is discussed briefly here.

Oak woodland

A significant portion of the LWS NFH property is occupied by open or semi-open white oak (*Quercus garryana*) woodland habitat. The location of this habitat type within the hatchery ownership is as follows.

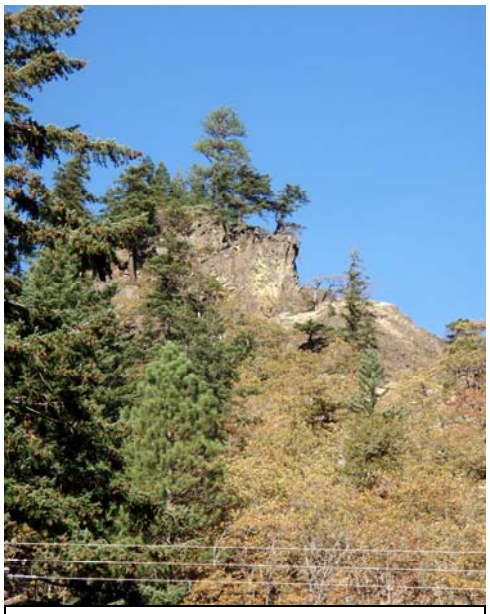
West of the Little White Salmon River: Beginning at the junction of the hatchery road with Highway 14, a narrow band of oak habitat (ranging from the road level to approximately 100m up-slope) parallels the uphill side of the road all the way to the hatchery gate. This oak habitat is primarily east-facing in aspect. Just north of the office, the collection pool of the Office Springs marks the southern end of a patch of oak woods that dominates the east-facing side of a series of hills. This patch borders the Little White Salmon River in many places and extends to approximately the north boundary of the LWS hatchery property. It extends up-slope in a patchy manner, as far

Oak woodland habitat at the LWS NFH

West-facing oak stand in NW corner of Drano Lake

uphill as the Cook-Underwood Road in some places. Along the north side of the Cook-Underwood Road, a similar band of east and south-facing oak habitat occupies a stretch extending from the Skamania County water tank (on the north side of the road) north and east to approximately Milepost #2 (on the Cook-Underwood Road). This habitat extends for as much as several hundred meters uphill.

East of the Little White Salmon River: Beginning several hundred meters east of the peninsula at the east side of the mouth of the Little White Salmon River (as it enters the main body of Drano Lake), a band of oak habitat extends north and east to approximately the boundary of the public fishing area. This habitat is primarily south and west-facing, and reaches from the edge of the river to the top of the hill. A second patch occupies the west-facing side of the Little White Salmon River canyon, from the area near Milepost #2 to the top of the Chenowith bench. This habitat is fairly patchy and mostly overgrown with Douglas-fir (*Pseudotsuga menziesii*) forest. Atop the Chenowith bench, a stand of oak that has been overgrown by Douglas-fir occupies a large part of hatchery property.



Southeast-facing oak hill north of LWS NFH office

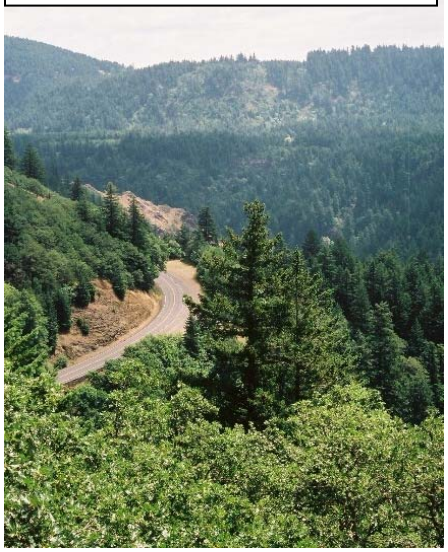
The majority of the oak woodland habitat on the LWS NFH property occupies open, highly exposed sites, usually quite steep and having either a south or east-facing aspect. Substrate consists of basalt-dominated rocky hills with thin soil. In the most exposed areas, oaks are present as widely scattered, single trees, usually with a compact growth pattern and are probably quite old. Understory vegetation in these areas, if present, usually consists of a mixture of native and introduced grasses, biscuit-root (*Lomatium* spp.), onion (*Allium* and *Brodiaea* spp.), yarrow (*Achillea millefolium*), rose campion (*Lychnis coronaria*), parsley fern (*Cryptogramma crispa*), poison-oak (*Toxicodendron diversilobum*) and scattered other herbaceous and low perennial plants. In areas with deeper soil or a more sheltered location (e.g., along stream canyons), oaks exist in stands with a denser understory and/or groundcover layer. This layer consists mostly of poison-oak, with small scrubby white oaks, lupine (*Lupinus* spp.), asters (*Aster* spp.), tall Oregon-grape (*Mahonia aquifolium*), dewberry (*Rubus ursinus*), blackcap (*Rubus leucodermis*), ninebark (*Physocarpus capitatus*), snowberry (*Symphoricarpos albus*), ocean-spray (*Holodiscus discolor*), and serviceberry (*Amelanchier alnifolia*) present, among others. Relatively little woody debris exists in most of the oak stands.

Much of the exposed sites on which oaks are found have areas of a loose rock matrix which extends well below the surface. Most of these areas also possess large

boulders near the surface. In many places, these rocks and boulders are covered with a thick layer of moss and/or a thin soil and grass layer. These areas have a distinctive invertebrate fauna and provide the best habitat on hatchery property for five reptile species: the rubber boa, ring-necked, and king snakes, as well as the southern alligator lizard and western skink (see respective species accounts).

Coniferous forest

Coniferous forest on the grounds of the LWS NFH consists primarily of stands of Douglas-fir, of varying ages and densities. This habitat type encompasses most of the remainder of hatchery property, excluding, for the most part, only a few springs and the hatchery complex itself (see below). In general, the majority of the Douglas-fir stands on hatchery property have a north or west-facing aspect, a high degree of canopy closure, and a relatively dry, open understory. Common understory plants include poison-oak and short Oregon-grape (*Mahonia nervosa*) on drier sites, and a mixture of woody and herbaceous species including vine maple (*Acer circinatum*), sword-fern (*Polystichum munitum*), lady fern (*Athyrium filix-femina*), piggy-back plant (*Tolmiea menziesii*), coltsfoot (*Pedasites palmatus*), vanilla-leaf (*Achlys triphylla*), and miner's lettuce (*Claytonia* spp.) in moister areas (e.g., along streams). The forest understory in the vicinity of the Chenowith bench contains scrubby white oak, oceanspray, fairy slipper (*Calypso bulbosa*), and rein-orchid (*Platanthera* spp.).



LWS River canyon and part of Chenowith Bench (facing east across draw formed by Office Springs Creek)

Mixed conifer stand at the mouth of the Little White Salmon River

Substrate within these forests consists of soil with a dry duff layer, patches of rocks (usually basalt) which may be either bare-surfaced or moss-covered, and a variable amount of woody debris. Because much of this habitat is heavily shaded, and because the soil surface is very dry from late spring to fall (including during the survey period), few amphibian and reptile species were found in coniferous forests away from aquatic habitats (see discussion of water features, below). The two species that were found in coniferous habitats, the northwestern garter snake and the northern alligator lizard, were found at the forest's margins, near sunny, open areas. Although a number of interesting mollusk species were observed in

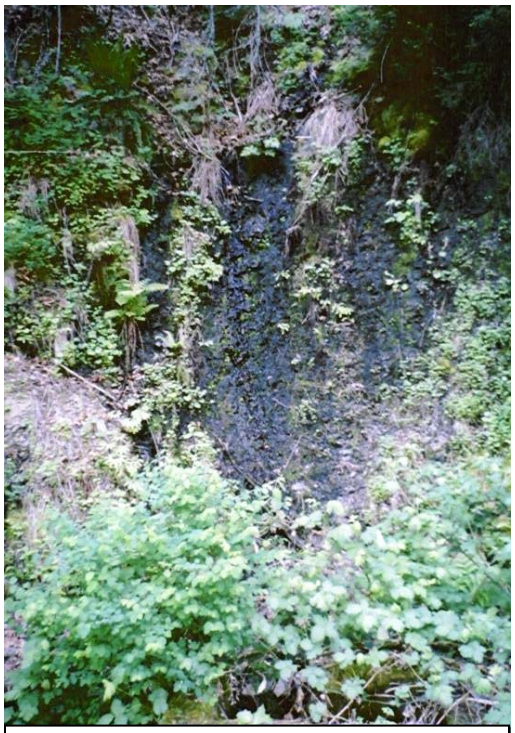
South-facing oak hill and adjacent Douglas-fir stand, uphill from water tank on north side of Cook-Underwood Road

and near the boundaries of the coniferous forests on the LWS hatchery property, no attempt was made to identify those species during the survey.

Forested water features

This habitat type included all water features (streams, springs, and seeps) on hatchery property, except for Drano Lake, which is here treated separately (see below). The water features included in this category were the hatchery road seeps, Hillside Springs, Office Springs (including Office Springs Creek and its tributaries), and the Little White Salmon River.

Hatchery Road Seeps: These are a series of seeps along the west side of the hatchery road, between the Hillside Springs and the hatchery road's intersection with the Indian Access Road. These springs generally consist of laminar flow down a variable height of vertical bedrock, usually with a pile of talus at the base. The water from the seeps drains into a silt-bottomed, rock-filled ditch, then flows into Drano Lake via a culvert passing under the hatchery road. Most of these seeps appear to be perennial, though the flow of the seep complex was observably greater at the beginning of the survey. The bedrock around the splash zone supports a number of mosses and other plants, including maidenhair fern (*Adiantum pedatum*). The talus around the base of each spring is fairly highly embedded in a silt or soil matrix, leaving few interstitial spaces for salamanders to inhabit. Nonetheless, two salamander species (the Cascade torrent salamander and the roughskin newt) were found at the base of these seeps during the survey. Although these seeps (and the surrounding roadside talus) have the potential to support other salamander species, including the Larch Mountain salamander, no other species were found during the survey, possibly because the habitat in the vicinity of the seeps was too dry at the time of sampling (as a result of recent warm weather).



Above: One of the hatchery road seeps
Below: Ditch at base of seep

Hillside Springs: These are the largest of the springs along the west side of the hatchery road between its junction with the Indian Access Road and the hatchery gate. They surface on the hill above the hatchery, and are perennial in flow, with a rocky substrate of varying diameter. They were not searched until relatively late in the survey (July), when much of the flow was sub-surface. Nonetheless, the Cascade torrent salamander was found in these springs, and it is likely that coastal giant salamanders inhabit this spring as well. To find giant salamanders most efficiently with a

minimum of habitat disturbance, the best time to survey would probably be during the wet part of the year (November through March), when the springs have the highest flow and the salamanders are most likely to be near the surface.

Office Springs: The Office Springs is the source of the hatchery's internal water supply (S. Doulos, *pers. comm.*), and runs into a screened collection basin at the base of a hill just north of the hatchery office. (A small tributary seep emerges from the hillside just above the collection basin.) This collection basin is at the downstream end of "Office Springs Creek," which flows from the northwest, through a canyon that begins above hatchery property and which crosses the Cook-Underwood Road at a sharp, east-facing bend. Just east of the road crossing at this bend, another spring crosses the Cook-Underwood Road. This seep, flowing downhill from the north, joins Office Springs Creek south of the Cook-Underwood Road, and thus also provides water for the hatchery. Several hundred meters above the road crossing on this spring is a spring house; above this house, a tributary stream, flowing from the east, joins the main spring.

Above: Main tributary to Office Springs Creek, north of the Cook-Underwood Road
Top right: Office Springs Creek above collection pool
Bottom right: Collection pool above screened intake on Office Springs

Little White Salmon River: The Little White Salmon River flows across the hatchery property from the northeast, cutting it approximately in half. It flows through a steep canyon and is alternately bordered by coniferous forest (particularly on its east bank) and oak-dominated hills; several large, bare rock slides occur along this stretch. The river is cobble and boulder-dominated, and flows swift and cold year-round. Though no reptiles or amphibians were found in the river itself during the survey, it is likely that Cascades torrent and coastal giant salamanders inhabit some of the more sheltered areas along the river's margins.

Complex and housing

This habitat simply consists of the area around the hatchery complex. It includes the office and other facility buildings, housing, parking lot boundaries and lawns, the equipment storage yard, and the overgrown field across the Cook-Underwood road from the LWS housing. Cover in this area is mostly loose rock or objects made of plastic, wood, or metal. Artificial cover, consisting mostly of plywood and sheets of corrugated aluminum, was laid out around some areas (e.g., near LWS housing and the in the equipment yard) to enhance detectability of secretive reptile species. Vegetation within the area consisted of mown lawns and brushy margins of blackberries (*Rubus discolor* and *Rubus ursinus*), poison-oak, tall Oregon-grape, mixed grasses, and other shrubby species. The northwestern garter snake and northern alligator lizard were the reptile species most frequently observed in this habitat type.

Drano Lake

The shoreline and selected shallow portions of Drano Lake are the areas which are of the greatest importance to reptiles and amphibians. The shoreline of Drano Lake contains a small portion of oak woodland in the northwest corner (see oak woodland section, above). The remainder of the north shore is coniferous (mostly Douglas-fir) forest, with a border of hardwood trees and shrubs. These trees and shrubs include bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), and mock-orange (*Philadelphus lewisii*). Within this forested area are several boulder slides, composed of loose basalt rocks of large size (>0.5m or larger in diameter). The shoreline of the lake is mostly loose rock and gravel, with driftwood accumulations on gentler slopes. The east end of the lake consists of a large basalt cliff; the south shore, along which Highway 14 runs, is entirely riprap. The western shore is a

West end of Drano Lake. LWS NFH housing is visible on hill (right side).

Northwest corner of Drano Lake

mixture of soil and rock, overhung with a few conifers (Douglas-fir) and hardwood trees (bigleaf maple and red alder) and blackberry patches. A few steep, grassy banks exist in the vicinity of the hatchery gate. The aquatic portions most important to reptiles and amphibians include the cool bay in the northwest corner of the lake, the shoreline from the hatchery gate to the island, and the shallows bordering the south and east side of the peninsula at the mouth of the Little White Salmon River. The portion of the shoreline between the west end island and approximately one-fourth of the way across the northern shore is the terrestrial area of greatest importance to reptiles and amphibians.

Other areas

Reptiles and amphibians were found at several locations other than the LWS NFH during the course of the project. These included the Willard NFH (northwestern garter snake, western yellow-bellied racer), the Mill A area (Pacific tree frog, three-toed box turtle – see above), and the bank of the Columbia River at the junction of Highway 14 and the Cook-Underwood Road (Pacific tree frog). Of special note is the property maintained by Carol Sather, located along Chenowith Road on a south-facing slope uphill from the LWS NFH holdings. This area consisted primarily of a large, grassy field and old home site bordered by a primarily coniferous forest. This property provided excellent habitat for the western yellow-bellied racer. Other species observed on Carol's property included the Pacific treefrog, western fence lizard, northern and southern alligator lizards, northwestern garter snake, and western rattlesnake.

Left: The grassy field on Carol Sather's property, north of Chenowith Road, was good habitat for racers.

Above: An old rock wall at the north side of the field provided habitat for western rattlesnakes.

Species observed

The amphibian and reptile species encountered during the survey, along with brief descriptions of their distribution, abundance, and selected aspects of their life history, are listed here. Species names used here follow those in Stebbins (2003).

AMPHIBIANS

Salamanders

Cascade torrent salamander (*Rhyacotriton cascadae*)

This small salamander (to 2.5 inches in body length) is usually a glossy, chocolate brown color above and bright lemon-yellow or yellow-orange below. The entire animal is covered with white and black specks (with heaviest speckling on the sides), giving it a "salt-and-pepper" look. Larvae have visible external gill stubs and may occasionally possess a lighter (almost white) belly. The entire animal frequently appears semi-translucent.

Cascade torrent salamander (*Rhyacotriton cascadae*)

Ventral view of larval (*left*) and adult (*right*) salamanders

Cascade torrent salamanders are restricted to cool, wet seeps and cold flowing streams. They feed on small invertebrates and may spend several years as larvae prior to metamorphosis. The sex of adult animals may be distinguished by the presence of externally visible, squared-off vent lobes in the male.

Ventral view of male (*top*) and female (*bottom*) Cascade torrent salamanders

This salamander was the most abundant amphibian species observed. Both adults and larvae were found throughout the stream system that feeds the Office Springs (see map – Appendix A), as well as in the Hillside Springs; adults of this species were even found in the shallow ditch along the west side of the hatchery road. Cascade torrent salamanders appear to be present in most, if not all, of the perennial streams and seeps in the immediate vicinity of the LWS NFH. This species may even occur in protected locations along the edge of the Little White Salmon River.

Coastal (Pacific) giant salamander (*Dicamptodon tenebrosus*)

This species, the largest salamander (to 6 inches in body length) in western Washington, is generally tan to grayish dorsally (whitish-gray ventrally) when in the aquatic larval form. Terrestrial (metamorphosed) animals are generally brownish or coppery, with distinct black marbling. This salamander inhabits cool, permanent streams within the Columbia Gorge. Within these streams, individual salamanders may become sexually mature while in the gilled, aquatic larval form. Alternately, they may transform, after two or so years as a larva, into a terrestrial adult. Both larvae and adults are voracious predators and will consume a wide variety of aquatic and terrestrial animals as prey.

Above: Coastal giant salamander (*Dicamptodon tenebrosus*) – terrestrial adult
Below: Coastal giant salamander – small aquatic larva

Coastal giant salamanders were found in the stream which feeds the Office Springs. Only two individuals were encountered during the study; however, this may be a result of the fact that most water bodies were searched later in the year, when some, such as the creek feeding the Hillside Springs, as well as a large portion of the stream feeding the Office Springs, had been reduced to subsurface flow, decreasing the potential to observe these creatures. Because of this, giant salamanders may also occur in the Hillside Springs, the tributary stream that feeds the Office Springs (see torrent salamander account), parts of the Little White Salmon River, and Drano Lake.

Rough-skinned newt (*Taricha granulosa*)

This distinctive amphibian is brown above and bright orange below. It is a medium-sized (to about 3.5 inches in body length) salamander with a distinctively rough, granular skin while in its terrestrial stage.

Above: Rough-skinned newt (*Taricha granulosa*): adult male
Right: Ventral view (same adult male)

Rough-skinned newts mostly occur west of the Cascade crest in Oregon and Washington, and frequently spend at least part of the year (summer and fall) on land, returning to still water in the winter or spring to breed. However, newts in certain areas, such as high-elevation lakes, may remain in aquatic habitats year-round.

Only one rough-skinned newt was found during the survey. This animal was a gravid female, discovered under a piece of bark in some wet leaves, in the ditch on the west side of the hatchery road just south of the Hillside Springs. As the only potential breeding habitat for this species on hatchery property is Drano Lake, it seems likely that any newts breeding in the area utilize the warmer portions of the lake (e.g., shallow margins). Furthermore, newts in this area may breed later in the season (after water temperatures in Drano Lake have increased), than do those in the western and coastal portions of the state. Due to the apparently limited breeding habitat and relatively dry nature of much of the upland habitat in the summer, this species may occur at fairly low numbers across hatchery property.

Frogs and Toads

Pacific tree frog (*Hyla regilla*)

Pacific tree frog (*Hyla regilla*)
Above: Brown form (dorsal view)
Below: Green form (side view)

These frogs are small (to about 2 inches in body length) and highly variable in color; most commonly, they are some shade of brown or green, and have a black mask-like stripe across each eye. The tips of their toes possess sticky pads that allow the frogs to climb smooth surfaces. Their "*kreck-it*" calls are very distinctive, especially during the spring breeding season. They are found statewide and occur in almost every type of habitat, though they must return to still water to breed. They feed on small insects and other invertebrates.

Pacific tree frogs were the only anuran encountered during the survey. They were found at only one location on hatchery property; this consisted of a small (ca. 60 x 40 cm, 20 cm deep) pool surrounded by rushes (*Juncus*), grasses, and small red alder (*Alnus rubra*) trees. It was located in the ditch on the north side of the Cook-Underwood Road, approximately 2m upstream of the spring crossing east of Office Springs Creek. This pool is seep-fed, and the water remained relatively stable in both temperature (50-60°F) and quantity over the course of the survey. On the evening of 25 April, two male tree frogs were heard calling from the bushes surrounding this pool; on 26 April, tree frog eggs were discovered in the pool. Larvae developed slowly, likely due to the low temperature of the water, and transformation had not been observed by 29 June 2006. These frogs were heard calling at several sites off of the hatchery grounds, and were also found breeding in a spring-fed pond on Carol Sather's property; tadpoles observed there on 11 July 2006 were beginning metamorphosis.

Pacific tree frog: green form (dorsal view)

REPTILES

Lizards

Southern alligator lizard (*Elgaria multicarinata*)

The subspecies of this medium-sized (to almost 6 inches body length) lizard which occurs in Oregon and Washington is the Oregon alligator lizard, *Elgaria multicarinata scincicauda*. This subspecies is generally some shade of olive-green, brown or reddish-brown above, with offset black bands along its back; on the lizard's sides, these bands are bordered posteriorly with white. Its belly is generally light gray; it has a large head (particularly in males), which is often partly or completely greenish-yellow. The eyes of this species are usually bright yellow. The presence of a long (to twice the length of the body, if unbroken) tail completes the appearance of this lizard.

Southern alligator lizard (*Elgaria multicarinata*)
Above: Adult female (side view)
Below: Adult female (ventral view)

This is a relatively secretive species, spending most of its time beneath leaf litter or grass, under rocks or logs, or below the soil surface. In Washington, it favors sunny, south-facing slopes, especially those dominated by open stands of oak, or with a large amount of loose or broken rock. The tail is prehensile and sometimes used for climbing; however, as it is easily lost, most lizards have at least part of the tail undergoing some degree of regeneration. It is carnivorous, and feeds on most small invertebrate and vertebrate animals which it encounters. It reproduces via eggs laid in soil or under rocks or logs in mid-summer; these eggs typically hatch by early October.

Southern alligator lizards were found at four sites on hatchery property, and at an additional site on Carol Sather's property. All animals encountered were adults. This species probably occurs across the entire hatchery property, with the exception of dense, shaded forest patches and in cooler sites near water. In these areas, the northern alligator lizard (see below) replaces it as the dominant lizard species.

Northern alligator lizard (*Elgaria coerulea*)

Northern alligator lizard (*Elgaria coerulea*)
Above: Adult (side view)
Below: Adult (dorsal view)

The subspecies of northern alligator lizard found in Washington is the northwestern alligator lizard, *Elgaria coerulea principis*. This species is similar in form to the southern alligator lizard, but is generally smaller (to 4-5 inches body length) and darker in appearance, with a smaller head and coppery-brown eyes. This species is coppery brown, usually with some degree of black mottling, on the back and sides; its belly is pale gray to white.

Although similar to the southern alligator lizard in many aspects of its behavior and microhabitat use (being found under cover or concealed by vegetation on most occasions), this species inhabits a much wider range of habitat types. In Washington and Oregon, it appears to reach its highest densities in areas with a combination of grassy meadows or rocky flats interspersed with tree or shrub cover. However, it is much more tolerant of cool, partially shaded conditions than the southern alligator lizard, and may be found in the moist coniferous forests of western Oregon and Washington, and at high elevations (to 7,000 ft.) in the Cascade Mountains. This lizard gives birth to live young (usually during August), which are gold-colored above and black on the sides. It feeds on a number of small invertebrates, and some specimens appear to be fond of ground beetles and grasshoppers.

Northern alligator lizard (ventral view)

On the LWS NFH, this species was only encountered on the portion of the property north of the bridge crossing to the visitor center; most lizards were found in or around the equipment storage area. This species probably occurs over most of the hatchery property and adjacent lands, to a higher elevation than the southern alligator lizard.

Western skink (*Eumeces skiltonianus*)

The subspecies of this small lizard (2-3 inches adult body length) which occurs in Skamania County is the Skilton skink, *Eumeces skiltonianus skiltonianus*. The typical color form has a brown background with a pair of very light, cream or white-colored stripes running along its sides, from the snout to the base of the tail. A thick black stripe also runs along each side, between the light stripes. The tail is bright blue, and is easily lost if the lizard is grabbed.

Western skink (*Eumeces skiltonianus*)

The heads of adult males develop a distinct reddish hue during the breeding season. Only two of these secretive lizards were found during the survey: the first was under a large, warm rock atop the ridge just west of the hatchery bridge. The second was removed from the stomach of a road-killed racer found at the construction site of the hatchery's new pond.

Western skink (side view).

That only two of these lizards were encountered is surprising, as they are often easily found where they occur. Preferred habitat in Washington consists of open, south-facing slopes, particularly in areas of open oak woodlands. Within these areas, they are usually found beneath rocks or logs. All of the oak habitat within hatchery boundaries, as well as the area around the hatchery complex, has the potential to support the western skink.

Western fence lizard (*Sceloporus occidentalis*)

The subspecies of western fence lizard found in Skamania County is the northwestern fence lizard, *Sceloporus occidentalis occidentalis*. This medium-sized lizard (to about 3.5 inches body length) has a distinctively "rough" appearance, resulting from the presence of pointed, keeled scales on its sides and back. (It is the only lizard found on LWS property with strongly keeled scales.) Above, western fence lizards are generally some form of brown, typically with longitudinal rows of light-edged dark blotches. Adult males often have blue spots on their back. Beneath, this reptile may range from white or off-white to almost black; two large blue patches on the sides of its abdomen give it the common name "blue-belly". A third blue patch is present on the animal's chin; these patches are generally darker in males and lighter in females.

Western fence lizard (*Sceloporus occidentalis*)

Top left: Adult male (underside)
Bottom left: Recently hatched juvenile
Top right: Young adult male (underside)
Bottom right: Young adult male (dorsal view)

This species is distinctively diurnal and feeds on almost any small animal (mostly insects) it can catch. It reproduces by means of eggs, which are laid in soil or under cover (such as a rock or log), in a sunny area; young lizards, an inch or less in body length, emerge in about two months. In the vicinity of the LWS NFH, eggs are probably laid from late May through mid-June.

Western fence lizards were the most widespread reptile species encountered (see map – Appendix A); they were found across most of the hatchery property. In particular, this species was most frequently observed along the Little White Salmon River in the vicinity of the hatchery (from the bridge to the visitor's center to the area around the Office Springs, and up the hill to the Cook-Underwood Road). Fence lizards were also observed along the Cook-Underwood Road in several locations, as well as on the Chenowith bench and on Carol Sather's property.

Snakes

Rubber boa (*Charina bottae*)

Rubber boa (*Charina bottae*)

This small (to 2 feet in total length), thick-bodied snake is characterized by a small head and blunt tail. One of only two members of the boa family native to the United States, it ranges in color from chocolate brown to olive green dorsally; the ventral surface of this snake is typically yellowish in color. This snake is quite slow-moving and spends the majority of its life underground, where it feeds on small rodents, often robbing nests. Lizards and small snakes of other species have also been reported as prey. Two specimens of this secretive snake were found during the study. Both were underneath rocks atop the oak-dominated ridge just west of the bridge to the hatchery's visitor center. This snake probably occurs across most of the hatchery property and adjacent areas, although its secretive habits make it difficult to observe. Highest densities of rubber boas are usually found around open, south-facing grassy or rocky areas. Like several of the other snake species mentioned here, the rubber boa may be found most easily during the spring (see account for California mountain king snake).

Rubber boa (ventral side), next to freshly shed skin

Ring-necked snake (*Diadophis punctatus*)

Subspecies in our area: Northwestern ring-necked snake, *Diadophis punctatus occidentalis*. This is a small, secretive species, usually 1.5 feet or less in total length. It is the most attractively colored snake in the study area: steel-blue above with an orange

Ring-necked snake (*Diadophis punctatus*)

Left: Note coiled tail (defensive display)

Middle and right: Ventral views, showing brightly colored underside

band behind their heads, ring-necked snakes have bright orange bellies flecked with black dots. The underside of the tail is red, and is coiled and thrust upward when the snake is disturbed, exposing the vivid coloration to a would-be predator. This coloring is thought to warn that the snakes are toxic if ingested.

Ring-necked snakes are known to eat earthworms, slugs, and small amphibians and reptiles (salamanders, lizards, and snakes). It is the author's experience that adult ring-necked snakes from western Oregon and northern California prefer young of the northwestern garter snake (*Thamnophis ordinoides*) as prey, along with plethodontid salamanders and small lizards. Small prey items are consumed alive; larger prey are subdued via the use of a mild venom, which the snake "chews" into its prey via enlarged rear teeth. While this venom may not actually kill the prey animal, it typically slows it enough to permit swallowing.

This snake was found at only two sites on LWS NFH property: at the east edge of the field just north of the employee housing on the LWS hatchery grounds, and atop the oak-dominated ridge just west of the bridge to the hatchery's visitor center. Like the rubber boa, the ring-necked snake probably ranges across most of the hatchery property, occurring in highest densities in areas of open rocky and grassy areas and being least abundant under the closed canopy of coniferous stands. This snake is another species which spends much of its time under cover and is most easily found in spring (see California mountain king snake account).

Ring-necked snake: several individuals from under rocks on oak hill near visitor center. Note distinct neck ring.

Racer (*Coluber constrictor*)

The subspecies of racer which occurs in Washington is the western yellow-bellied racer, *Coluber constrictor mormon*. Racers, which reach a maximum length of about 3 feet in the vicinity of the LWS NFH, are usually blue, grey, or brown above, with a white chin and a bright yellow belly. This is a fast-moving, diurnal species which actively hunts its prey. This snake feeds on just about any animal it can catch, including insects, other reptiles, and small mammals. Prey is not killed before it is eaten; rather, this snake immobilizes prey with its jaws and occasionally a loop of its body, then swallows it alive.

Preferred habitat for this species in western Oregon and Washington consists of open, grassy or brushy fields, particularly those with an abundance of burrowing rodents. These snakes also like rocky areas adjacent to grassy hills and fields. Like several of the other snake species in the area, racers often use a communal den site for overwintering. These snakes are egg-layers, and frequently use abandoned rodent burrows as areas in which to deposit their eggs.

Racer (*Coluber constrictor*)

Racers were found at four locations on hatchery property, as well as on Carol Sather's property. Hatchery locations consisted of: the construction site of the new hatchery pond, the edge of Drano Lake just south of the construction site (not marked on Appendix A map), the east edge of the field just north of the employee housing on the LWS hatchery grounds, and the rock wall along the north side of the field on the opposite side of the Cook-Underwood Road from this location (see Western Rattlesnake account). Based on these observations, it is likely that racers occur across most of the LWS NFH property, with highest densities expected in the vicinity of the open, grassy patches associated with oak woodlands.

California mountain king snake (*Lampropeltis zonata*)

The subspecies of this snake which occurs in Washington is currently considered to be an intergrade between the St. Helena mountain king snake, *Lampropeltis zonata zonata*, and the Sierra mountain king snake, *L. z. multicincta*. This snake has a very distinctive appearance: it is ringed with a series of white, black, and red bands, which cause it to resemble a coral snake.

California mountain king snakes, along with ring-necked snakes and rubber boas, are secretive animals which spend much of their life underground. Preferred habitat in Washington consists of open stands of oaks on exposed, grassy hillsides, especially in the vicinity of small streams. Within this habitat, they may be found most frequently in rocky areas with numerous crevices, under logs, and along stream canyons in hot weather. In Washington, this species is only known to occur in Skamania and Klickitat counties.

California mountain king snake, *Lampropeltis zonata*

Like several of the other species mentioned here, the best time to find the mountain king snake in the vicinity of the LWS NFH is in May or June. Optimal conditions are when daytime temperatures first begin to reach the upper 70s ^{o}F or higher, and the surface of the soil begins to warm up but still retains some moisture. During these times, the snakes may be found beneath rocks warmed by the sun, particularly those on south-facing oak hills. As the season progresses and daytime temperatures rise, these surface habitats become quite hot during the day and dry out underneath. At this point, the snakes in the vicinity of the hatchery appear to venture deeper into the rocks, especially during the day and in hot weather. They may emerge at night to pursue prey or find water. The California mountain king snake is known to eat lizards, other snakes, and small mammals. Prey is killed by constriction. This species, like the racer and ring-necked snake, lays eggs.

Due to their secretive nature, these snakes are often difficult to find, even though they may be quite abundant in suitable habitat. Only one of these snakes, a small male, was found alive during the survey. It was discovered under a large rock atop the oak-dominated ridge just west of the bridge to the LWS visitor center. However, three additional observations of this species were recorded during the study. Two of these consisted of freshly shed skins, one found under a rock several meters from the location of the live snake, and one found by Mary Stad (USFWS – LWS NFH) in the grass on the loading dock just south of the hatchery's main gate. Both of these skins came from large (>2 foot long) female snakes. The third observation consisted of a road-killed specimen of unknown sex, found by Speros Doulos (USFWS – LWS NFH manager) at the point where the Office Springs Creek crosses the Cook-Underwood Road.

Because of the distinctive appearance of this snake, it is less likely to be misidentified than are others in the area. Furthermore, as many people think it to be a venomous coral snake, sightings are more likely to be remembered. A number of sightings of this species were reported by various individuals, including Larry Leighton and Peter Long (USFWS – LWS NFH), Gary Orr (WDFW), and several fishermen.

These sightings were made from the Office Springs collection pool south to the junction of the hatchery road with Highway 14, and included several points along the shore of Drano Lake. One fisherman reported seeing a coral snake on the peninsula east of the entrance of the LWS into Drano Lake proper.

These observations indicate that the California mountain king snake occurs across hatchery property, with highest densities expected in areas of rocky, south-facing oak stands. It is unclear how far uphill this species may occur; present records fall between the Columbia River and approximately Milepost #2 on the Cook-Underwood Road.

Northwestern garter snake (*Thamnophis ordinoides*)

Northwestern garter snake (*Thamnophis ordinoides*): photos depict some of the color forms found on LWS NFH property

The northwestern garter snake is a small to medium-sized snake (1.5 to 2 feet in total length) which is highly variable in coloration. In our area, it is generally brown to black above, with a red, yellow, or tan stripe which runs the length of its back. Ventrally, this snake ranges in color from pale cream to black; its belly may be plain or have a variable amount of spots which range in color from black to red.

The northwestern garter snake was the reptile species most frequently encountered on hatchery property; thirty-two individual observations were made during the course of the study. Most of these consisted of snakes captured under pieces of tin (see below).

These snakes were found in highest densities around the buildings of the hatchery complex, particularly in areas where woods or brushy areas bordered lawns, roads, or water features. This choice of habitat reflects the species' feeding habits; their diet appears to consist mostly of soft-bodied invertebrates, such as worms and slugs. As a result, they are found where these prey can be most easily captured, and they often forage under artificial cover objects such as boards, sheets of plastic, etc., which tend to attract their prey. They also use such cover objects as an opportunity to raise their body temperature without exposing themselves to predators. Not surprisingly, these snakes were the reptiles most attracted to artificial cover objects (mostly corrugated aluminum or tin sheeting). These snakes were also found over the widest range of temperature and weather conditions – during hot, dry days as well as on cool, rainy evenings.

Northwestern garter snake (ventral view)

Identifiable prey items were recovered from two of the northwestern garter snakes captured during the study. These included

the introduced African nightcrawler (*Eudrilus eugeniae*), and an introduced slug (*Arion circumscriptus*). Prey is not killed before being eaten, but is consumed alive.

Northwestern garter snakes in Oregon and Washington may hibernate singly or in communal dens; the latter habit appears to be more common at higher elevations and east of the Cascades. How the garter snakes of the LWS NFH spend the winter is unknown.

Western terrestrial garter snake (*Thamnophis elegans*)

Western terrestrial garter snake

The subspecies of the western terrestrial garter snake found in the vicinity of the LWS NFH is the wandering garter snake, *Thamnophis elegans vagrans*. This is a medium to large garter snake (to just under three feet total length in the survey area) which is generally olive-brown to gray above, with a yellowish stripe down the center of the back. In the survey area, the sides of this snake may bear large black blotches in alternating rows, giving it a "checkerboard" appearance, or they may be plain tan or olive, with almost no spotting at all. It feeds on almost any small animal it can catch; favorite prey includes amphibians, fish, and small mammals. Prey are generally swallowed alive.

Western terrestrial garter snake (*Thamnophis elegans*)

At the LWS hatchery, this snake was only found along the Little White Salmon River and along the shore of Drano Lake, from the bridge to the visitor center downstream to the "old-timer's beach", several hundred meters north of the island. All but one of these snakes were found as they were foraging along the water's edge, even on cool and windy days.

Western rattlesnake (*Crotalus viridis*)

The subspecies of western rattlesnake which occurs in Skamania County is the Northern Pacific rattlesnake, *Crotalus viridis oreganus*. This is a medium-sized (to about 3 feet in the vicinity of the LWS NFH), heavy-bodied snake which is highly variable in coloration. The most common form is tan or light brown, with a series of darker brown dorsal blotches; the underside is typically light grey, brown or straw-yellow with dark spots. However, this snake may also occur in a greenish

Western rattlesnake (*Crotalus viridis*)

Western rattlesnake – ventral view

form, a melanistic (black) form, and a very pale, "sandy" tan or grey. This variation in appearance often leads people to believe there is more than one species of rattlesnake in their area, but *C. v. oreganus* is the only rattlesnake that occurs in Washington State.

Rattlesnakes feed primarily on mammals, and have several physical adaptations, including heat-sensitive facial pits, which allow them to efficiently hunt rodents and other small, warm-blooded animals. Prey is killed by envenomation.

Western rattlesnake. Note large bulge in body, indicating that snake has recently fed.

In the vicinity of the LWS NFH, the annual cycle of a rattlesnake is generally as follows: winters are spent in a communal den, which typically consists of crevices in a rocky outcrop or wall which are deep enough to allow the snakes to escape freezing temperatures. Following emergence in the spring, rattlesnakes may remain in the area of the den for several weeks. Mating typically takes place several weeks after emergence. Individual snakes then disperse out into the habitat in which they will spend the active season (typically areas of high rodent populations, usually with some sort of rock feature nearby). They spend the next several months feeding; young are usually born in the fall (September), at which time the snakes find their way back to the den to overwinter. Den sites may be shared with other species of snakes, including (in this area): rubber boas, racers, ringneck and sharptail snakes, and garter snakes.

Western rattlesnake, in grass beneath an open stand of oaks

Rattlesnakes were found at four sites during the study, two of which were on hatchery property. The first of the hatchery sites was at the top of a oak-dominated ridge which paralleled the Cook-Underwood Road just south of the Office Springs Creek. The second was a rock wall which ran along the north side of a small grassy field on the north side of the Cook-Underwood Road just east of its junction with the Indian Access Road. One adult snake and one cast skin were found at the first site; three adult snakes were found at the second.

Close-up of rattlesnake which is preparing to shed; note blue eyes and pale skin.

The two off-hatchery locations at which snakes were found were on Highway 14 at its junction with the hatchery road, and on Carol Sather's property on Chenowith Road. The Hwy. 14 record consisted of a DOR animal >500mm SVL, observed around the first of June by Peter Long (USFWS – LWS NFH). The record for Carol Sather's property consisted of a snake 700-800mm SVL, observed next to her house on the afternoon of 27 June 2006. In addition to this animal, Carol has observed this species on her property numerous times in preceding

years (a total of five observations; for one of these, she has a photo depicting a large [>800mm SVL] adult snake in her yard), and her property includes some areas of excellent habitat for this species.

One of the three snakes captured at the rock wall on hatchery property had just eaten, as indicated by a large bulge in its midsection; based on the size of this bulge, the mass of the prey item was likely equal to or greater than that of the snake. Several scats were obtained from rattlesnakes captured on hatchery property; all contained hair, which was not identified to species.

The observations and sightings reported here indicate that the western rattlesnake occurs across the entirety of the LWS NFH property and on up the hill for a considerable distance, though this distribution is not continous. Rather, the highest densities of these snakes appear to be centered on a few areas having a combination of overwintering habitat (deep, broken rocks on a south- or east-facing slope) and active season habitat (open, grassy or brushy areas with sunny openings). On hatchery grounds, this combination of habitat occurs primarily along the northern side of the Cook-Underwood Road, from the river up the broken, oak-dominated ridge to just north of Milepost #2. A smaller area of suitable habitat is found along the northwest corner of Drano Lake, extending upstream along the Little White Salmon River.

Summary and Discussion

Summary

Fifteen species of reptiles and amphibians were found on LWS NFH property during surveys conducted from the end of April through the beginning of July, 2006. A number of other species were not discovered but have the potential to be present (see Appendix B). The LWS NFH supports a relatively diverse herpetofauna, due to its geographic location and the presence of multiple habitat types in close proximity. This herpetofauna is primarily an upland community, dominated by snakes; in contrast, turtles do not appear to be present on hatchery grounds. Of particular importance to reptile species diversity are the steep, open stands of Oregon white oak on south-facing slopes throughout the hatchery grounds. The abundance of this habitat type on the LWS NFH supports a number of snake and lizard species which are uncommon in (or absent from) other portions of Washington State.

Reptile and amphibian communities

In general, the reptile and amphibian species found on the hatchery can be divided into four main groups, based on habitat preference: an oak woodland group, a stream-dwelling group, a still-water group, and a habitat generalist group. The first group consists primarily of reptiles and contains those species which prefer the open, south-facing areas dominated by oak woodlands (see below). These are the southern alligator lizard, western fence lizard, western skink, ring-necked snake, rubber boa, western yellow-bellied racer, California mountain kingsnake, and western rattlesnake. Several of these species, such as the southern alligator lizard, rubber boa, racer, and fence lizard, may be found in other habitats (e.g., openings in coniferous forests, open fields, and rockslides), but are most abundant where oak woodlands are in relatively close proximity. Other species, such as the ring-necked snake, skink, and kingsnake, are more closely tied to oak habitats in this area. The western rattlesnake prefers open, rocky areas which, in the vicinity of the LWS NFH, are mostly found in the vicinity of steep, south-facing oak stands.

The stream-dwelling amphibian group is represented in the vicinity of the hatchery by the Cascade torrent salamander and the coastal giant salamander. These animals favor cold, highly oxygenated springs and streams. The torrent salamander may also be found in seeps which have a more or less perennial source; in cooler weather and during increased flows, the salamanders are generally found closer to the surface. In warmer weather and under decreased flow conditions, this species often retreats deeper into the substrate. Coastal giant salamanders are more aquatic than the preceding species, and can sometimes be found along the margins of larger rivers and in cold lakes. They may also undergo metamorphosis into a terrestrial form.

The still-water breeding amphibians are poorly represented on LWS NFH property, with only two forms observed (the rough-skinned newt and the Pacific treefrog), though several others have the potential to be present (*see* Appendix B). The absence of most of these amphibians is likely due to the lack of standing water warm enough to support successful development of larvae, as well as a shortage of perennially

moist terrestrial habitat. The apparent absence of the common garter snake from hatchery property is attributed to the scarcity of these amphibians.

The generalist group includes those reptile species which can use a variety of habitats, such as the northern alligator lizard and northwestern garter snake. These species have the ability to exist in areas which are less favorable to other reptiles, such as coniferous forest and the areas around buildings and lawns. To a lesser extent, the rubber boa, western yellow-bellied racer, western fence lizard, western terrestrial garter snake, and western rattlesnake may adapt to a variety of habitats, though most of these (all but the rubber boa) prefer warmer, more open sites than do the northwestern garter snake and northern alligator lizard.

The reptile and amphibian community of the LWS NFH is unique because it represents a transition zone between the distinct communities of eastern and western Washington State. In addition, it includes several species whose core geographic ranges are located farther south (e.g., southern alligator lizard, ring-necked snake, California mountain king snake). The resulting herpetofauna is one of the most interesting and distinctive in the Pacific Northwest.

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Speros Doulos, Nancy Duncan, Joe Engler, Larry Leighton, Peter Long, Dan Magneson, Gary and Lori Orr, Lon, Susan, and Emma Rombough, Carol Sather, and Mary Stad. THANKS, GUYS!!

Photo credits

Gary Nafis generously provided the following photos from his excellent collection: Coastal giant salamander (adult and larva), western red-backed salamander, Oregon slender salamander, Oregon ensatina (adult photo), long-toed salamander (*A. m. columbianum* photo), western pond turtle, night snake, and sharptail snake.

Credit is also due to Alan Barron, for his photo of a Northwestern salamander, and to Bill Leonard, for his photos of a Larch Mountain salamander and a Cope's giant salamander.

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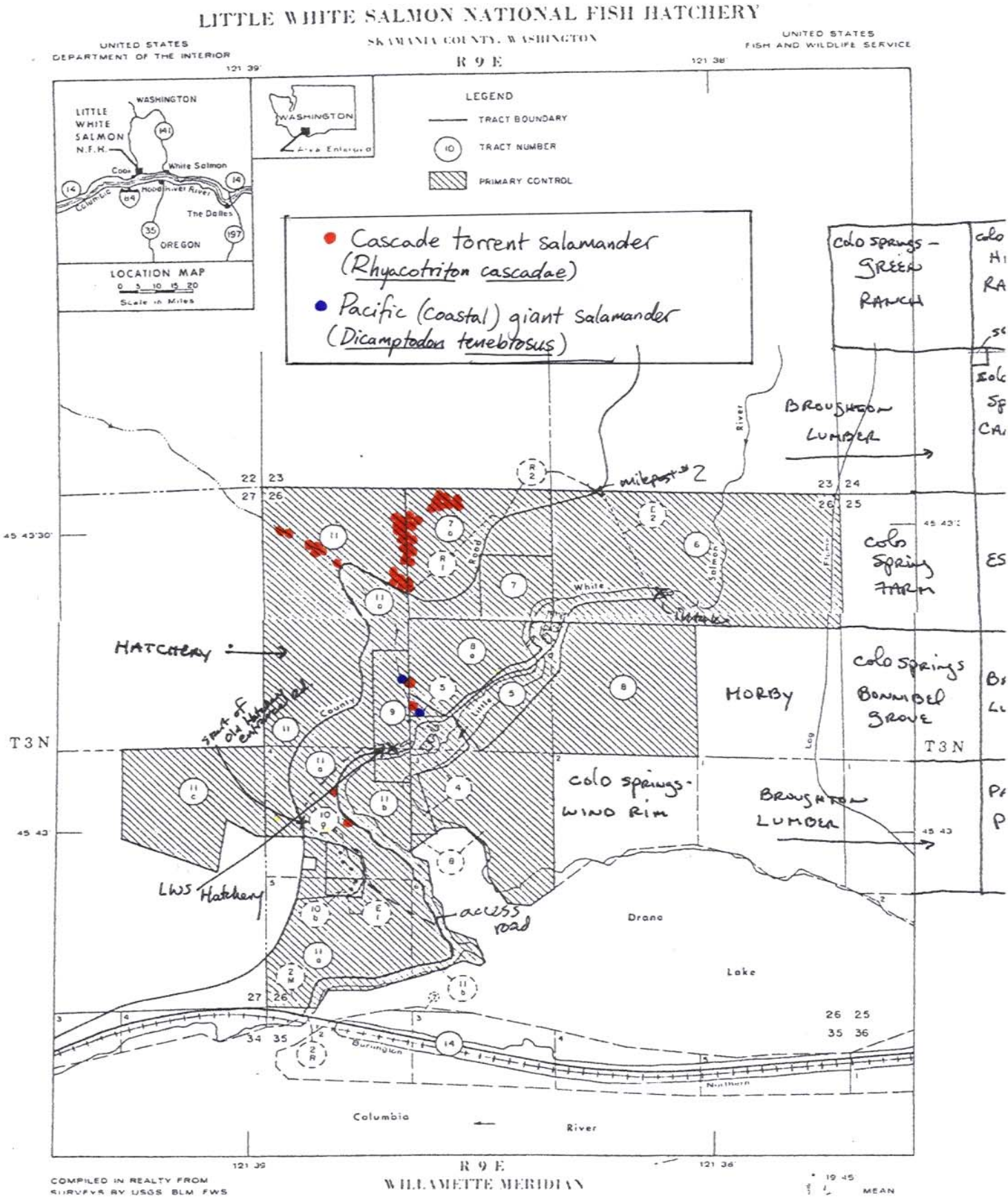
Appendix A.
Distribution of Amphibians and Reptiles on the LWS NFH

The following maps give the locations of animals found during the survey. They show only locations for animals observed prior to 12 July (*see* Table 1); for observations made after this date, see Field Notes.


LITTLE WHITE SALMON NATIONAL FISH HATCHERY
UNITED STATES
DEPARTMENT OF THE INTERIOR
SKAMANIA COUNTY, WASHINGTON
UNITED STATES
FISH AND WILDLIFE SERVICE
R 9 E
121 39'
121 38'
LOCATION MAP
Scale in Miles
LEGEND
TRACT BOUNDARY
TRACT NUMBER
PRIMARY CONTROL
Cascade torrent salamander
(Rhyacotriton cascadae)
Pacific (coastal) giant salamander
(Dicamptodon tenebrosus)
colo springs - GREEN RANCH
BROUGHTON LUMBER
milepost 2
colo spring FARM
HATCHERY
MORBY
colo springs BONNIBEL GROVE
T3N
colo springs - WIND RIM
BROUGHTON LUMBER
LWS Hatchery
access road
Drano
Lake
Columbia
River
R 9 E
WILLAMETTE MERIDIAN
COMPILED IN REALTY FROM
SURVEYS BY USGS BLM FWS
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LITTLE WHITE SALMON NATIONAL FISH HATCHERY

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SKAMANIA COUNTY, WASHINGTON

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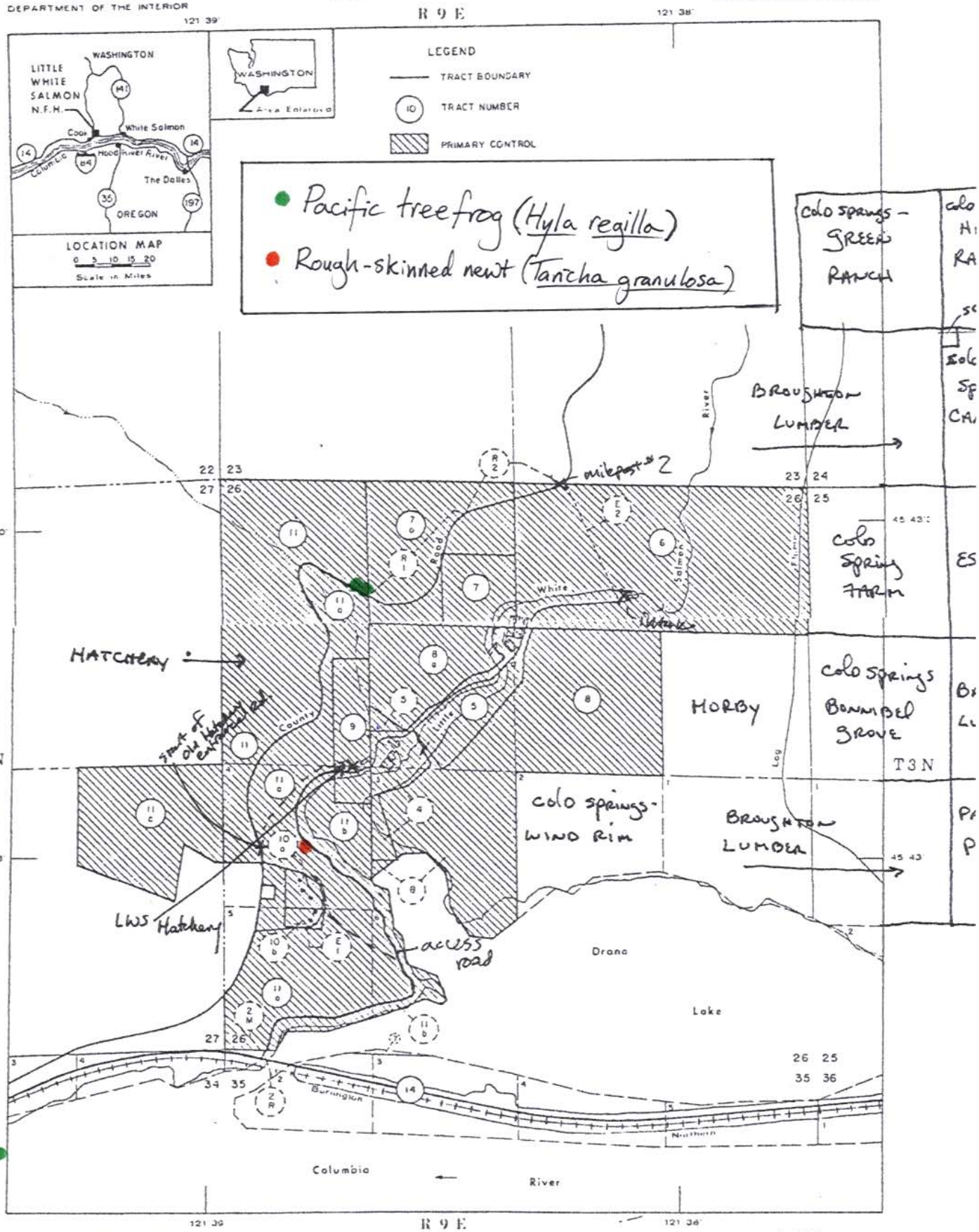

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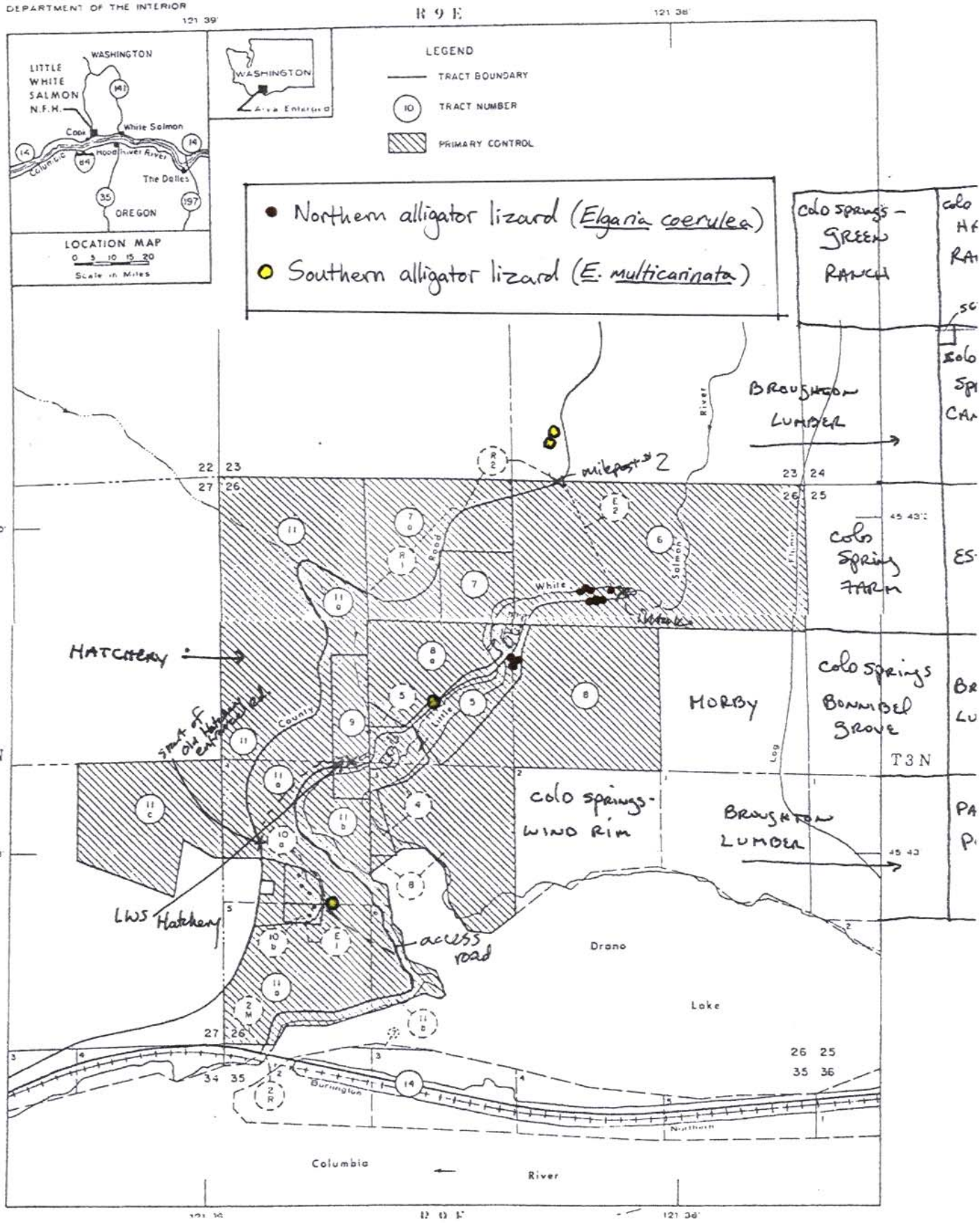

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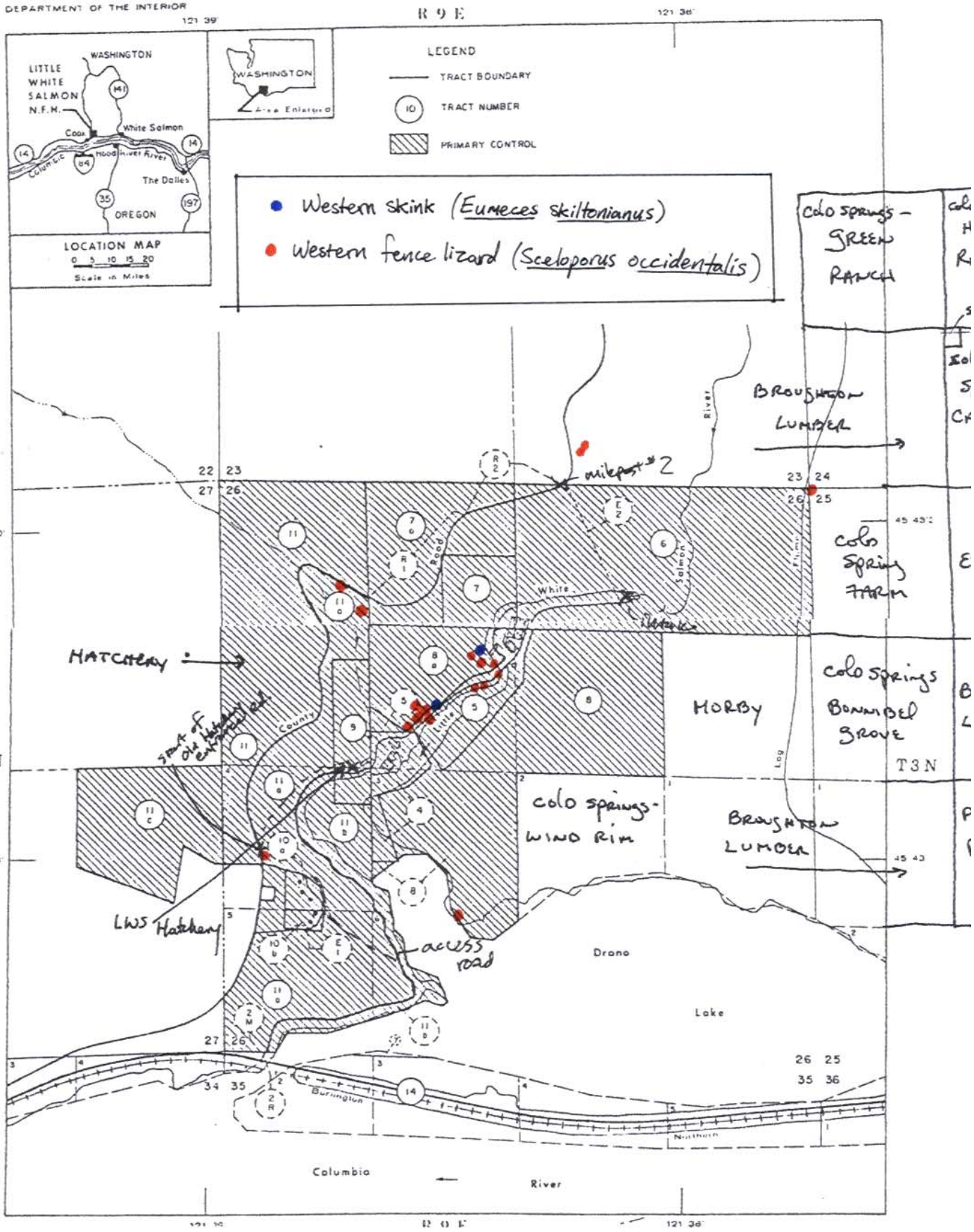

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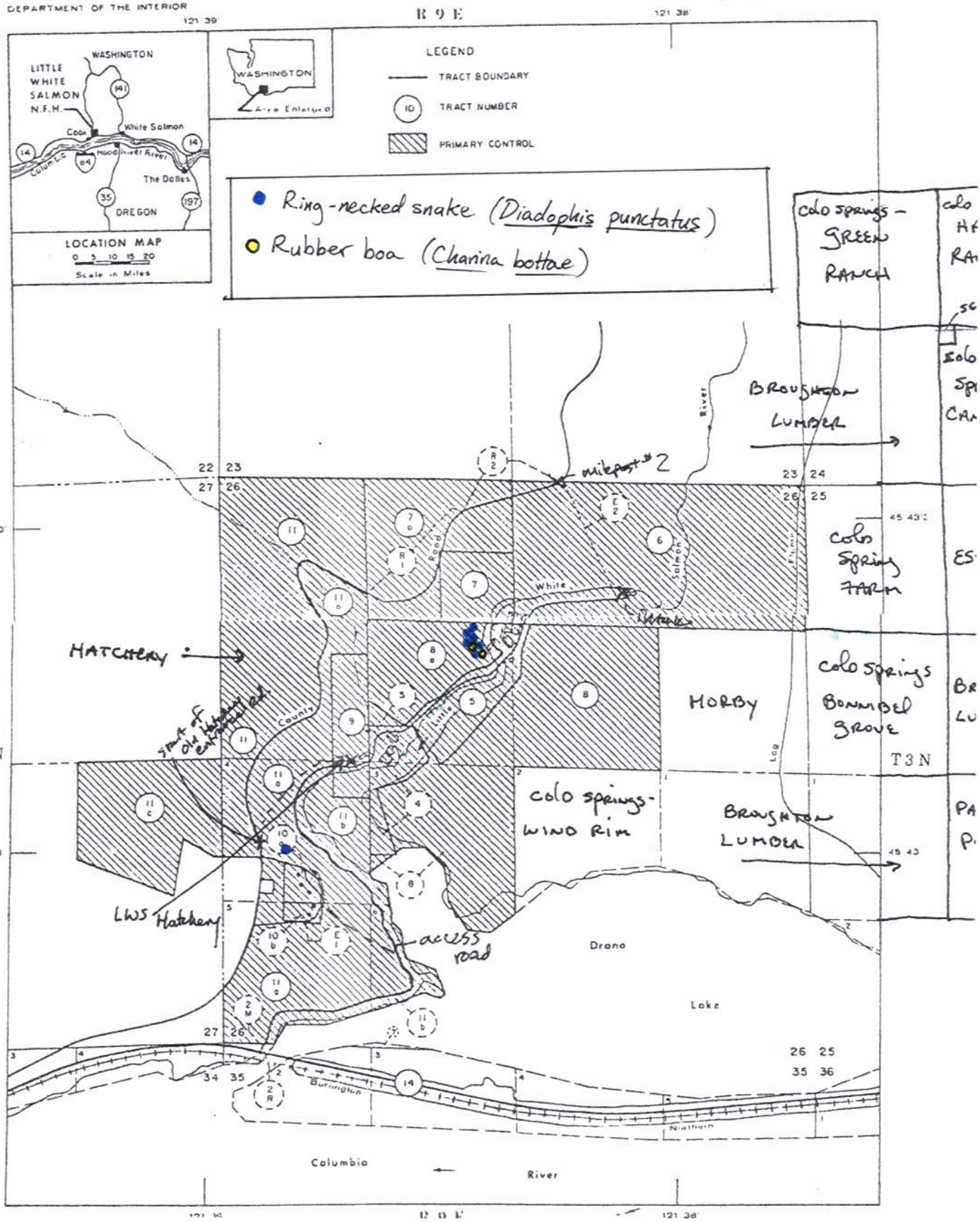

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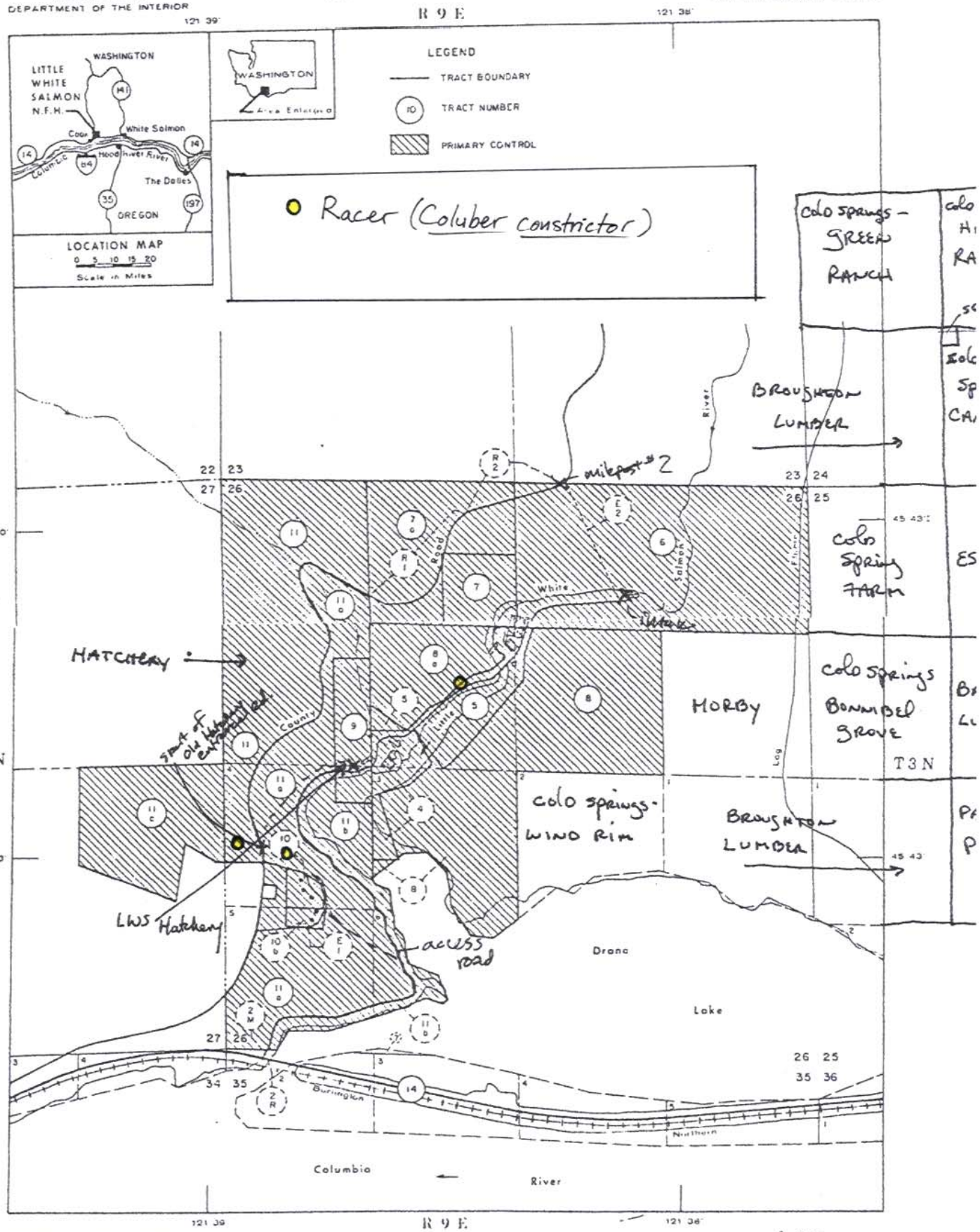

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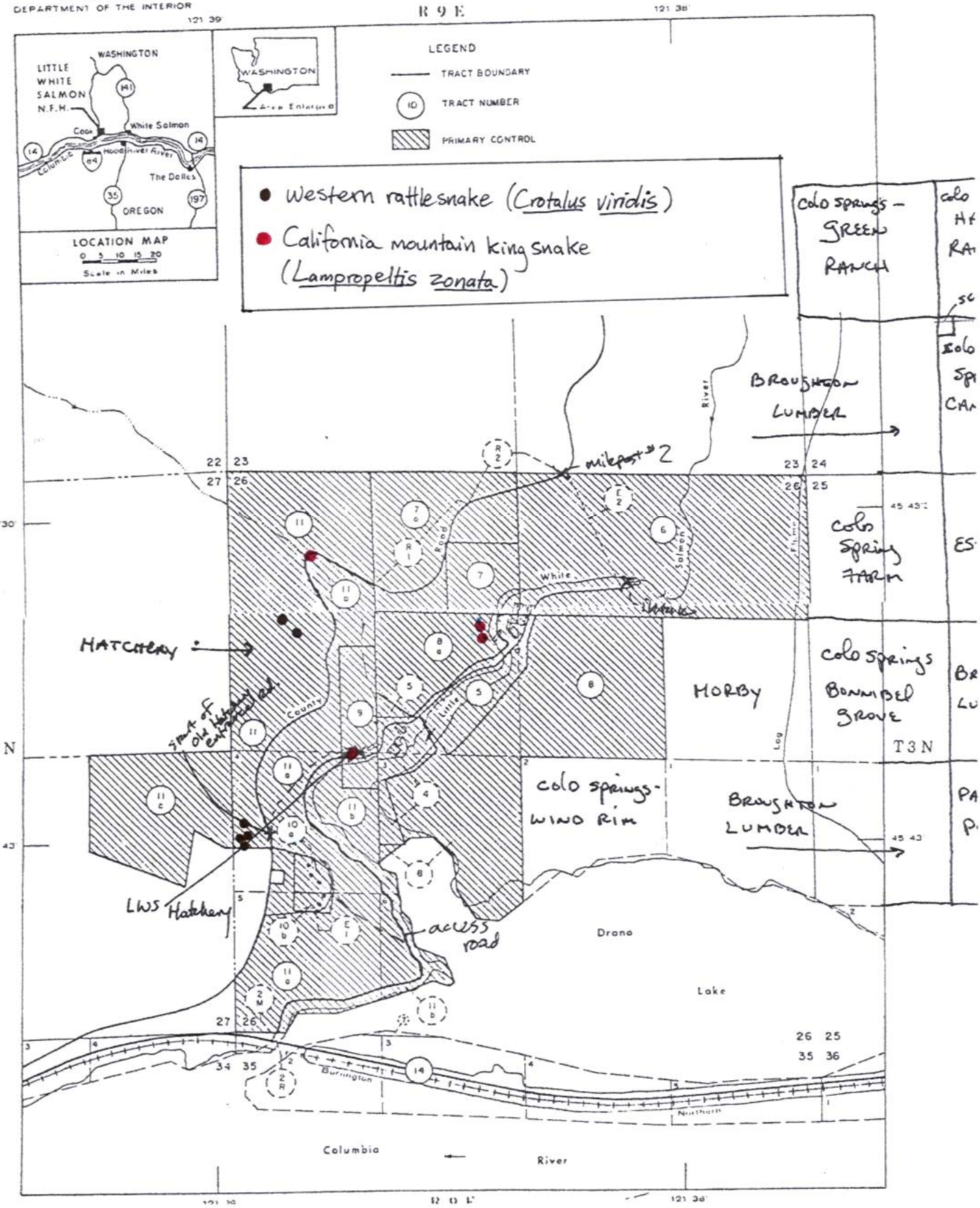

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SKAMANIA COUNTY, WASHINGTON

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Appendix B. Species of possible occurrence

This appendix lists those amphibian and reptile species which were not found on hatchery property during the surveys, but which have the potential to occur in the immediate area, either on hatchery property or within a few miles of the LWS NFH. Effort has been made to include only those species which have the highest likelihood of ocurrence; therefore, species whose range approaches the LWS NFH, but require habitats not found on hatchery or immediately adjacent property (e.g., the northern sagebrush lizard, *Sceloporus graciosus gracilis*, and the pigmy short-horned lizard, *Phrynosoma douglasii*), are not included.

Amphibians

Larch Mountain salamander (*Plethodon larselli*)

A very small (1-2 inches adult body length), light to dark gray (or brownish) salamander with a wide dorsal stripe which is highly variable in color. The stripe is typically some shade of reddish or orange, but may be brown; it is frequently covered with black spots. *P. larselli* has an orange or reddish underside (occasionally, it is semi-transparent or grayish ventrally). This salamander is often found in wet talus, under gravel or rocks near seeps or streambanks, or under woody debris in old-growth forested situations. Because it may inhabit areas which dry considerably during the summer months, forcing the salamanders deep below ground, it is most easily detected during the cool, wet months of the later fall and early spring. It is listed as a sensitive species by the Oregon and Washington Departments of Fish and Wildlife and by the US Forest Service.

Larch Mountain salamander (*Plethodon larselli*)

Although this species was not detected during the survey, there is a distinct possibility that it may occur on the grounds of the LWS NFH, based on the proximity of known populations, combined with the presence of potential habitat.

Western red-backed salamander (*Plethodon vehiculum*)

This small (to 2 inches body length) salamander is another species which inhabits western Oregon and Washington and whose geographic range approaches the area of the LWS NFH. It most frequently occurs with a dorsal stripe which extends from the snout through to the tip of the tail; this stripe is usually red, reddish-orange, or brownish-yellow.

Western red-backed salamander (*Plethodon vehiculum*)

The ventral surface of this species is gray. It favors wet, rocky areas, such as gravel near streams or moist talus, but may also be found under logs or rocks in coniferous or deciduous forest.

Oregon slender salamander (*Batrachoseps wrighti*)

Oregon slender salamander (*Batrachoseps wrighti*)– dorsal view

B. wrighti – ventral view

This is a small (1.5-2 inches body length) and extremely slender salamander, with an almost wormlike appearance. Generally reddish-brown dorsally, with white-flecked black sides, it is found under rocks and woody debris on the ground, under bark on rotten logs, and occasionally in talus. It has only four toes on each hind foot. Although this species has never been found outside of Oregon, populations are known to exist on the south bank of the Columbia River, just opposite the LWS NFH.

Oregon ensatina (*Ensatina eschscholtzii oregonensis*)

Oregon ensatina (*Ensatina eschscholtzii oregonensis*)

A small (to approximately 2 inches body length), brown salamander with a stocky appearance. The legs of this salamander have yellow bands at their base, and the ventral surface of this species is grayish-white and semitransparent; organs may often be seen through the abdominal wall. The base of an ensatina's tail has a distinct constriction; this serves as a breaking point should it be grabbed by a predator (the tail will be regenerated later). This species favors forested habitats; either hardwood or coniferous stands will do, as long as there is sufficient moisture. During the wetter months of the year, when this species is most easily observed near the soil's surface, it is usually found in the presence of woody debris; specifically, in or under rotten logs. To a lesser extent, it may be found under rocks and other types of cover, as well.

Oregon ensatina – juvenile

This salamander is largely restricted to western Oregon and Washington, but has the potential to be found on hatchery property, though such occurrence would likely be fairly limited, as the area included in the survey represents the easternmost portion of the species' Washington range. In addition, little moist terrestrial habitat near the soil's surface is available for this species during the summer months.

Cope's giant salamander (*Dicamptodon copei*)

This relatively large (to about 4 inches in body length) species is quite similar to the coastal giant salamander (*D. tenebrosus*), and co-occurs with *D. tenebrosus* in the western Columbia Gorge. The two species can be differentiated via a number of physical characteristics, including head and gill shape; see Stebbins (2003) for a complete list. Although Cope's giant salamanders apparently metamorphose into terrestrial forms much less frequently than do coastal giants (aquatic adults being much more common in the former species), terrestrial Cope's do exist. Coloration of these forms is similar to that of a terrestrial coastal giant salamander. Although *Dicamptodon copei* was not found on hatchery property, it is known to occur nearby, and there is a distinct possibility that it may be found on LWS NFH grounds under more intensive searches of the available stream habitat.

Cope's giant salamander (*Dicamptodon copei*)

Long-toed salamander (*Ambystoma macrodactylum*)

Two subspecies of long-toed salamander occur in the Columbia Gorge, in the vicinity of the LWS NFH: the western long-toed salamander, *Ambystoma macrodactylum macrodactylum*, and the central long-toed salamander, *A. m. columbianum*. This is a small (to about 2.5 inches body length), secretive species which spends most of the year below ground, in root channels, rodent burrows, under rocks and logs, etc. It is black or dark grey in appearance, with a wide yellowish-brown or green to bright yellow dorsal stripe which runs the entire length of the animal's body, from snout to tail-tip. It breeds in still water, early in the spring (commonly from late January to early March in western Oregon and Washington). This species, though not found during the survey, has the potential to occur on the grounds of the LWS NFH, as it has been found both to the east and west of the hatchery property, and some portions of Drano Lake may provide breeding habitat (though not of high quality) for this species.

Long-toed salamander (*Ambystoma macrodactylum*)
Left: *A. m. macrodactylum*
Above: *A. m. columbianum*

Northwestern salamander (*Ambystoma gracile*)

This medium-sized (to about 4 inches in body length) salamander is a uniform dark brown, and can be identified by the presence of a large parotid (poison) gland on each side of its head. The subspecies of northwestern salamander which occurs in the Columbia Gorge is the brown salamander, *Ambystoma gracile gracile*. This species is similar in habitat requirements to the long-toed salamander, and has the potential to be present on the grounds of the LWS NFH for the same reasons as the long-toed salamander. The northwestern salamander breeds later in the season than the long-toed salamander, typically from late February to April in western Oregon and Washington. A single large egg mass, with very stiff jelly, is laid around a stick or other sturdy brace (e.g., a cattail stem) in relatively deep (20 to 60+ cm water depth), still water.

Northwestern salamander (*Ambystoma gracile*)

Northern red-legged frog (*Rana aurora*)

The northern red-legged frog is one of the largest frogs native to western Oregon and Washington. To 4 inches in total length, it is brown above and grey-white beneath, with some degree of reddish coloration on the underside of the hind legs (in large animals, the reddish color may extend onto the posterior part of the abdomen and onto the front legs). Largely terrestrial in nature, this frog is generally an animal of cool, moist forests, although it requires standing water (preferably, in areas receiving partial to full sun) for breeding. This species was not observed during the survey, but has been found to the east (at Conboy Lake NWR), and has the potential to be present on hatchery property. The only suitable breeding habitat for this species on hatchery property is Drano Lake; however, like the western toad (see below), red-legged frogs may move long distances from their breeding sites. If present on the LWS NFH grounds, it would almost certainly be restricted to the vicinity of cool, shaded streams during the warmer summer months.

Northern red-legged frog (*Rana aurora*)

Above: Adult female – side view
Below left: Adult in streamside habitat
Below right: Adult male

Western toad (*Bufo boreas*)

Western toad (*Bufo boreas*)

This fairly large anuran (to 5 inches body length) is quite variable in coloration, ranging from light grass-green to black; the most common color is brown. Most western toads have a distinct, yellow-green stripe running down the center of their back, and are a mottled grey ventrally. The subspecies of western toad which occurs in Washington State is the boreal toad, *Bufo boreas boreas*. Although no toads were found during the survey, they are known from sites both west (including Pierce NWR) and east (including Conboy Lake NWR) of the LWS hatchery. Furthermore, western toads are better adapted to dry upland habitats (such as those found around the LWS NFH) than are most other native anurans. While the only habitat on hatchery property capable of supporting toad reproduction is Drano Lake, toads are able to travel long distances from breeding sites and could thus be present even if they were spawned at a location outside of hatchery property. Toad tadpoles are small (usually an inch or less in total length) and jet black; they typically form large schools in shallow water. Adult toads are usually nocturnal during warm months and can sometimes be found around lights at night.

Western toad – top view

American bullfrog (*Rana catesbeiana*)

This frog, the largest in our area, may reach a body length of over 7 inches. Introduced from the eastern United States, it has been naturalized in many areas of Oregon and Washington. Bullfrogs are generally some form of green or greenish-brown

American bullfrog (*Rana catesbeiana*)

Left: Adult male
Right: Adult female

above and white below. Males typically have a greenish head, a more-or-less brownish back, and a white belly. They also possess enlarged thumbs, ear openings (tympana) that are larger than their eyes, and a yellow throat. Females are mottled green and brown above and are white with black mottling beneath. Bullfrogs prefer still, warm water with abundant aquatic vegetation. The deep, “jug-o-rum” calls of the males can be heard

throughout the spring and early summer – the breeding season in Oregon and Washington. Tadpoles require an average of two years to complete metamorphosis in this area. Bullfrogs were not detected on the LWS NFH. The only habitat capable of supporting this species on hatchery property is Drano Lake.

Reptiles

Western pond turtle (*Clemmys marmorata*)

This native species appears dull brown from a distance; its carapace (top shell) is usually some shade of brown, while its plastron (lower shell) is usually some shade of yellowish or brown. The legs and head of this species are also yellowish brown. This turtle reaches a shell length of about 8 inches in the Columbia River Gorge. Although this species is known from several locations in Skamania and Klickitat Counties, no pond turtles were observed on hatchery property; however, no surveys specifically targeted turtles. Drano Lake represents the only potential turtle habitat on the LWS NFH grounds, and trapping (either with baited hoop traps or basking traps) may reveal turtles not observed during this survey. The subspecies of pond turtle present in Washington is the northwestern pond turtle, *Clemmys marmorata marmorata*.

Western pond turtle (*Clemmys marmorata*)
Above: Adult – head view
Below: Adult – underside

Painted turtle (*Chrysemys picta*)

This, the second of our two native turtle species, has a greenish-black carapace and a red-and-brown plastron. The legs and head of this turtle are black, with narrow yellow stripes. Maximum size in the Gorge is approximately 10 inches (shell length). This colorful turtle occurs throughout the Columbia River Gorge, but was not found on hatchery property. As with the pond turtle, Drano Lake represents the only suitable turtle habitat on the LWS NFH grounds, and trapping (either with baited hoop traps or basking traps) may reveal turtles not observed during this survey. Because this species is a favored pet, it is often released in areas where it does not naturally occur, and stray individuals may be encountered from time to time. The western painted turtle (*Chrysemys picta bellii*) is the subspecies occurring in Washington.

Painted turtle (*Chrysemys picta*)

Painted turtle – side view

Red-eared slider (*Trachemys scripta elegans*)

This turtle, a native of the southeastern United States, has been introduced into the Pacific Northwest and, as with the bullfrog, naturalized populations occur in some places. Red-eared sliders have an olive-green or brown carapace and a yellowish plastron with black smudges. Their neck and limbs are green or gray with yellow lines, and there is a distinctive red stripe or smudge behind their eyes,from which they get their name (see photo). Maximum shell length in our area is about 12 inches. They prefer warm, quiet waters with abundant aquatic vegetation, but may also be found in slow-moving stretches of rivers. As with the painted turtle, this species is a favored pet, and may be found in unexpected areas. This species is known from the Columbia River Gorge in the vicinity of Washougal (J. Engler, *pers. comm.*).

Red-eared slider (*Trachemys scripta elegans*)

Red-eared slider – underside of adult

Common garter snake (*Thamnophis sirtalis*)

The subspecies of this medium-sized (to 3.5 feet in Washington) snake which occurs in the vicinity of the LWS NFH is the valley garter snake, *Thamnophis sirtalis fitchi*. This snake is distinctively colored: it is black dorsally, with a row of red blotches or vertical stripes along each of its sides, and a yellow stripe down the middle of its back. One of the most widely distributed snakes in the northwest, it favors sunny areas near water, and is usually found in greatest numbers where pond-breeding amphibians (its favorite food) are present. The apparent absence of this species from the LWS NFH was somewhat of a surprise, and is attributed to the lack of amphibian prey. In its place, western terrestrial garter snakes occupy the shores of Drano Lake. The terrestrial garters seem to be more adept at feeding in cooler waters, apparently on small fish.

Because common garter snakes are so widespread within Oregon and Washington, it is likely that a specimen or two may turn up on hatchery property from time to time.

Common garter snake (valley garter subspecies, *Thamnophis sirtalis fitchi*) – adult male

Sharptail snake (*Contia tenuis*)

A small, secretive snake (usually less than 1 foot in length) that is thought to feed primarily on terrestrial mollusks. Although these snakes were not found on hatchery property, a specimen was observed near Willard by Corey Rathgeber on 7 July 2006, who found it crossing the road next to the Mill A School. His description perfectly matched that of a small (ca. 110mm SVL) sharptail snake. This species almost certainly occurs on the grounds of the LWS NFH, and was simply missed during sampling. Like several of the other snake species described above, it is secretive and spends most of its time underground or in rotten logs. The best time to detect this snake on hatchery property would be during the spring, when the soil surface begins to warm but is still moist.

Sharptail snake (*Contia tenuis*) - *Left*: juveniles; *center and right:* adults

Gopher snake (*Pituophis catenifer*)

Two subspecies of this snake occur in the Pacific Northwest: the Pacific gopher snake, *Pituophis catenifer catenifer*; which occupies western Oregon, and the Great Basin gopher snake, *P. c. deserticola*, which occupies eastern Oregon and Washington, and is the form most likely to occur in the area of the LWS NFH. Both are large (to 5 feet in Washington and Oregon), tan to brown snakes with darker blotches dorsally. No gopher snakes were found on hatchery property. Although they are found elsewhere in the Columbia Gorge (increasing in abundance as one moves east), little of their preferred habitat (open, grassy or brushy areas with large populations of burrowing rodents) exists on the LWS NFH. Nonetheless, there is potential for this species to be found in the area of the lower Little White Salmon River.

Gopher snake (*Pituophis catenifer*)

Night snake (*Hypsiglena torquata*)

This small snake (to 2 feet in length) is gray or tan with large, dark brown blotches dorsally; ventrally, it is an iridescent pearly-white. Distinctive characteristics include vertical pupils and paired dark blotches on the nape of this snake's neck. This is a secretive, rear-fanged snake that favors arid habitats, and is particularly fond of areas with rock outcroppings. It feeds heavily on lizards, which it subdues with the use of venom. As it is a particularly secretive snake, and as it has been recorded from a short distance east of the LWS NFH, it is possible that this species may occur on hatchery property.

Night snake
(*Hypsiglena torquata*)

Appendix C. Capture Data

All capture data for the survey period given in Table 1 is provided in electronic format (MS Excel spreadsheet) along with this report.

Appendix D. Field Notes

This appendix consists of printed copies of the notes taken over the survey period listed in Table 1.