Surveys for presence of Oregon spotted frog (*Rana pretiosa*): Background information and field methods

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Executive Summary

The Oregon spotted frog (*Rana pretiosa*) is a highly aquatic ranid that is endemic to the Pacific Northwest. Oregon spotted frogs typically breed in marshes or ponds that lack flow and have extensive vegetation. It has been estimated that the species is extirpated from more than 70 percent of its historic range. Potential threats to Oregon spotted frog populations include hydrological changes, invasive predators such as fish and bullfrogs, vegetation succession, intensive livestock grazing, diseases, and activities that decrease connectivity between populations.

This document is meant to provide surveyors with general background and methods to detect presence of Oregon spotted frogs on public lands. Our specific objectives are to: summarize attributes of Oregon spotted frog distribution, biology and habitat use that are relevant to survey methods; outline strengths and weaknesses of common survey methods as they relate to Oregon spotted frogs; suggest an approach for assessing presence of Oregon spotted frogs based on past field surveys. This document is not a protocol for monitoring trends in frog populations. The survey approaches described herein can be incorporated into a monitoring plan, but the success of such a plan also depends on clearly-stated objectives and attention to statistical concerns.

Thorough Visual Encounter Surveys (VES) are an efficient method for detecting juvenile and adult life stages during summer, when Oregon spotted frogs are most active at the water's surface. We recommend at least two summer VES be conducted at target wetlands to assess presence of Oregon spotted frogs. If both surveys are conducted in favorable conditions and fail to find frogs, but it is determined that the site has potential to host the species (based on proximity to extant or historic frog sites and appropriate habitat conditions), we recommend $\geq$1 survey the following calendar year. We recommend one of these surveys be conducted during the spring breeding season. Spring breeding surveys can be difficult to optimally time, due to a short temporal window and dependence on snow conditions at high sites. However, spring surveys may be particularly valuable at sites where thick vegetation makes summer surveys difficult or where direct confirmation of breeding (rather than just adult use in summer) is a goal.

Quantitative comparisons of survey methods for Oregon spotted frogs are few, and such studies are needed to refine survey techniques. An improved of variation in detection probability of Oregon spotted frog life stages will be helpful, particularly the effects of temperature, season, habitat complexity, and behavioral modifications in response to predators.

Table of Contents

Introduction

The Oregon spotted frog (*Rana pretiosa*) is the most aquatic of the native frogs in the Pacific Northwest. The common name derives from the pattern of black, ragged-edged spots set against a brown or red ground color on the dorsum of adult frogs. Oregon spotted frogs are generally associated with wetland complexes that have several aquatic habitat types and sizeable coverage of emergent vegetation. Like other ranid frogs native to the Northwest, Oregon spotted frogs breed in spring, larvae transform in summer of their breeding year, and adults tend to be relatively short lived (3-5 yrs).

Each life stage (egg, tadpole, juvenile and adult) has characteristics that present challenges for detection. Breeding can be explosive and completed within 1-2 weeks. Egg masses are laid in aggregations, often in a few locations in large areas of potential habitat. Egg masses can develop, hatch, and disintegrate in <2 weeks during warm weather. Tadpoles can be difficult to identify, have low survival, and spend most of their 3-4 months hidden in vegetation or flocculant substrates. Juveniles and adults are often difficult to capture and can spend summers away from breeding areas. Moreover, a substantial portion of extant populations are of limited size (<100 breeding adults), and field densities of all life stages are often low. An understanding of the biology of the species and use of multiple visits are thus important for assessing presence of Oregon spotted frogs.

This report is meant to be a resource for USDA Region 6 Forest Service (FS) and OR/WA Bureau of Land Management (BLM) personnel tasked with surveying for the presence of Oregon spotted frogs. Our objective was to summarize information to improve the efficiency of field surveys and increase chances of detection if frogs are present. We include overviews of historical and extant ranges of Oregon spotted frog. We briefly summarize what is known of Oregon spotted frog habitat associations and review aspects of behavior and ecology that are likely to affect detectability in the field. We summarize characteristics that can help differentiate Oregon spotted frog life stages from other northwestern ranid frogs encountered during surveys. Appendices include examples of data collection formats and a protocol for disinfecting field gear.

PART 1: BACKGROUND INFORMATION

Classification and Description

The Oregon spotted frog (*Rana pretiosa*) was first described from specimens collected in 1853 by Baird and Girard from the general locality of "Puget Sound" in Washington. Until 1997, *R. pretiosa* included two subspecies: *R. p. pretiosa* was considered to occupy the western portion of the taxon's range, and *R. p. luteiventris* occupied a much larger range to the east and north of *R. p. pretiosa*. Subsequently, investigations of allozyme variation in the complex revealed differences substantial enough to recognize two species of spotted frogs that coincide relatively well with the geographic bounds of the original subspecies (Green et al. 1996, 1997). Currently, the Oregon spotted frog (*Rana pretiosa* Baird and Girard, 1853 *sensu stricto*) is recognized to have occurred from southwestern British Columbia into western and south central Washington, through the Willamette Valley and Cascade Range in Oregon, into northeastern California (Green et al. 1996, 1997) (Fig. 1). Spotted frogs from most of eastern Oregon, eastern Washington, and eastern and northern British Columbia (as well as Montana, Wyoming, Nevada, Utah, Alaska, Alberta, and Yukon) belong to a distinct species, the Columbia spotted frog (*Rana luteiventris* Thompson, 1913 n. comb. ; Green et al. 1997). Information on distinguishing spotted frog species from each other and from other northwestern ranids can be found in Leonard et al. (1993), Hayes (1994), McAllister and Leonard (1997), Jones et al. (2005), Corkran and Thoms (2006), and Appendices A and B of this document**.**

Geographic Distribution

Oregon spotted frogs historically ranged from southwestern British Columbia to northeastern California (Hayes 1994, Green et al. 1996). The species once extended from the Fraser Valley in southwestern British Columbia through western and south-central Washington into the Willamette Valley, Cascade Range, and upper Klamath Basin in Oregon (Fig. 1). The southern terminus of Oregon spotted frog historic range appears to lie in the Pit River drainage in northeastern California (Hayes 1994). A map of Oregon spotted frog localities (extant and historical sites) relative to 5th field HUCs (Hydrological Unit Codes; Seaber et al. 1987) is provided in Appendix C.

Oregon spotted frogs can be found with several other native ranid frogs, some of which have life stages that are difficult to identify to species. The range of Oregon spotted frogs overlaps with Cascades frogs (*R. cascadae*) in the central and northern Cascade Range in Oregon and southern Cascades of Washington (Nussbaum et al. 1983, Green 1985). Oregon spotted frogs historically and currently co-occur with Northern red-legged frogs (*R. aurora*) in the Puget Lowlands in Washington and Fraser Valley in British Columbia (Licht 1969, 1974; McAllister et al. 1993). Prior to its apparent extirpation, Oregon spotted frogs probably overlapped extensively with Northern red-legged frogs in the Willamette Valley of western Oregon (Nussbaum et al. 1983, Hayes 1994). Sympatric populations of Oregon and Columbia spotted frogs are not known (McAllister and Leonard 1997).

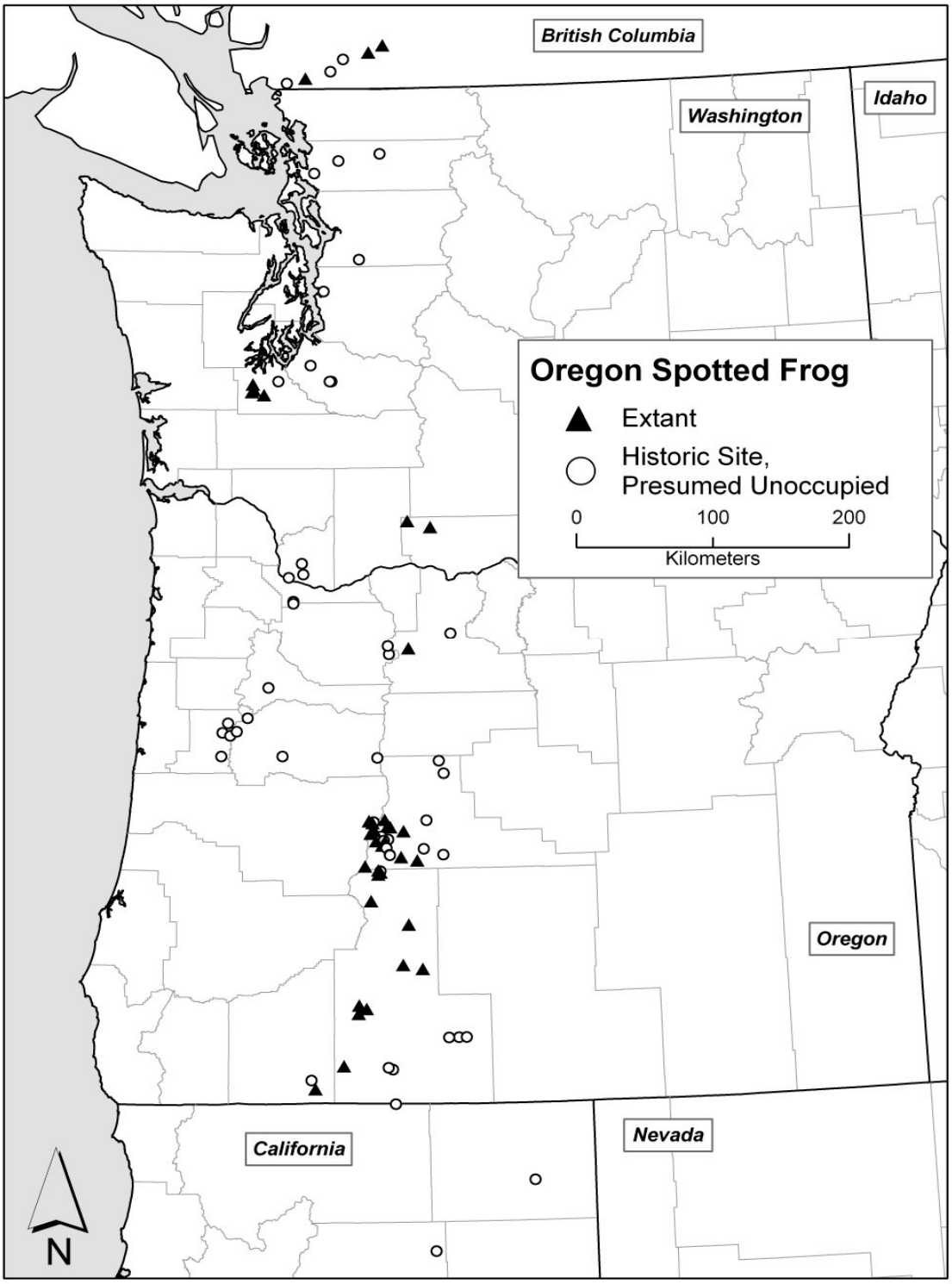

Figure 1. Oregon spotted frog distribution in the Pacific Northwest. Locality data are from McAllister et al. (1993), Hayes (1994, 1997), Haycock (2000). Map is from Cushman and Pearl (2007).

A summary of earlier literature on habitat preferences is presented in Pearl and Hayes (2004). Higher elevations and latitudes appear to limit Oregon spotted frog populations in northern Washington and British Columbia (Fig. 2). The few available records suggest that Oregon spotted frogs may never have been common above 300-m elevation in the northernmost portions of its range. However, surveys in this area have not been comprehensive.

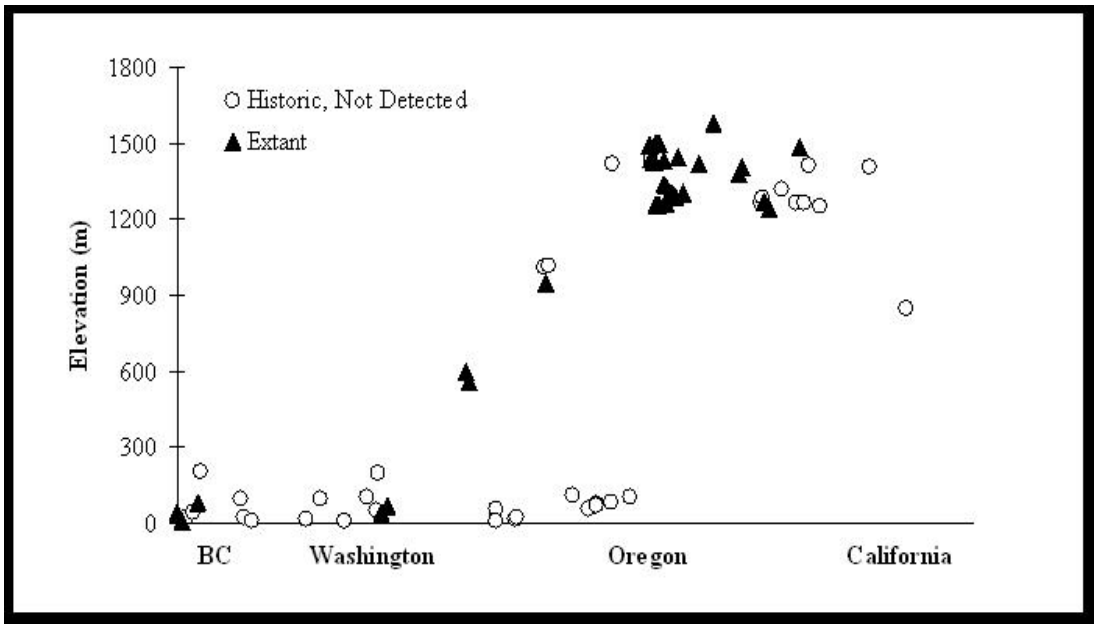

Figure 2. Elevation (meters above sea level) of historic and extant Oregon spotted frog sites across the species' latitudinal range. Figure is from Pearl and Hayes (2004).

Biology and Ecology

Much of the early published work on biology and ecology of Oregon spotted frogs derives from one low elevation population in southwestern British Columbia (Licht 1969, 1974, 1975, 1986a, 1986b). Information on biology of Oregon spotted frogs in Washington State comes from the Puget Lowlands (Watson et al. 2003) and lower elevations of the Cascade Range in southern Washington (Hallock and Pearson 2001, Hayes et al. 2001). Information on Oregon spotted frog ecology and distribution in Oregon is found in Hayes (1994, 1997), Chelgren et al. (2008), and Bowerman and Pearl (2010).

Habitat

Palustrine, lacustrine, and riverine wetlands (per Cowardin et al. 1979) with extensive emergent, submergent or floating vegetation can provide suitable habitat for Oregon spotted frogs (Hayes 1997, Pearl et al. 2009). Wetlands that host Oregon spotted frogs typically receive direct sunlight and encompass or are proximal to deeper, permanent water, including flowing channels or springs. While all Oregon spotted frog life stages are strongly aquatic, habitat-use patterns vary with season. These seasonal differences in habitat use can be pronounced, particularly at higher elevation sites

along the Cascade Range. Habitat use can be separated into three phases based on the Oregon spotted frog's main seasonal activity patterns (Watson et al. 2003, Pearl and Hayes 2004): spring breeding, summer surface activity, and overwintering.

Breeding Habitat

Oregon spotted frogs typically deposit egg masses in aggregations in shallow water that is open to sun (Pearl et al. 2009). Oviposition sites tend to be above gently sloping substrates with herbaceous vegetation such as sedges, rushes, and grasses (McAllister and Leonard 1997, Pearl et al. 2009). Oviposition sites usually lack significant vertical structure; taller vegetation (e.g., cattails, *Typha* spp.) can be nearby and used as cover by male frogs (L. Hallock, pers. comm.). Adults are thought to be philopatric (return to the same general breeding location across years). Actual locations of eggs shift within these regularly used areas based on water depth at the time of breeding. Eggs are generally laid in water <30-cm deep but can be laid in as little as 4-5 cm. It is not unusual to have tops of egg masses exposed above the water surface. Floating mats of prostrate vegetation (e.g., flattened culms of reed canary grass, *Phalaris arundinacea*) can be used for oviposition above deeper water (M. Bailey, pers. comm.). Water-level changes after oviposition can result in egg masses being stranded or inundated by deeper water.

Summer Habitat

After breeding, Oregon spotted frogs often redistribute themselves across a broader summer range. This summer range can include wetlands >0.3 km from the original breeding site (Watson et al. 2003, Chelgren et al. 2008). After relocating to summer habitat, individual adult Oregon spotted frogs often stay within a relatively small area until fall (Watson et al. 2003). In summer, adult Oregon spotted frogs bask and forage near moderate to dense vegetation; deeper pools or flocculant substrates are used by adults as retreats when disturbed (Licht 1986b, Watson et al. 2003). Summer is the season of maximum growth (Chelgren et al. 2008) but also highest predation. Frogs may balance basking and feeding opportunities against vulnerability to predators such as garter snakes (Pearl et al. 2005). The diet of Oregon Spotted frogs at a site in British Columbia included slugs, snails, spiders, crickets, grasshoppers, dragonflies, damselflies, true bugs, beetles, butterflies, moths, bees, ants, and wasps (Licht 1986a).

Winter Habitat

At one wetland complex in Washington's Puget Lowlands, Oregon spotted frogs used a variety of habitats near breeding areas during winter, including vegetated sites that did not freeze (Watson et al. 2003). At higher elevations with harsher winters, Oregon spotted frogs appear to use non-freezing aquatic environments such as springs, channels, beaver runs, and areas of deep water (Shovlain 2005, Chelgren et al. 2008). Telemetry studies at montane sites in Washington and Oregon suggest that Oregon spotted frogs can be active under ice during portions of the winter (Hallock and Pearson 2001; Shovlain 2005).

PART 2: Survey Methods

Overview

Relatively few studies offer quantitative comparisons of field survey methods for Oregon spotted frogs. However, interest in the species has resulted in a large amount of field survey work over the last 10-15 years that helps identify efficient survey options. We briefly address the common survey methods for inventory of ranid frogs and outline our preferred approach for assessing Oregon spotted frog presence. We note that additional work is needed to understand variation in detectability of western ranid frogs including the Oregon spotted frog. We also emphasize this document relates to inventory (investigating species presence) rather than monitoring (investigating trends). The latter generally requires more regular and intensive sampling.

Five survey techniques are commonly cited for ranid frogs: 1) visual encounter surveys (VES), 2) dip netting (usually as a component of VES), 3) calling surveys, 4) funnel trapping, and 5) pitfall trapping with or without drift fences. Pitfall trapping is not advisable for Oregon spotted frogs because it is unlikely to sample such a highly aquatic species and has high potential for frog mortality (Dodd and Scott 1994, Olson et al. 1997). We also do not recommend funnel trapping for inventory work with this species because mortality risk is high and captures can vary markedly with trap location. Calling surveys also are not a reliable method for Oregon spotted frog inventories. Males of this species typically issue calls from below the water's surface that are audible only over relatively short distances (Licht 1969). Their calls can be overwhelmed by wind or choruses of Pacific tree frogs (*Pseudacris regilla*). In addition, the calls can be sporadic and detectable for only short periods. Still, we encourage surveyors to familiarize themselves with breeding calls because this sometimes helps in finding breeding locations within survey sites. Recordings can be found in the field guide by Elliot et al. (2009) and at http://californiaherps.com/frogs/pages/r.pretiosa.sounds.html.

We recommend assessments of Oregon spotted frog presence be based mainly on Visual Encounter Surveys (VES) for juvenile and adult frogs during summer. These can be complemented with VES for egg masses and breeding frogs in early spring. VES are the most common method for ranid frog inventories and have been used for many species and habitats (Heyer et al. 1994, Fellers and Freel 1995, Bury and Major 1997, McAlpine 1997, Olson et al. 1997, Padgett-Flohr and Jennings 2002, Hoffman et al. 2005). We recommend surveyors review VES descriptions that emphasize habitats and ranid frogs of western North America, such as Thoms et al. (1997) and Padgett-Flohr and Jennings (2002).

For all field survey methods applied to aquatic habitats, field gear should be cleaned and sterilized between sites (see Survey Ethics section and Appendix D).

Visual Encounter Surveys (VES) for Oregon spotted frog

Trained multi-person crews should conduct ≥2 summer surveys to assess Oregon spotted frog use at a target site. Summer surveys focus on detecting surface-active juvenile and adult Oregon spotted frogs. If both summer surveys do not detect Oregon spotted frogs, we recommend conducting ≥1 survey the following calendar year, with at least 1 spring survey for egg masses and breeding frogs. Additional surveys may be warranted if weather conditions during the initial surveys were marginal or the site has high potential to host the species. We consider high-potential sites to have the following characteristics:

1) Sites are situated within basins that currently or historically supported Oregon spotted frogs (Appendix C).
2) Sites are hydrologically connected to habitats used seasonally by Oregon spotted frogs (shallow breeding sites; basking and refuge sites during summer; non-freezing waters for overwintering).

Effectiveness should be maximized by optimally timing surveys with respect to local temperature and visibility, and effort should reflect the amount and complexity of the habitat.

Preparation for surveys

Preceding surveys, the field team should familiarize themselves with map and photographic resources and the general conditions, extent, and access of the site. Surveyors should bring copies of maps and photos afield during the field survey, and use these as references to record habitat features and biota. Primary information sources include recent aerial photographs, National Wetland Inventory maps, and USGS Topographic quadrangle maps.

A list of basic field materials is included in Appendix E. Crews should check that instruments are working and have spare batteries and back-up units. In general, waterproof gear is strongly recommended. Proper wading gear and polarized glasses to reduce glare are essential items regardless of the survey timing. Gear for equipment sterilization and rinsing should be taken afield if >1 site is to be surveyed before returning to the office.

Sample data sheets and descriptions are provided in Appendices F (BLM GeoBOB general wildlife survey form), G (USGS Amphibian breeding form), and H (supporting information for breeding surveys). Updated BLM and USFS forms and descriptions are at http://www.fs.fed.us/r6/sfpnw/issssp/inventories/monitoring.shtml

Summer VES for juveniles and adults

Summer VES are central to assessing presence of Oregon spotted frogs. Advantages of summer VES are that the technique can cover large amounts of habitat in a limited time, minimal field materials are required, and surveys can be conducted during a relatively broad temporal window during the summer.

We recommend summer VES be conducted by teams of at least 2-3 surveyors. Large or complex sites require larger or multiple crews. VES should be systematic and thorough: we inspect all littoral zones and near-shore moist vegetation by having surveyors walk roughly in parallel. Surveyor paths can be marked with GPS tracking or drawn on the site map. Multiple passes in a day raise the chance of observing frogs not seen initially. Summer VES are conducted during the daylight hours when frogs are feeding or basking. Habitats with more open water or submergent vegetation can be scanned with binoculars by a 'spotter'. Surveyors should use dip nets to attempt to capture all frogs and tadpoles for identification. For ranid frogs and larvae where identification is questionable, surveyors should take digital photo vouchers (dorsal, lateral, ventral).

Post-metamorphic frogs are generally most active at the water surface during warm, summer days with limited wind. Oregon spotted frogs feed and grow most in summer (Chelgren et al. 2008). Adult female frogs are often the most detectable life stage during the summer: this may be related to feeding and basking as they develop ova for the following spring. Post-metamorphic frogs can be found in a range of microhabitats, but they are most often detected in areas of open canopy with or near standing (rather than flowing) water, emergent or submergent vegetation, and some type of escape refuge (e.g., deeper water, denser vegetation, flocculant sediments).

Figure 3 depicts typical summer locations of surface-active adult Oregon spotted frogs in two ponds in Deschutes County, Oregon. Basking frogs commonly use vegetation that creates a platform away from the pond's edge. Frogs in these locations have access to invertebrate prey that is flying, ovipositing, or swimming near the water surface, as well as deeper water for escape from potential predators (Licht 1986b, Pearl et al. 2005). In these situations, long handled dip nets are helpful to apprehend frogs.

Depending on elevation, surveys conducted between June and mid-September should be suitable for detecting juvenile and adult frogs. Metamorphosis to the juvenile stage is typically complete by mid-August at most Oregon sites (elevations 1270 – 1390 m [4200 – 4600 ft]). Metamorphosis in years of late breeding can occur in late August and even early September at the highest elevation sites (above 1520 m [5000 ft]). The window for detecting post-metamorphic stages of Oregon spotted frog is broader in lowland sites, where transformation to juvenile frogs is often complete by mid- or late-July.

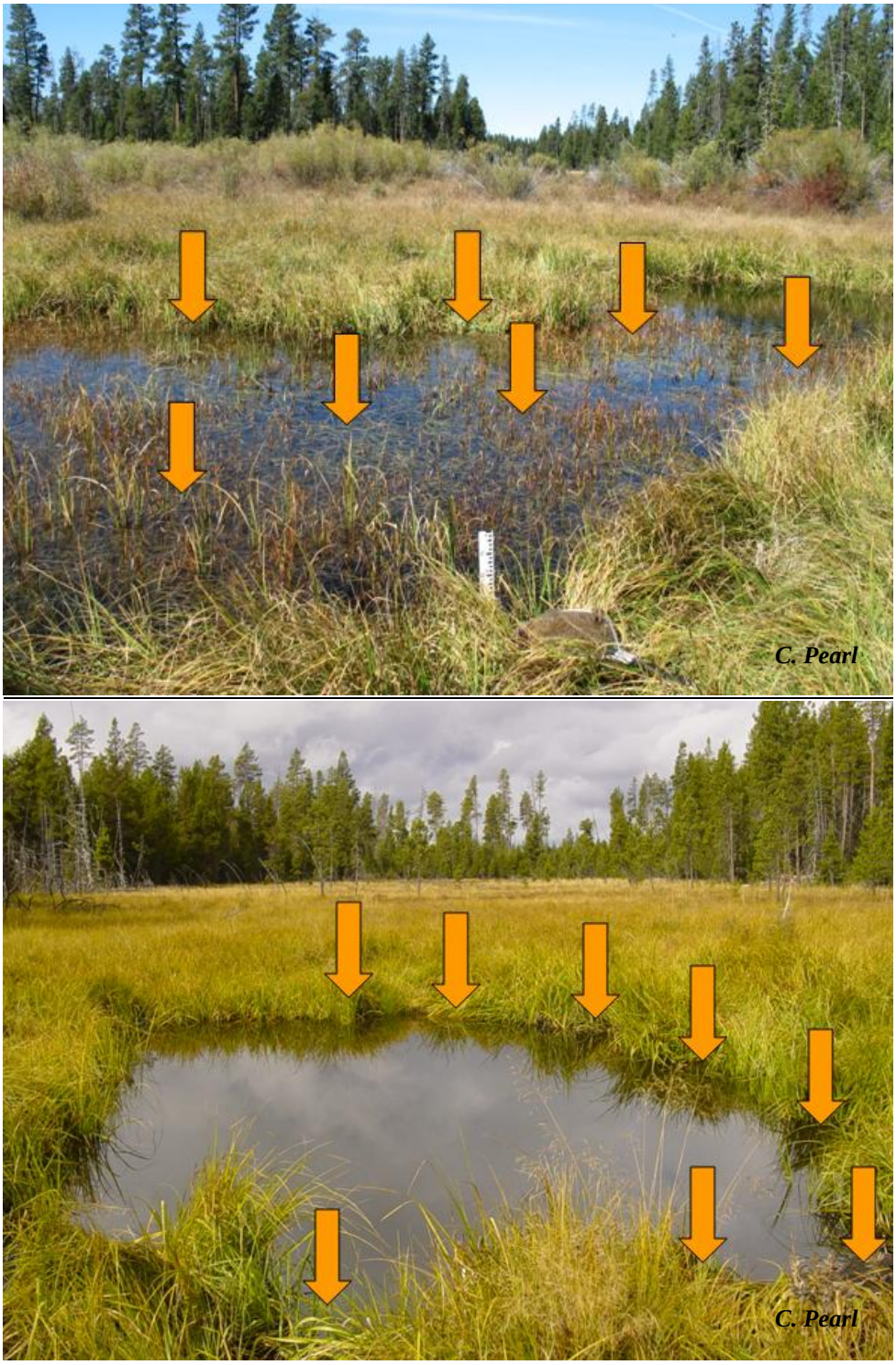

Figure 3. Typical summer locations of surface-active, adult Oregon spotted frogs at two ponds in central Oregon. The pond in the upper photograph is ca. 1.2 m deep and heavily vegetated. The pond in the lower photo is >1.5 m deep and has cooler water over flocculant sediments and algae; macrophytes are limited to periphery.

Summer detection of post-metamorphic Oregon spotted frogs appears to be most likely during warm, sunny days when winds are low or moderate. Surveys on days with exceptionally strong winds or low air temperatures should be avoided. The following temperature guidelines were offered by Hayes (1998):

- average water temperatures of $\geq$20°C [68°F] are adequate for detecting spotted frogs
- average water temperatures of $\geq$16°C [61°F] and <20°C [68°F] are marginal for detecting spotted frogs
- average water temperatures of <16°C [61°F] are inadequate for detecting spotted frogs

Our observations are generally consistent with these suggestions. However, factors influencing detectability of Oregon spotted frogs are poorly known, and there are likely exceptions to these guidelines. For example, at least at one site in Oregon's Klamath Basin, frogs appear most difficult to detect when sun and temperatures are highest on hot summer days (C. Pearl. pers. obs.). We thus conduct at least one survey pass during cooler temperatures in morning or late afternoon on particularly hot days. In addition, at selected spring-fed sites, water temperatures rarely exceed 16°C [61°F] and frogs can be found at surface in much of summer (C. Pearl, pers. obs.).

Oregon spotted frog tadpoles make extensive use of vegetation and flocculant sediments and are often difficult to detect with visual surveys. In some habitats they can be detected as they disturb vegetation and can be captured with dip nets when they escape toward deeper water. Surveyors should sweep the upper layers of sediment because they often seek refuge in detritus or vegetation. Care must be taken to sort contents of the sweep to find larvae without injuring them.

Cautions for summer surveys

- Days with light rain can be suitable for surveys if air and water are sufficiently warm. Because frogs will sometimes use moist vegetation near water, surveyors should expand the search to include these areas during or just after rains or heavy dew.
- Complex habitats, particularly those with relatively dense vegetation, deep water, or extensive flocculent sediments, can reduce detectability and capture success.
- Presence of predators (e.g., sandhill cranes, river otters, invasive bullfrogs) has potential to reduce detectability of Oregon spotted frogs, and should be carefully noted.

Spring VES for breeding frogs and egg masses

Spring breeding surveys can be used to complement summer surveys when assessing presence of Oregon spotted frog. Spring surveys can be particularly useful at sites where dense summer vegetation limits reliability of inspections. An overview of amphibian egg mass surveys can be found at http://www.pwrc.usgs.gov/monmanual/techniques/eggmass.htm

Several limitations of spring surveys make them better as a complement rather than a sole means of assessing spotted frog presence:

1. there can be a narrow time window to detect egg masses
2. rain, wind, and ice can reduce search effectiveness in spring
3. access to snowy, higher elevation sites can be difficult
4. egg masses of Oregon spotted frog can be hard to distinguish from those of congeners (*R. aurora, R. cascadae*), and adults can be difficult to find just after breeding.
5. spring surveys can fail to identify non-breeding sites used by frogs during summer

Perhaps the most significant challenge for conducting breeding surveys is optimizing their timing. In contrast to summer surveys, breeding surveys are best conducted during a short temporal window that can be specific to each site. Ideal timing for egg mass counts is between completion of breeding and hatching and disintegration of egg masses. Initiation of breeding appears to be influenced by timing of thaw and warming water temperatures. Breeding at one British Columbia site started after daily water temperature minima exceeded 6°C (Licht 1971), but frogs at some sites in Oregon can delay breeding days or weeks after this threshold is crossed (J. Bowerman, C. Pearl, unpubl. data; see also Bull and Shepherd (2003) for Columbia spotted frog). Oregon spotted frogs are explosive breeders that can complete breeding in as little as a few days. Eggs can hatch and disperse in 10–15 days if conditions are warm. The window to detect Oregon spotted frogs during spring can be slightly broader than the aforementioned because adults may be visible before oviposition, and hatchlings/egg mass remnants may be visible for a short time after hatching. However, both of these are difficult to rely upon and can be very condition dependent. Care must be taken to get the timing right, and repeat surveys may be necessary.

Table 1 includes information on breeding initiation of Oregon spotted frogs at selected sites in Oregon and Washington. In the Puget Lowlands of western Washington, breeding can begin as early as mid-February in mild winters (McAllister and Leonard 1997; K. McAllister, pers. comm.). In very high snow years in the Cascade Range, surveys can extend into late May or even early June (C. Pearl, pers. obs.).

Table 1. Initiation of Oregon spotted frog breeding in Oregon and Washington. The dates listed are the earliest observed breeding frogs or estimations of first oviposition based on stages of eggs.

Site	Basin	State	Elev (m)	Mean	Early	Late	Num. Yrs	Years
Dempsey Creek [1]	Black	WA	36	24-Feb	16-Feb	5-Mar	13	1996-2009
Trout Lake [2]	White Salmon	WA	595	12-Mar	1-Mar	26-Mar	11	1998-2009
Wood River [3]	Klamath	OR	1243	2-Apr	18-Mar	19-Apr	4	2006-2009
Sunriver [4]	Deschutes	OR	1246	30-Mar	19-Mar	10-Apr	2	2006-2007
Crosswater [4]	Deschutes	OR	1249	25-Mar	14-Mar	6-Apr	2	2006-2007
Parsnip Lakes [5]	Klamath	OR	1340	04-Apr	20-Mar	15-Apr	6	2003-2008

Data are from [1] K McAllister, Wash. Dept. Fish and Wildlife; [2] L. Hallock, Wash. Dept. Nat. Res.; [3] R. Roninger, Bur. Land Mgmt; [4] J. Bowerman, Sunriver Nature Center, [5] M. Parker, Biology Dept., Southern Oregon University

Sizes of survey crews vary with site size and extent of shallows. Small sites such as beaver or oxbow ponds can usually be surveyed by 2-person crews. Larger sites with extensive shallow benches are the most demanding for crew time: enough observers must be used to walk in parallel across the shallows so that fields of view slightly overlap. For example, a site with a 50-m wide band of shallow marsh fringe is probably best surveyed by a team of 5-10 surveyors. We also recommend resurveying these areas on the return trip if possible.

All shallows and shorelines of focal water bodies should be searched. It is important to thoroughly search gently sloping benches that are flooded or have recently flooded (see 'Cautions' section below). Figures 4 and 5 show Oregon spotted frog egg mass locations at three sites in Oregon. These shallow benches can be under ≥60 cm of water during spring breeding in years of high snowfall; standing water is often absent from benches by late August. Shallow bench habitats in some of the larger marsh sites can be expansive, and multiple surveyors walking side-by-side can be required for a thorough search.

Oregon spotted frog egg masses can be relatively easy to find once observers have developed a search image. Egg masses are baseball- to softball-sized and often laid in aggregations in shallow waters that lack cover early in the season. Male frogs can sometimes be found advertising around oviposition sites during breeding season.

A variety of factors can reduce effectiveness of egg mass surveys, including weather conditions (wind, glare), raised or lowered water levels (flooding or stranding egg masses), inability to reach and survey all potential breeding habitat (e.g., due to deep water or crew size), and variation in experience of observers (Grant et al. 2005, Scherer 2008). Survey crews should be familiar with these factors to take measures to account for them. For example, it is worthwhile to gather surveyors together to calibrate search images and discuss searching techniques and areas to be covered. Familiarize the survey group with egg masses in their field context prior to initiating surveys whenever possible.

Figure 4. Oregon spotted frog egg mass locations at two sites in Oregon (2006, 2008).

Cautions for spring breeding surveys

- Observations on thaw rate and water temperature can be useful to gauge the progression of breeding conditions at a target site.
- Egg masses that are stranded above the water line are easily missed. Stranding of masses occurs relatively frequently when water levels recede after eggs have been laid. If evidence of water recession is found, it is worth having one surveyor inspect shallowly sloping areas between the current water level and high water mark. Conversely, an increase in water level can result in egg masses being in deeper water than surveyors typically search or being more likely to drift if eggs float off of substrate with elevated water surface.
- Windy periods after oviposition can cause egg masses to drift from their original locations (Garwood et al. 2007). Chances of this occurring also are likely related to water level increases after oviposition (which can float egg mass aggregations above the substrate).
- Egg masses of Oregon spotted frog can be found above deeper water than is typical where prostrate vegetation forms a shelf above deeper water. This pattern has been mainly noted with reed canary grass, which has rigid culms that can reach more than 1 m in length.
- Some breeding sites can support significant algal growth even in early spring. In these conditions, surveyors should be careful not to miss egg masses that are among algae.
- Oregon spotted frog egg masses are similar to those of Cascades frog and to a lesser extent, Northern red-legged frog. In sites where >1 native ranid may occur and where adults are not found, surveyors should consult identifying keys (Corkran and Thoms 2006; Appendix A of this report).

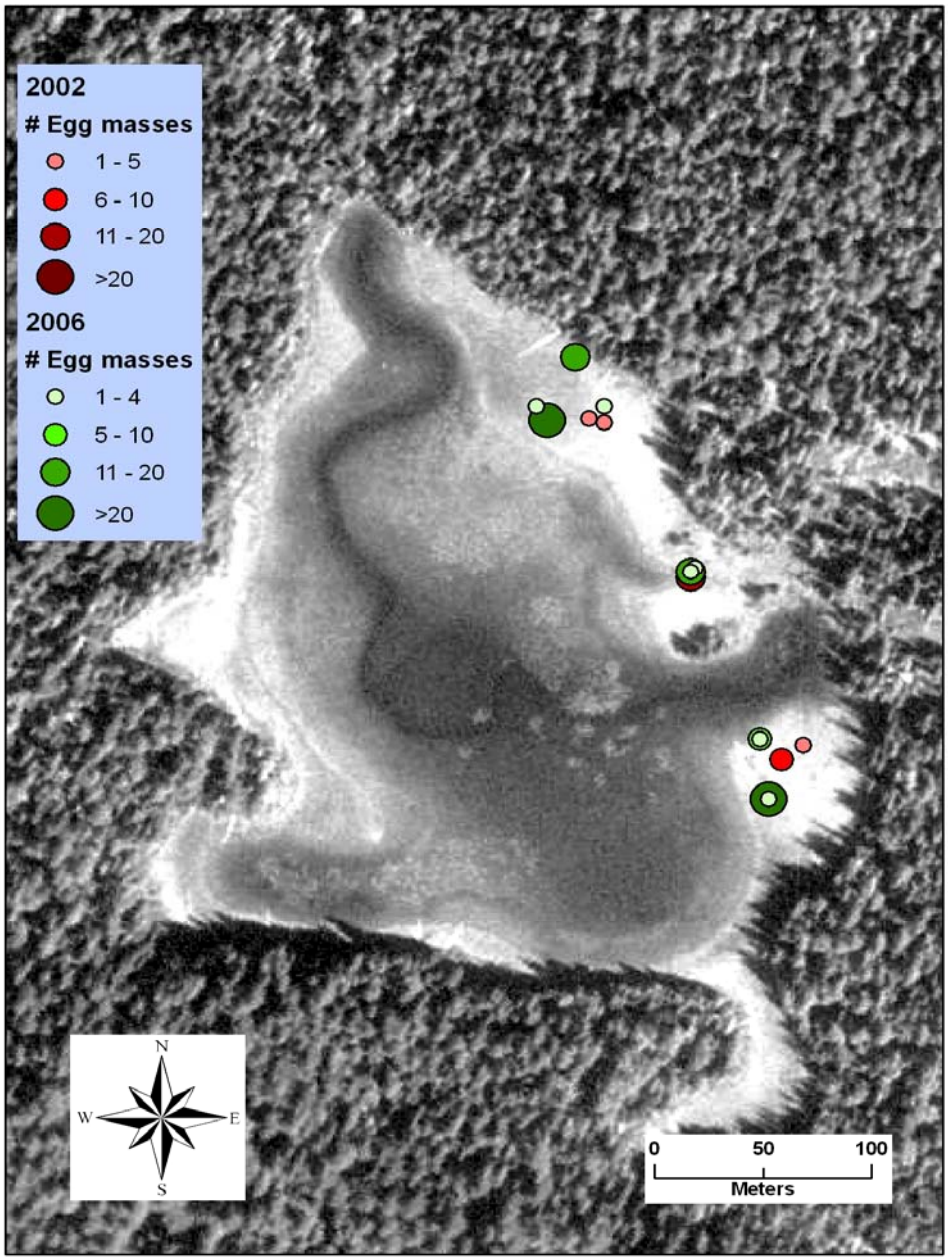

Figure 5. Oregon spotted frog egg mass locations at one breeding site in Oregon, 2002 (red circles and 2006 (green circles).

Field data collection

Data collected during surveys should be recorded either on paper data forms or in to electronic data recorders. Survey locations should be characterized with a Global Positioning System (GPS, latitude and longitude: Universal Transverse Mercator [UTM] grid coordinates, preferably NAD83 datum).

Surveyors on BLM lands should complete the Geographic Biotic Observations (GeoBOB) Flora/Fauna Survey and Observation Forms (example form in Appendix F). Surveyors on National Forest lands can use Natural Resource Information System (NRIS) Fauna Forms. BLM and Forest Service data forms and supporting information should be available at http://www.fs.fed.us/r6/sfpnw/issssp/inventories/monitoring.shtml

Information collected during spring and summer surveys should include the following:

- Names of site, section of site, surveyors. Times of start, finish, and breaks.
- Information on site alterations such as ditching, draining, and impoundments.
- General site location data, notation or maps of access points, and survey routes.
- Air and water temperatures, general weather conditions at survey initiation, midway point, and conclusion. Note time of day for each. Water temperature data are only for coarse assessments of site conditions; because of temporal and spatial variation of water temperatures, it does not provide a definitive link to phenology or activity levels of Oregon spotted frogs (e.g., see Bowerman and Pearl 2010).
- Map illustrations and GPS locations for the extent of the area searched, vegetation types, inundation patterns, and other habitat features that may relate to Oregon spotted frogs (e.g., springs, channels, oxbows, beaver impoundments). Explicitly note areas that were not included in surveys. Having one person walk the perimeter with GPS tracking can provide a geo-referenced polygon of the area searched.
- Photographs of site conditions and amphibians should be linked to datasheet entries that include site name and date. Locations of photographs should be indicated on the site map with a reference number. Photographic vouchers of all ranid frogs are recommended.
- GPS information on any Oregon spotted frog locations; locations should also be indicated on maps or aerial photographs. Also on the map, surveyors should indicate extent of inundation and potential habitat for future searches.
- Information on factors that have potential to reduce detectability of Oregon spotted frogs, such as recent freeze or flooding, presence of predators, etc.
- Species identifications and counts of non-target amphibians and other fauna, including stage, gender, and location. Other fauna such as western toads, garter snakes, sandhill cranes, or beaver may suggest favorable habitat for spotted frogs; presence of bullfrogs, bass, or other fish may indicate less potential to host Oregon spotted frog.

Other examples of datasheets (and supporting information on quantifying habitat attributes) that can be modified for Oregon spotted frog surveys are in Fellers and Freel (1995), Olson et al. (1997), Padgett-Flohr and Jennings (2002), Hoffman et al. (2005), and Graeter et al. (2008).

Documentation and data management

The hard copy file should include documentation of pre-field review, all field survey data, field forms and field notes, maps/aerial photos of survey areas, and any other supporting documentation such as photo vouchers. Systematic Quality Assurance/Quality Control protocols should be followed, particularly during/after field surveys and data entry.

Electronic data entry into a database is crucial for rare species management and status assessments. There are three general categories of information that are collected during BLM/FS species surveys: survey data (information characterizing the survey), detection data (information characterizing site occurrences as well as habitat data), and supporting data (supporting information including photo vouchers).

Locality data for Oregon spotted frogs on USFS lands resides in the Natural Resource Information System (NRIS) Fauna database; data from BLM lands resides in the GeoBOB database. BLM and USFS require data collected from their surveys be entered in a timely manner (i.e., the year it is collected). Both agency databases are equipped to accept non-detection data, so surveys that fail to detect Oregon spotted frogs or other targets should also be entered.

Questions on suitability of databases for surveys on other public lands can be addressed to the Inventory Coordinator at the Interagency Special Status/Sensitive Species Program (ISSSSP), OR/WA BLM & R6 Forest Service, Portland, Oregon.

Safety

Potential Oregon spotted frog habitats can be isolated and a logistical challenge to navigate (e.g., bogs, deep channels, beaver complexes). As with any field work, surveyors should be trained in basic safety measures and familiar with first aid procedures. It is recommended that surveyors work in pairs, be trained in identifying symptoms of hypothermia, wear clothing appropriate to the season or activity (rain gear, non-slip footwear, etc.) and have proper swimming training and instruction for specialized activities such as boat operations. Helpful overviews of safety considerations for field work in aquatic contexts have been compiled by some professional societies (e.g., Professional Safety Committee 2008; http://www.fisheries.org/afs/docs/policy_safety.pdf).

Survey plans can include a Job Hazard Analysis (JHA) or Risk Management Assessment (RMA) for each situation and location as well as tailgate safety sessions prior to initiation of field work. See Appendix I for a sample JHA for conducting fisheries and aquatic surveys. See also Forest Service Safety Handbook FSH 6709.12 and BLM Manual Section MS-1112 for safety procedures and authorities.

Information that would assist in the refinement of surveys for Oregon spotted frog

We only have fragmentary understanding of how phenological, environmental, and biotic factors influence detectability of Oregon spotted frog life stages. Among these information gaps are

1) how weather conditions affect detectability of different life stages
2) how physical habitat conditions affect detectability of different life stages
3) how presence of predators or livestock affect detectability of different life stages

For example, capture probability of adults was highest in mid-summer and differed between genders at one site in the Deschutes basin (Chelgren et al. 2008). It would be useful to know whether this is typical of Oregon spotted frog populations across their range. In addition, information on weather conditions that increase basking (i.e., visually detectable behavior) by adult frogs would be useful. Few data exist on behavior and habitat use of juvenile Oregon spotted frogs.

Survey Ethics and Disease Abatement

Concern exists about surveyors potentially introducing and spreading pathogens and invasive species propagules. We reiterate the need to clean all field gear between survey sites (Appendix D). Given the concern about transmission of fungal diseases among sites, we recommend surveyors limit handling of all life stages of Oregon spotted frogs. When handling any stages of Oregon spotted frogs, surveyors should make sure hands are wet and no chemical residues (sunscreen, insect repellent, etc.) come in contact with the animals. Wetlands that host Oregon spotted frogs are often habitat for sensitive plants and other taxa, so a minimal amount of disturbance (foot traffic, dip-netting, etc.) should be the goal.

Permits and Collections

Both Oregon and Washington require scientific collection permits for the survey of rare or listed taxa. Work in national parks, wildlife refuges, and research natural areas usually requires a separate permit or permission from the managing agency.

Oregon State requires a Scientific Taking Permit for birds, mammals, amphibians and reptiles; the permit application can be found at http://www.dfw.state.or.us/wildlife/license_permits_apps/

Washington State requires a Scientific Taking Permit for birds, mammals, amphibians and reptiles; the permit application can be found at http://wdfw.wa.gov/scp/ .

Removing animals from the wild is discouraged in all cases other than justifiable research efforts. Surveyors should carry digital cameras and collect photo-vouchers for any frogs, particularly those individuals that are difficult to identify or are potentially Oregon spotted frogs.

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Appendix A. Characteristics of Pacific Northwestern Ranid frogs

Characteristics that can distinguish ranid frogs from the range of the Oregon spotted frog in the Pacific Northwest. Information compiled from Leonard et. al (1993), Corkran and Thoms (2006), and personal observations. American Bullfrogs (*Rana catesbeiana* [= *Lithobates catesbeianus*]) are an introduced species that is native in eastern North America.

	Oregon Spotted Frog (R. pretiosa)	***Northern Red-legged Frog (R. aurora)***	***Cascade Frog (R. cascadae)***	***American Bullfrog (R. catesbeiana)[1]***
EGGS				
Mass Size	Orange to grapefruit sized mass	Orange to cantaloupe sized mass; unique among PNW ranids in attaching mass to a central vegetation brace	Usually slightly smaller than *R. pretiosa*, baseball to orange sized	Laid in broad sheet of jelly
Mass Position	Laid atop or adjacent to one another, typically above previous years vegetation; in shallow water, often protruding above water surface	Usually affixed to vegetation brace, in deeper water then other natives; can be ~0 - 40 cm below surface.	Laid atop or adjacent to one another, above previous years vegetation; in shallow water, often protruding above water surface	Laid near water surface, often draped over vegetation.
Aggregation	Yes (usually)	No (usually spaced apart)	Yes (usually)	No (usually spaced apart)
Egg Size prior to elongation	~2 mm	~3 mm	~2 mm	Smaller ~ 1 mm, can look like poppy seeds
Appearance before Hatching	Floats to the surface, spreads out and looks frothy		Can spread out and appear frothy	Can become frothy as disintegrates; can be mixed in with algae and sink below surface as develops
HATCHLINGS				
Overall Appearance	Sweeping appearance from a long tail and tall dorsal fin	Stubby appearance from a short tail and a tail dorsal fin	Streamlined appearance from a long tail and a low dorsal fin; dark	Slender body and short tail; pale gray tan, yolk easily visible in belly
Tail Length	Long, usually more than 1 ½ times body length (top view)	Short, usually no more than 1 ½ times body length (top view)	Long, usually more than 1 ½ times body length (top view)	

[1] Bullfrogs are the only of the four discussed that are summer breeders, typically June- August. The three native ranids breed in early spring at lower elevations and soon after snow melt in higher elevations; all natives typically precede bullfrog breeding.

	Oregon Spotted Frog (R. pretiosa)	*Northern Red-legged Frog (R. aurora)*	*Cascade Frog (R. cascadae)*	*American Bullfrog (R. catesbeiana)*[1]
Dorsal Fin	Top edge arches steeply up from middle of back (side view)	Top edge arches steeply up from middle of back (side view)	Top edge angles slightly up from near base of tail (side view)	
Dorsal Fin Color	Translucent, light gray	Translucent, light gray	Nearly opaque, charcoal	Light gray tan
Gills	Long, like gnarled fingers	Reduced, sometimes barely visible	Long, like gnarled fingers	May not be visible externally
TADPOLES				
Overall Appearance	Sweeping appearance from long tail and tall dorsal fin	Stubby appearance from short tail and tall dorsal fin	Streamlined appearance from long tail and short dorsal fin; dark	Long body and short tail; prominent nostrils; black and gold mottling and striping on dorsal surface when small.
Tail Length	Long, usually about twice the body length (top view)	Short, usually no more than 1 ½ times body length (top view)	Long, usually about twice body length (top view)	
Dorsal Fin, Top Edge	Arches steeply up from base of tail, behind spiracle (side view)	Arches steeply up from base of tail, behind spiracle (side view)	Angles slightly up from lower back near base of tail, behind spiracle (side view)	
Dorsal Fin Height (profile)	Taller than thickness of tail trunk	Taller than thickness of tail trunk	Equal to or less than thickness of tail trunk	Taller than thickness of tail trunk
JUVENILES				
Eyes	Gold, yellow or dark; oriented upwards (top view)	Gold; oriented to side (top view)	Gold; oriented to side (top view)	Orange to bronze
Dorsolateral Folds	Inconspicuous, especially on lower back which looks very broad and plump	Distinct, less so on lower back and lower back looks wide and round between them	Distinct on full length of back to hip and lower back looks angular or flat between them	Absent
Underside of Thigh Color	Moderate orange, sometimes to red	Usually red, sometimes pink or salmon	Dull yellow or tan	Usually white, sometimes with grey mottles
ADULTS				
Eyes	Bright yellow or gold; oriented upwards	Gold; oriented to side	Gold; oriented to side	Gold; oriented more upward
Dorsolateral Folds	Vague on lower back	Distinct to hip	Distinct to hip	Absent but have a short fold extending from eye over and behind the tympanum to the

	Oregon Spotted Frog (R. pretiosa)	*Northern Red-legged Frog (R. aurora)*	*Cascade Frog (R. cascadae)*	*American Bullfrog (R. catesbeiana)*[1]
				forearm
Back (Spots)	Ground color tan to brown to red; sizeable black spots with blurred or scalloped edges, generally with light bump in center	Ground color tan to brown, rarely with red hue; Black speckling or irregular marks (or no marks)	Ground color tan to brown; Round or angular black spots with crisp edges sometimes with light center; may have no spots	Ground color usually grey-green; spots on juveniles typically fade quickly
Lip Line	Either distinct or blurred on snout	Vague or absent on snout	Distinct to below nostril or end of snout	Upper lip bright green with blurred edges
Underside of Thigh Color	Opaque with a red or orange surface color	Most of hind leg is usually translucent red	Translucent yellow or tan	Typically white, sometimes grey mottles
Hind Legs	Short, lower leg length is less than half of SVL	Long, lower leg length is more than half of SVL	Long, lower leg length is more than half of SVL	
Webbing on Hind Foot	Extends almost to tips of toes along both sides	Is stepped down along inside of one toe to near tip of next	Is stepped down along inside of one toe to near tip of next	Extends to tip of toes and is convex
Groin Color and Pattern	Similar to that further forward on sides or they are plain gray	Mottled with black and yellow; patches are larger than those further forward on sides	Pale or similar to than further forward on sides and may have green wash	
Dark Mask behind Eye	Absent, pale or patchy	Variable, sometimes distinct	Distinct	
Underside Color	Mottled red, orange or gray on belly	Red, orange, or gray	White or yellow, throat mottled	Whitish with large gray mottling; male throat yellow

Appendix B. Photographic comparison of Northwestern Ranid frogs

Variation in appearance of Oregon spotted frogs (*Rana pretiosa*) and two other northwestern ranid frogs with which it can be confused: Cascades frog (*Rana cascadae*) and Northern red-legged frog (*Rana aurora*).

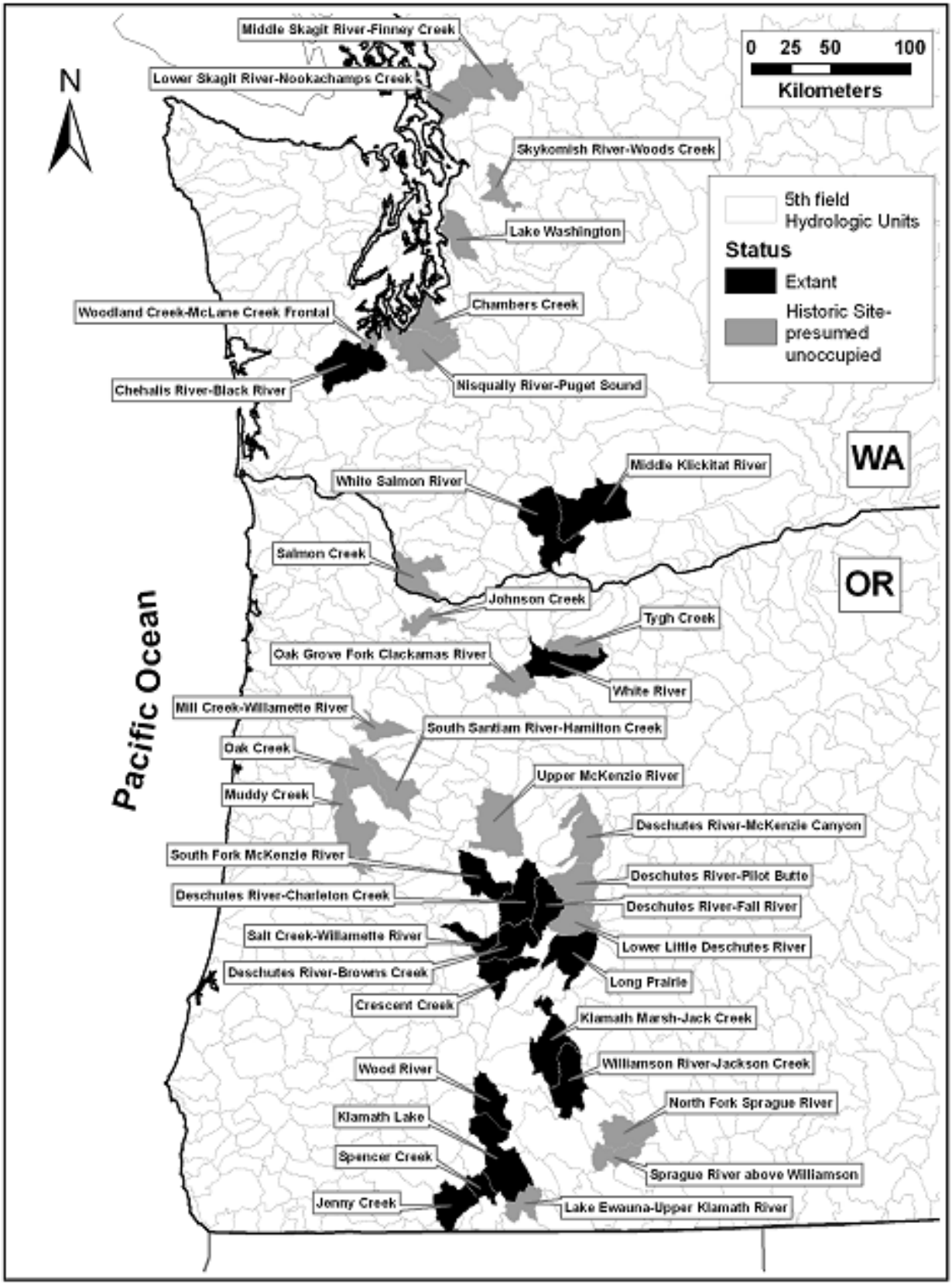
1. Oregon spotted frog (*Rana pretiosa*)

2. Cascades frog (*Rana cascadae*)

3. Northern red-legged frog (*Rana aurora*)

Appendix C. Historical distribution of Oregon spotted frogs

Watersheds (5th field hydrologic units [HUC]) with extant or historical localities for Oregon spotted frogs in Oregon and Washington, USA.


Middle Skagit River-Finney Creek
Lower Skagit River-Nookachamps Creek
Skykomish River-Woods Creek
Lake Washington
Chambers Creek
Woodland Creek-McLane Creek Frontal
Nisqually River-Puget Sound
Chehalis River-Black River
Middle Klickitat River
White Salmon River
Salmon Creek
Johnson Creek
Tygh Creek
Oak Grove Fork Clackamas River
White River
Mill Creek-Willamette River
South Santiam River-Hamilton Creek
Oak Creek
Upper McKenzie River
Muddy Creek
Deschutes River-McKenzie Canyon
South Fork McKenzie River
Deschutes River-Pilot Butte
Deschutes River-Charleton Creek
Deschutes River-Fall River
Salt Creek-Willamette River
Lower Little Deschutes River
Deschutes River-Browns Creek
Long Prairie
Crescent Creek
Klamath Marsh-Jack Creek
Williamson River-Jackson Creek
Wood River
North Fork Sprague River
Klamath Lake
Spencer Creek
Sprague River above Williamson
Jenny Creek
Lake Ewauna-Upper Klamath River
Pacific Ocean
N
0 25 50 100
Kilometers
5th field Hydrologic Units
Status
Extant
Historic Site-presumed unoccupied
WA
OR

Appendix D. Hygiene protocol and disease information resources

Hygiene Protocol US Geological Survey, FRESC, February 2007
For Control of Disease Transmission Between Amphibian Study Sites

To be completed between any sites that are not "water-connected" or that amphibians do not freely move between. To be completed on all gear/equipment that may have touched site water or especially amphibians, including but not limited to:

- Waders
- Shoes/boots
- Dip nets
- Rulers and other instruments
- Traps

Materials:

- Plastic bucket with handle for sterilization and holding cleaning gear
- Liquid chlorine bleach (6% concentration of sodium hypochlorite).
    - NOTE: Liquid bleach loses its potency relatively quickly after opening. Surveyors should acquire small volumes adequate for short-term field work (on order of days to weeks).
- Two stiff scrub brushes with handles, one for sterilization, and one for cleaning off mud/dirt
- Rubber dishwashing gloves
- Spray bottle

Procedure:

1) Before leaving site, wash off in site water as much of the mud/dirt on equipment and gear, and remove any vegetation or detritus attached to gear by shaking, rinsing in water and hand picking.
2) Do all sterilizing well away from streams or ponds.
3) Fill bucket with two gallons (eight quarts) clear water (from pond or spigot).
4) Add 12 capfuls (6 Tablespoons or 1/3 cup) of liquid bleach (for a 1% concentration).
5) Stir to mix with brush.
6) Clean off any remaining vegetation or mud with brush that may have been missed earlier.
7) Dip and rotate folded Minnow traps in solution, shake off, open and lay out in sun/wind to dry
8) Dip shoes in solution and scrub, shake off and let dry in sun.
9) Either dip and scrub waders in bucket or lay waders on ground and pour solution on them while scrubbing. Spray bottle (with same solution concentration) can also be used to apply solution where needed.
10) Sterilize brushes in solution.
11) If possible, save any remaining sterilization solution in a sealable container for future use. If solution must be discarded, dispose of on asphalt, cement or hard roadbed, well away from any water bodies.
12) If at all possible, allow all gear and equipment to dry completely before reuse at next site.

Alternatively, use a spray application of isopropyl alcohol (70%), or dry completely for over 3 hours. It is still necessary to wash completely (preferably with pressurized hose) and complete all scrubbing steps to remove all mud and vegetation.

Other information resources on disease abatement and survey ethics:

1. Department of Environment and Heritage. 2006. Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis. Department of Environment and Heritage, Commonwealth of Australia. 64 p.

Background Document:
http://www.environment.gov.au/biodiversity/threatened/publications/tap/pubs/chytrid-background.pdf

Plan:
http://www.environment.gov.au/biodiversity/threatened/publications/tap/pubs/chytrid-report.pdf

2. Kast, J. and Hanna, N. 2008. Chapter 2: Hygiene and Disease Control: Field and Captivity: In: Poole, V.A. and Grow, S. (eds). 2008. Amphibian Husbandry Resource Guide, edition 1.1, Amphibian Taxon Advisory Group, Association of Zoos and Aquariums. p. 53-62.
http://www.aza.org/ConScience/Documents/Chapter2_Hygiene_DiseaseControl.pdf

3. Speare R. (ed). 2001. Recommendations from Workshop in Getting the Jump on Amphibian Disease. Attachment 5: In: Speare R and Steering Committee of Getting the Jump on Amphibian Disease. Developing management strategies to control amphibian diseases: Decreasing the risks due to communicable diseases. School of Public Health and Tropical Medicine, James Cook University: Townsville. p. 131-147. http://www.jcu.edu.au/school/phtm/PHTM/frogs/adrecommendations.htm

4. Speare, R., Méndez, D. and Berger, L. 2005. The Management of Disease in Wild Amphibian Populations in Australia. Cooperative Research Centre for Tropical Rainforest Ecology and Management. Rainforest CRC, Cairns. Unpublished report. 64 p.
http://www.jcu.edu.au/rainforest/publications/amphibian_disease.pdf

5. Wellington, R., and R. Haering. 2001. Hygiene protocol for the control of diseases in frogs. New South Wales National Parks and Wildlife Service Threatened Species Management Information Circular No 6, Hurstville, Australia., 16 p.
http://www.environment.nsw.gov.au/resources/nature/hyprfrog.pdf

Appendix E. Survey equipment and materials

Example list of materials for field surveys for Oregon spotted frogs.

Survey protocol(s)
Polarized glasses
Camera and spare battery
Binoculars
Magnifying device (hand lens, view box, magnifying glass)
Identification guides/keys or photos
Data sheets and clipboard
Staging table (Gosner 1960) for development of amphibian embryos
Pencils, extra lead, Sharpies
PDA (personal data assistant), spare batteries, backup chip, Aquapac
Dip net with graduated handle in centimeters
Measuring tape or Slope stick with centimeter graduations, 2 m long
Ziploc bags or vials for any specimen collection of diseased individuals
Waders (hip and chest) and shoes
Thermometer
Rulers (2)
Extra water
Sunscreen, broad brimmed hat
Mosquito repellent or head nets, where needed
Water or wipes to clean sunscreen, repellent, etc., before handling amphibians

Scientific Collecting permit
Itinerary with contact information
Navigation:
- GPS and batteries
- Maps, Gazetteer, aerial photographs
- Compass

Cell phone and car charge cable
Satellite phone (charged)
Emergency gear including First Aid kit, emergency preparedness equipment, etc.

Gear for sterilizing field materials between sites:
- Protocol
- Bleach
- Measuring container
- Scrub Brush
- Bucket
- Spray bottle

Appendix F. Bureau of Land Management (BLM) GeoBOB data form

BLM Flora/Fauna Survey Form for recording survey data as of summer 2010.
The US Forest Service may have updated their Natural Resource Information System (NRIS) form.
Surveyors should consult the following web address for updated BLM/FS forms and descriptions:

http://www.fs.fed.us/r6/sfpnw/issssp/inventories/monitoring.shtml

OR / WA BLM GeoBOB Flora/Fauna Survey Form, pg 1.

(*Circle* appropriate option when a list is provided, **Bold** items are required fields, *key to codes on cheat sheet. See data dictionary for Field Name and List of Value definitions.)

SURVEY

Survey ID :_____Admin Unit :_____Sub Admin :_____
Date :_____**Location Accuracy:**_____Survey area (ac):_____
Observer(s):_____USGS Quad:_____
_____
GPS model / software used: _____
UTM: _____, E _____N Zone: _____ Datum: _____
Legal Description: T _____R _____ S _____¼_____ 1/16_____ 1/64_____ Meridian: W H D
Related documents / files: _____
Notes: _____

VISITS

Visit ID: _____ ***Survey Type**: _____
***Survey Method**: _____ Project Name: _____ Project Unit: _____
*Protocol Name _____
Observers: _____
Contractor:_____ Contractor Bid:_____
Visit Start Date: _____End Date: _____**Date Accuracy**: Day, Exact, Hour, Month, Previous Year, Year
Military Start Time (HHMM): _____Military End Time (HHMM): _____Visit Length: _____
Estimated Actual Survey Area (acres and/or percent of whole): _____
Notes:_____
_____

TARGET SPECIES List all species that are the focus of the survey. Record Negative data in the GeoBOB Add_Obs table (use Inventory / Neg Obs button in Survey form). Positive data goes in Flora_Sites or Fauna_Obs tables.

Species Code	Scientific Name	Found (Y/N)

HABITAT/ENVIRONMENTAL CONDITIONS

Slope (%): _____ Slope – min.: _____ Slope – max.: _____ Slope source: _____
Aspect (deg): _____ Aspect – min. _____ Aspect – max. _____ Aspect source: _____
Elevation (ft): _____ Elevation – min.: _____ Elevation – max.: _____ Elevation source _____
source: C = Calculated, M = Measured, E = Estimated, G = GPS generated (for elevation only)
*Landform: _____ Stand Age: _____
Stand Structure: Multiple Canopies, One Canopy, Two Canopies, Unspecified
Seral Stage: Pioneer, Early (20-39yrs), Mid (40-79yrs), Late (80-200yrs), Climax
Percent Cover: 1) Overstory: _____ Overstory min.: _____ Overstory max:_____
2) Understory: _____ Understory min.: _____ Understory max:_____
~Fire Presence: Absent, Burned, Complete Burned, High Scorched, Mod Scorched, Part Scorch, Very High Scorch
Topographic Position (rel. to overall slope): Bottom, Lower, Mid, Ridge, Upper. *Substrate: _____
Soil Texture Class: Clay, Clay Loam, Loam, Sand, Silt, Silt Loam, Sandy Loam, Other
Air Temperature (F): _____ Relative Humidity (%): _____ Soil Temperature (F): _____
Soil Moisture: Dry, Moist, Wet Light Index: Full Shade, Full Sun, Part Shade
Precip: Dry, Fog, Misty Rain, Rain, Sleet/Hail, Snow Wind: Calm, Gusty, Light, Moderate, Windy (15+ mph)
Notes: _____
_____
~If fire was present within the last 5 years

INVENTORY OBSERVATONS

Create a list below of species (other than those on the target list) found during the survey. Indicate percent cover, abundance for each species, and the quantity. Enter data into GeoBOB Add_Obs table (use Inventory / Neg Obs button in Survey form).

Species Code	Scientific Name	% Cover	*Abundance	Quantity

Appendix G. USGS Amphibian Breeding Survey Form

AMPHIBIAN BREEDING SURVEY FORM

Site Name		Population Name		Date (mm/dd/yyyy)	
Visit #	1 2 3	% of Site Surveyed		Survey Crew (1st last name)	
Time-Start		Time-End		Down Time		Water Temps	°C °F	Air Temps	°C °F

Weather-Start	Wind-Start	Weather-End	Wind-End	Water conditions (all that apply)
☐ clear/slight clouds ☐ overcast ☐ light rain ☐ heavy rain ☐ sleet/snow	☐ calm ☐ windy ☐ light breeze ☐ gusts	☐ clear/slight clouds ☐ overcast ☐ light rain ☐ heavy rain ☐ sleet/snow	☐ calm ☐ windy ☐ light breeze ☐ gusts	☐ placid ☐ clear ☐ choppy ☐ mod. turbid ☐ glare ☐ very turbid

Notes (*e.g., changes in survey conditions or H20 level, proportion of site covered, whether other crews are surveying other areas)*

SITE data

Habitat Type	☐ Pond ☐ Lake ☐ Marsh ☐ Ditch ☐ Impoundment	Origin	☐ Beaver ☐ Human ☐ Oxbow ☐ Natural ☐ Other _____	Site Size (m)		Max. depth (m)	<1 1-2 >2	% Shallow (<0.5 m)	
Site Veg. Composition	% Emgt		% Submgt		% Open water		% other (specify type)		
Beaver Activity	☐ Lodge ☐ Dam ☐ Channels ☐ None ☐ Other _____	Beaver Status	☐ Current ☐ Historic ☐ No evidence	Notes (H20 levels, predators, disturbance)					

OVIPOSITION SITE and Individual EGG MASS data

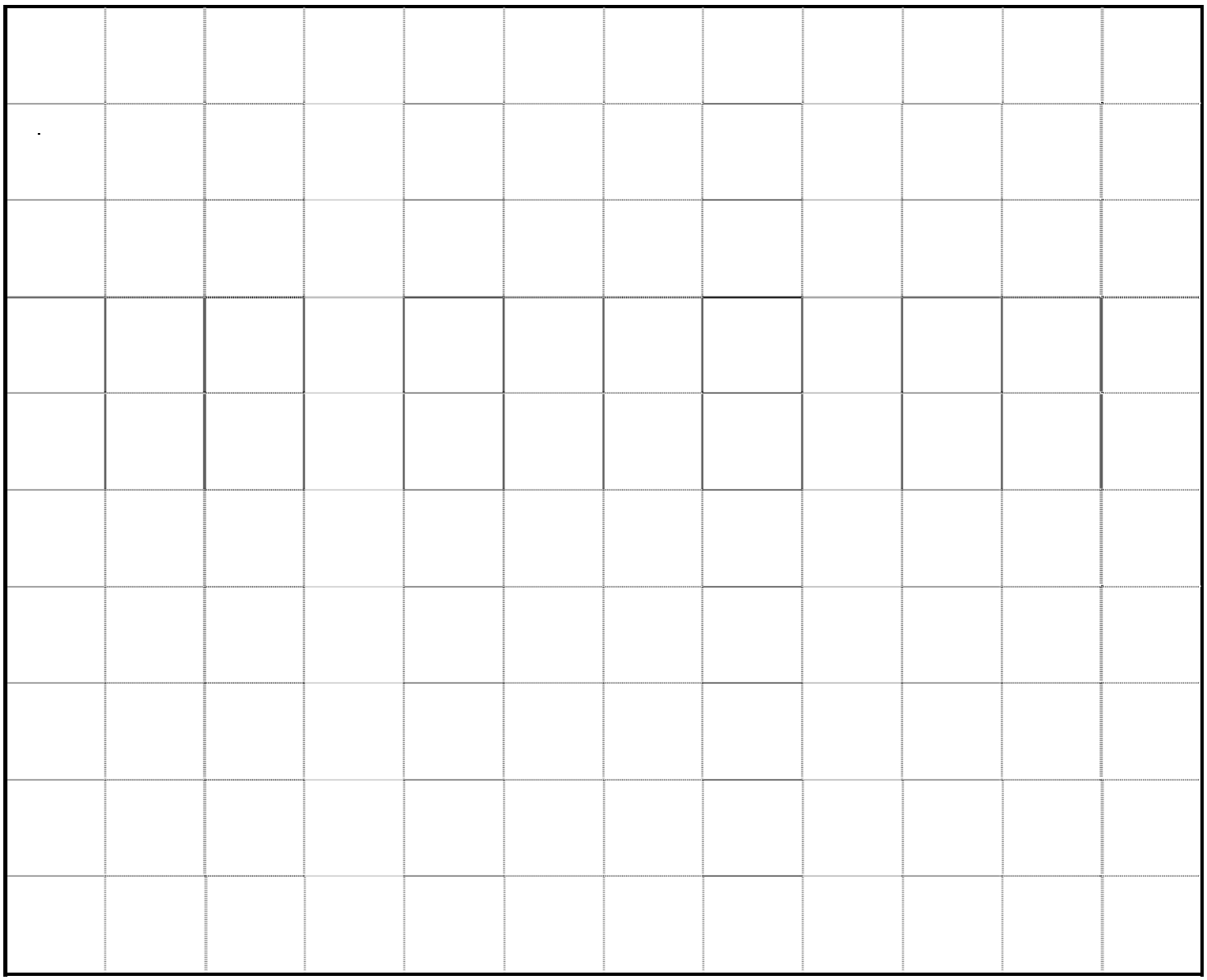
Oviposition Site Data						*Individual Egg Mass Data*			
Ovip Site #	Total Depth (cm)	Vegetation or Substrate	Northing NAD83	Easting NAD83	UTM Error	EM #	Stage	% dead (to 5%)	Note

Population Name		Site Name		Date	

SITE MAP

Sketch the following features on the site map:

- ☐ Inundation limits and tree lines
- ☐ North arrow
- ☐ Oviposition sites
- ☐ Streams, springs, ditches, channels
- ☐ General vegetation distribution
- ☐ Roads/Trails/Access points
- ☐ Beaver activity
- ☐ Photo locations and direction
- ☐ Invasive weed patches
- ☐ Recreation (boat ramps, campgrounds)



Approximate Scale: 1 grid = _____

Appendix H. Supporting information for USGS Amphibian Breeding Survey Form

This document provides supporting information and field definitions for the datasheet "**Amphibian Breeding Survey Form"**. The datasheet and supporting information were compiled by the US Geological Survey and the Interagency Special Status and Sensitive Species (ISSSSP) Working Group for the Oregon spotted frog (*Rana pretiosa*). The datasheet is designed to capture standardized data that are gathered during a single egg mass survey of one site. It is divided into sections for Survey conditions, Site characteristics, and Oviposition data; the latter includes the tallies of egg masses. It includes a Map page to sketch locations of oviposition sites, habitat features, and other information relevant to future surveys of the target habitat.

Quality Assurance: Proof read the data sheet at the conclusion of the field survey and again during data entry. Add initials of the readers in Header of the datasheet.

SURVEY DATA

This section contains information on survey effort and conditions, which relates to search efficiency. Note that **Populations** commonly contain more than 1 **Site**. We consider a Site to be a potential breeding pond that is separated from other potential breeding ponds by features that are not favored frog habitat (e.g., uplands, barriers, culverts, embankments, etc.). Examples of Populations with multiple potential breeding Sites are oxbow complexes (e.g., along the Little Deschutes River) or managed inundation units separated by embankments (e.g., Buck Lake, Klamath Marsh and Conboy Lake NWR, WA).

Site Name: The name of the Site being surveyed. Example: "NW Impoundment"

Population Name: The name of the population that the frogs belong to in this site. As described above, some populations contain multiple potential breeding Sites. Example: "Buck Lake".

Date: Day, month and year on which survey is being completed. Format: DD/MM/YYYY.

Visit: Circle the number that describes the visit number. Fill out a sheet for each survey, even if breeding has not yet started.

% of Site Surveyed: The portion of the site surveyed, as a % of the area of the potential breeding habitat (i.e., littoral zones <0.75 m deep) within the site. A complete survey is where 100% of potential breeding habitat is surveyed during that visit.

Survey Crew: Full names of the people surveying the site on this visit.

Time-Start: Start time of the survey (24-hr clock). Format: 0830 (=8:30 AM).

Time-End: End time of the survey (24-hr clock). Format: 1610 (=4:10 PM).

Down Time: Amount of time between Time Start and Time End when **not** surveying (eating lunch, etc.) expressed in total number of minutes.

Water Temps: Measure water temperature at 5 cm below water surface around littoral zone. Note temperatures in appropriate units (degrees Celsius and Fahrenheit). Take at least three readings (beginning, midway and conclusion of survey).

Air Temps: Measure air temperature 1 m above water. Note temperatures in appropriate units (degrees Celsius and Fahrenheit). Take at least three readings (beginning, midway and conclusion of survey).

Weather-Start: Check one box that best describes the weather conditions at the start of the survey. Format: clear/slight clouds, overcast, light rain, heavy rain, sleet/snow.

Wind-Start: Check one box that best describes the wind conditions at start of the survey. Format: calm, windy, light breeze, gusts.

Weather-End: Check one box that best describes the weather conditions toward the end of the survey.

Wind-End: Check one box that best describes the wind conditions toward the end of the survey.

Use **Notes** field to add detail on any significant changes in weather during the survey.

Water conditions: Check all boxes that apply to water conditions at the site during the survey. Format: placid, choppy, glare, clear (hand visible when held >50 cm below surface), moderately turbid (hand visible 20-50 cm below surface), very turbid (hand only visible <20 cm below surface).

Notes: Add any notes related to survey conditions or other factors that could affect detectability of egg masses (e.g., evidence of recent water level changes since breeding, other factors affecting search efficiency, etc.). Also note changes in weather conditions over course of survey not captured by Start and End fields described above.

SITE DATA

This section contains habitat characteristics that define the survey site.

Habitat Type: Check one option that best describes the type of site. There may be some sites where 2 types describe the site.

Origin: Check option that best describes how the site was created. Check 'Natural' for sites such as lakes or marshes formed by glaciers, lava flows, or unknown origins that do not fit the other options in the field. Format: Human (anthropogenic impoundment or excavation), Beaver, Oxbow (formed by fluvial action), Natural, Other (specify)

Site Size: Estimate dimensions of the site (area inundated). This can be refined somewhat by using maps and aerial photos, adjusted by the field assessment of the portion of the basin that is flooded. Example: 80 m x 20 m, with smaller lobe that is 30 x 30 m

Max. Depth (m): Circle option that best describes the maximum depth of the site. Format: <1 m, 1-2 m, or >2 m.

% Shallow (<0.5 m deep): Estimate the percentage of the site that has a water depth of less than half a meter.

Site Veg. Composition: Estimate the percentage of the site that fits into each category listed below. Numbers should sum to 100%.

% Emgt: Percentage of the site dominated by emergent vegetation cover (e.g., spike rush, canarygrass, cattail, etc)

% Submgt: Percentage of the site dominated by submergent vegetation cover (e.g., pondweeds, *Potamogeton* sp.).

% Open water: Percentage of the site with open water and little or no vegetation cover.

% Other: Percentage of the site in habitat type not listed; specify type.

Beaver Activity: Check evidence of beaver activity. Format: Lodge, Dam, Channels, None, or Other (identify)

Beaver Status: Identify whether the evidence of beaver is Current (this yr or last yr), Historic (older than last yr), or No Evidence

Notes: Add any notes related to site conditions (e.g., identity of predators such as fish or bullfrogs (winterkilled animals often visible during OSF breeding surveys), grazing, intensive human use, etc.). Of particular interest are changes in water levels between surveys or relative to other years. Note water level relative to Staff Gauges or fixed landmarks that can be compared to other visits.

OVIPOSITION SITE and individual EGG MASS (EM) data

An **Oviposition Site** is a location where either communal or single **egg masses** are found. We consider egg masses that are within the diameter of a large mass of one another (<20 cm) to be within the same Oviposition site. Data related to the **Oviposition Site** are on the left side of table; data related to individual **egg masses** are on the right side of the table. Careful tallies of numbers of egg masses and their respective developmental stages increase the chances of detecting new egg masses on subsequent surveys of the site.

Oviposition site

Oviposition Site #: A sequential code that assigns a number to each oviposition site. Format: first oviposition site is 1, second is 2, …3, ….etc.)

Total Depth (cm): The total depth of the water column at the Oviposition site, from the surface of the water to the top of the soil substrate. A meter stick makes this easy to assess quickly.

Vegetation or Substrate: The dominant vegetation or substrate that underlies the Oviposition site, listed from most to least. Example: "Spike rush, Open silt", where *Eleocharis* is dominant but some open silt is also present. Assess dominant vegetation or substrate on a 1-m diameter circular plot centered on the oviposition site or egg mass; if that plot is close to shore and includes an area beyond standing water, only consider the portion of the plot that is inundated.

Northing NAD83: The Northing UTM coordinates for the cluster, recorded in Datum **NAD83.**

Easting NAD83: The Easting UTM coordinates for the cluster, recorded in Datum **NAD83.**

UTM Error: The average error associated with the above coordinate values.

***** It is not necessary to add UTM Zone number: As the taxonomic status and distribution of the Oregon spotted frog are currently understood, all sites, historic and extant, are within UTM Zone 10 (~ west of 120 degrees longitude).

Egg mass

EM #: The number code of the egg mass being described (the first egg mass would be 1, the second would be 2, etc.). Alternatively, if data on each egg mass will not be collected, record the total number of egg masses found in each cluster here. If a single positive number of egg masses cannot be determined, record a high and a low estimate (25/22 = maximum of 25 masses, minimum of 22 masses).

Stage: Score developmental stages of eggs in a single egg mass using the attached table from Gosner (1960):

- **b**lastula **(B)** = Gosner stages 1 – 9
- **g**astrula (**G**) = Gosner stages 10 – 12
- **n**eurula (**N**) = Gosner stages 13 – ca. 19
- **h**atchling (**H**) = larvae emerging from capsules, typically > Gosner stage 20;

% dead: An estimate of the percentage of the egg mass, if any, that appears dead to the nearest 5%. Dead embryos often, but not always, appear white. Fungal hyphae may be visible.

Notes: Record any details about the egg mass not covered by the fields listed, etc. Note whether an egg mass appears to have been blown or drifted from its oviposition site; this can be discernable if egg masses are in accumulations of flotsam in windward sides of ponds.

SITE MAP

At the top of the page, fill in the **Population Name**, **Site Name** and **Date** to match the other datasheets for this visit. In the space provided, make a sketch of the site, including an approximate scale and the following information:

- **North arrow**
- approximate **scale**
- outline of **inundated area** and **tree lines**
- locations of **Oviposition Sites** and their respective numbers.
- hydrological features such as **inflow/outflow streams, springs**, **ditches**, **channels** or **seeps**
- general distribution and types of **vegetation**
- location and direction of any **photos** taken, with corresponding photo number
- location and type of any **beaver activity**
- **Roads/Trails/Access** points
- areas of concentrated **recreational use** (e.g., boat ramps, campgrounds)
- **Invasive weed** patches

Appendix I. Job Hazard Analysis (USFS) or Risk Management Assessment (BLM)

K:\fire\cascade_zone\Hotshots\JHA's
FS-6700-7 (2/98)

U.S. Department of Agriculture Forest Service	1. WORK PROJECT/ACTIVITY **Fish Surveys**	2. LOCATION **Rogue River Siskiyou NF**	3. UNIT **BFRD/PRD**
JOB HAZARD ANALYSIS (JHA) References-FSH 6709.11 and .12 (Instructions on Reverse)	4. NAME OF ANALYST **John Smith**	5. JOB TITLE **Bio-Tech**	6. DATE PREPARED **4/24/2008**

7. TASKS/PROCEDURES	8. HAZARDS	9. ABATEMENT ACTIONS Engineering Controls * Substitution * Administrative Controls * PPE
Walking	Uneven ground	Watch footing and wear appropriate foot wear, 8" high boots, corked boots, or felt bottom waders depending on location.
	Wet ground	Have no slip soles for walking on wet ground in and around streams when collecting specimens.
	Tripping/Falling	Be sure to use a walking stick to help balance yourself. Insure Footing and watch where you step.
Visibility		Visibility in streams is low without polarized sunglasses. Use sunglasses to help see fish and redds.
Equipment	Knives	If taking tissue samples be careful of sharp objects. Always cut away from yourself. Carefully store sharp objects so that when walking if you fall they will not cause injury. First aid certifications need to be up to date and first aid equipment also carried.
	Radios	Always have good communications between crew members. Know how to properly call in an emergency and know where you are so that directions can be given if needed.
Collecting specimens		Only collect those that can be safely reached. Safety is first. If you can't reach it don't try. This could lead to falling into the water causing injury or even drowning.
Snorkeling	Drowning	Be an adequate swimmer to avoid unexpected events. Avoid log jams as they can trap and disorient you causing drowning. Never snorkel alone.
Electroshock	Shock	Be properly trained in the use of the electroshocker. Be properly grounded. Other than the operator all others stay clear of water until given the okay to collect fish. Use only enough current to stun not injure the fish or people. Use shocker only as intended.
*		

10. LINE OFFICER SIGNATURE	**11. TITLE**	12. DATE

JHA Instructions (References-FSH 6709.11 and .12)

The JHA shall identify the location of the work project or activity, the name of employee(s) writing the JHA, the date(s) of development, and the name of the appropriate line officer approving it. The supervisor acknowledges that employees have read and understand the contents, have received the required training, and are qualified to perform the work project or activity.

Blocks 1, 2, 3, 4, 5, and 6: Self-explanatory.

Block 7: Identify all tasks and procedures associated with the work project or activity that have potential to cause injury or illness to personnel and damage to property or material. Include emergency evacuation procedures (EEP).

Block 8: Identify all known or suspect hazards associated with each respective task/procedure listed in block 7. For example:

a. Research past accidents/incidents

b. Research the Health and Safety Code, FSH 6709.11 or other appropriate literature.

c. Discuss the work project/activity with participants

d. Observe the work project/activity

e. A combination of the above

Block 9: Identify appropriate actions to reduce or eliminate the hazards identified in block 8. Abatement measures listed below are in the order of the preferred abatement method:

a. Engineering Controls (the most desirable method of abatement). For example, ergonomically designed tools, equipment, and furniture.

b. Substitution. For example, switching to high flash point, non-toxic solvents.

c. Administrative Controls. For example, limiting exposure by reducing the work schedule; establishing appropriate procedures and practices.

d. PPE (least desirable method of abatement). For example, using hearing protection when working with or close to portable machines (chain saws, rock drills portable water pumps)

e. A combination of the above.

Block 10: The JHA must be reviewed and approved by a line officer. Attach a copy of the JHA as justification for purchase orders when procuring PPE.

Blocks 11 and 12: Self-explanatory.

Emergency Evacuation Instructions (Reference FSH 6709.11)

Work supervisors and crew members are responsible for developing and discussing field emergency evacuation procedures (EEP) and alternatives in the event a person(s) becomes seriously ill or injured at the worksite.

Be prepared to provide the following information:

a. Nature of the accident or injury (avoid using victim's name).
b. Type of assistance needed, if any (ground, air, or water evacuation)
c. Location of accident or injury, best access route into the worksite (road name/number), identifiable ground/air landmarks.
d. Radio frequency(s).
e. Contact person.
f. Local hazards to ground vehicles or aviation.
g. Weather conditions (wind speed & direction, visibility, temp).
h. Topography.
i. Number of person(s) to be transported
j. Estimated weight of passengers for air/water evacuation.

The items listed above serve only as guidelines for the development of emergency evacuation procedures.

JHA and Emergency Evacuation Procedures Acknowledgment

We, the undersigned work leader and crew members, acknowledge participation in the development of this JHA (as applicable) and accompanying emergency evacuation procedures. We have thoroughly discussed and understand the provisions of each of these documents:

SIGNATURE **DATE**	**SIGNATURE** **DATE**
_____	_____
Work Leader	
_____	_____
_____	_____
_____	_____
_____	_____