Yellow-legged Frog Oviposition Site Surveys on the Lower Rogue River and Tributaries in 2005

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Background

The foothill yellow-legged frog (*Rana boylii*) is a relatively small ranid frog that is typically found close to water along open, low-gradient, streams dominated by a coarse substrate (Nussbaum *et al*. 1983; Borisenko and Hayes 1999). They are limited to Pacific drainages, ranging from southern California to Oregon (Borisenko and Hayes 1999), with a single disjunct record for Baja California, Mexico. Historically In the U.S., foothill yellow-legged frogs ranged from the Santiam River system in Oregon south to the San Gabriel River system in California (Nussbaum *et al*. 1983, Borisenko and Hayes 1999).

Foothill yellow-legged frogs are strongly associated with low-gradient, perennial stream systems and are most common along stream reaches that have exposed bedrock or rock, gravel, or sand bottoms. Oviposition tends to occur in quiet scour-pools, areas of slow, laminar flow, or riffles in gentle gradient streams, often where there is only slight flow from the main river (Nussbaum *et al*. 1983; Jennings and Hayes 1994, Borisenko and Hayes 1999).

The decline of the foothill yellow-legged frog has been documented in California (Jennings and Hayes 1994) and Oregon (Borisenko and Hayes 1999). Foothills yellow-legged frog populations are thought to have declined to about 40 percent of their historic distribution in California and have essentially disappeared from foothill drainages of the southern San Joaquin Valley (Jennings and Hayes 1994). In Oregon, a recent status review found that foothill yellow-legged frogs were absent from more than half of known historic localities (Borisenko and Hayes 1999). Foothill yellow-legged frogs were detected most often in the Rogue River drainage, but abundance was low, particularly in tributary systems with impoundments (Borisenko and Hayes 1999).

Habitat losses and alterations can affect amphibian species in a variety of ways, including effects on critical aspects of the habitat. These critical aspects may include suitable egg-laying and nursery sites, refuge from predation or unfavorable environmental conditions, and temperature maximums and minimums necessary for egg-laying, growth, and development (Hayes and Jennings 1986). Threats to the species habitat may include development, recreation, introduced exotic species, changes in hydrology due to construction and operations of dams and alterations to seasonal flooding, poor water quality, and water contamination. Specific to this project, there is a concern that large boat traffic on the lower Rogue River may be contributing to direct mortality of yellow-legged frog egg masses on the mainstem of the river.

Survey Area

Surveys for yellow-legged frog oviposition sites were conducted on an approximately 35 mile length of the Wild and Scenic portion of the Lower Rogue River on lands managed

by the Rogue River-Siskiyou National Forest and the Medford District of Bureau of Land Management (Appendix A).

Survey Methods

Potential oviposition sites were located using photo interpretation, GIS coverages, and local expertise prior to field work. Potential habitat was identified and quantified by stream reach and included all gravel bars with associated slow water areas along the river. Visual encounter surveys of all suitable gravel bars on the river and of several tributaries to the river were conducted during the spring and summer of FY 2005 using a standardized protocol (Sletenrich and Pool 2002) (Appendix G). Descriptive habitat data of each site was collected and included length and width of each site, habitat type, habitat features, bar and river gradient, turbidity, all faunal species present, water temperature, water depth and distance from shore at egg mass if found, percent canopy, vegetation cover, substrate type and size, substrate ocular measurements, and impacts to habitat (Appendices B and C). Two persons typically surveyed the site with one person in the near shore water and one on the river or stream bank. All animals observed were captured with either hands or three foot long-handled nets if possible and recorded if it was possible to identify to species. All sites were sampled for two-person hours or until the entire site was surveyed.

Results

Twenty one sites were surveyed at least once, eighteen were on the mainstem of the Lower Rogue River (Grave Creek to Lobster Creek) and two sites on tributaries to the river were also sampled for Yellow-legged frog. Surveys on the mainstem were conducted on 7.5 km (4.6 miles) of potentially suitable oviposition sites (gravel bars) in the Lower Rogue on both BLM and FS lands. Surveys on tributaries sampled 1490 meters (0.9 miles) of potential oviposition habitat. Amphibians were observed at eleven of the twenty-one sites, YLF were observed at two sites on the river and both tributary locations. One oviposition site was found on the mainstem and one site was found on a tributary (Table 1). Another oviposition site was reported to us by the Oregon State University herpetology class on May 2 2005, at Nancy Creek, a tributary of the Illinois River which is a tributary of the Rogue River. This site was also surveyed by the Forest after the report of egg masses

Table 1. Summary of sample locations and species observed during survey.

Species / Sample Location	CLMA[1]	RACA	PSRE	TAGR	RABO	TH spp.	Exotic fish
Sanderson Is.	X						
Tyee Is.							X
Tyee Camp	X	X	X			X	
Tyee River				X			X
Tyee Side Ch.				X			X
Russian Bar			X	X			
Telephone Bar							
Winkle Is.							
Winkle Bar		X	X			X	
Zane 1 Bar							
Zane 2 Bar							
Zane 3 Bar			X	X			
Paradise Bar							
Half Moon Bar		X				X	X
Brushy Bar		X		X	X	X	
Solitude Bar 1			X			X	
Solitude Bar 2							X
Foster Bar	X	X		X	X		
Nancy Creek		X			X		
Tom Fry Creek					X		
Quosatana Creek					X		
Lobster Creek			X		X	X	
Total Observations	3	6	5	6	6	6	5

[1] CLMA =western pond turtle, RACA =bullfrog, PSRE=pacific chorus frog, TAGR=rough-skinned newt, RABO=yellow-legged frog, TH spp.= garter snake, introduced fish=red side shiner, squawfish, bluegill.

Yellow-legged Frog Locations

Brushy Bar

This site was an historic site known to the surveyors by past visits; several sub-adults were found in October of 2005 and it was suspected that this might be an oviposition site. This is a long gravel bar approximately 800 meters long on the south side of the river with an adjacent pool that is connected to the river proper during high water periods (Appendix B). One adult was observed at the site in early May 2006 and five egg masses were observed at the site in a backwater area near the pool in June 6, 2006 (Appendices

C, E, and F). All masses were within 10 meters of shore and were attached to cobble or gravel/pebble substrate and were attached either on the shore side, top, or under the substrate. Flow orientation was either sheltered from flow in the eddy of the substrate or had no flow (Appendix E). A return visit on June 16, 2006 failed to find any egg masses at the site, however the water level of the river had gone up considerably and it was raining steadily at the time of survey. Adult and juvenile bullfrogs were also observed in a pond adjacent to the oviposition site.

Foster Bar

This site was also an historic location for YLF. Four sub-sites consisting of Foster Bar proper, Foster Bar side channels, Foster Bar Slough, and Foster Creek were sampled for YLF. One adult was found in Foster Creek proper and two juveniles were found on the small side channel associated with Foster Creek (Appendix C, F). The single adult located in Foster Creek was captured while swimming in a small scour pool (Appendix C and F). The two juvenile observed in the small side channel were sitting or basking in a connected side pool to the main side channel with a dominant substrate of cobble (Appendix C and F) Bullfrogs were observed in the Foster Bar Slough (Appendix B).

Nancy Creek

This site was report to us by the OSU herpetology class the first week of May. It was revisited on May 7; three adult YLF were observed as were five egg masses (Appendix C, D, and F). This site is an isolated pool approximately 230 meters long by 10 meters wide with a gravel/cobble bottom and an approximate depth of 15-20 cm. The pool is is usually a side channel of the river but was then isolated by a drop in flow. Nancy Creek flows directly into the pool. A bullfrog chirp was heard during the survey. This site was revisited on May 18 and no frogs or egg masses were observed, however the water level had risen approximately 10-15 cm in the pool and there was less than ideal weather at the time.

Quosatana Creek

This site is a small tributary of the Lower Rogue River, the reach that was sampled was from Agness Road to the mouth of the creek (950 meters) (Appendix B, C., and F). The creek is complex, with braided stream and riffle habitat as well as small side channels. Two adults and six sub-adults were observed or captured on June 20 2005. One sub-adult bullfrog was also captured at the site. All were observed and/or captured while basking on a substrate of gravel or pebble sized rock on open gravel bar habitat.

Lobster Creek

Lobster Creek is another tributary to the Lower Rogue River, a small section of the creek was surveyed between the mouth and the Lobster Creek Bridge that crosses the creek approximately 250 meters above the confluence with the Rogue River (Appendix B). This site is typified by a mainstem with a small side channel on the right side of the creek about 70 meters in length. On June 22, 2005, 19 YLF egg masses were observed in the side channel all within one meter from the right side of the side channel Appendix E and F). The egg masses were all attached to cobble usually near the top or sides of the cobble and oriented so that water flowed over the top of the egg masses. Approximately 200 to

300 tadpoles were also observed within three meters of the shore in the same immediate area (Appendix D, F). Water depth averaged 25 cm and the dominant substrate was cobble and gravel. On June 27, 2005, the site was revisited and 13 egg masses were observed as were several thousand tadpoles in the same immediate area as before. All of the tadpoles were stage one tadpoles and were approximately 10mm in size.

Tom Fry Creek
One sub-adult YLF was observed here during the survey on the bank adjacent to a deep (1 meter) side channel where the creek drained into the river. The bank gradient was moderately steep and there was little edgewater habitat. There was a moderate amount of margin vegetation in the form of willow (*Salix* sp.).

Non-Target Amphibian and Reptiles

Several other species were observed during surveys on the river and in the tributaries to the river.

Amphibians

Three relatively common amphibians were encountered most often during sampling. Rough-skinned newt (*Taricha granulosa*) was observed at 27 percent of all sites sampled. This species is an aquatic breeder and fairly common on the river in the spring and summer. Pacific Chorus frogs (*Pseudacris regilla*), both adults and tadpoles, were also observed at 23 percent of the sites. This species is also fairly ubiquitous in the river system. Bullfrogs (*Rana catesbeiana*) were also observed at 27 percent of the sites, as well as three or the four sites with YLF. This species was also encountered and abundant at many sites along the mainstem of the river that we did not survey for YLF due to a lack of potential habitat for YLF.

Reptiles

Two species of reptile were observed during surveys and incidentally on the mainstem of the river. The aquatic garter snake (*Thamnophis atratus*) was observed at 27 percent of all sites surveyed and at two YLF sites. This is not surprising as this species is known to prey on YLF as well as other amphibians and various fishes (Ashton et al. 1997, Nussbaum et al. 1983). The western pond turtle (*Clemmys marmorata marmorata*) was observed at only 14 percent of sites surveyed. However, turtles were observed in other areas not surveyed for YLF due to the different habitat types that the turtles appeared to be using. This is borne out by recent monitoring work done on the lower Rogue River over the last five years (R. Mendez-Treneman, pers comm.)

Fish

Native fish, including salmon and trout (*Oncorhynchus* sp.) were observed throughout the lower river and tributaries, primarily smolts and younger age classes in the immediate survey area. Introduced fish were observed at 23 percent of the survey sites and included

squawfish (*Ptychoheilus oregonensis*), redside shiner (*Richardsonius balteatus*), and bluegill (*Lepomis macrochirus*).

Discussion

Only one YLF oviposition site was found on the mainstem of the river, at Brushy Bar. This was a known site for YLF, several sub-adult frogs had been collected here on October 31, 2004 and it was suspected that this could be a breeding sites. This site was typical of breeding sites described in the literature, a large river bar with edgewater habitat protected from high river flows, shallow water(<40cm), cobble/gravel substrates, and low but steady stream flow at the site. The other site we located, Lobster Creek was similar; however this was a small tributary to the River and consisted of braided channel with open gravel areas and a small side channel that was the oviposition site. Some YLF sub-adults and adults were observed at Foster Bar along the mainstem but the population seemed to be more associated with the tributary than the river. One subadult was also observed at Tom Fry Creek in a side channel adjacent to the river at the outlet of the tributary. Both Quosatana and Lobster Creek sites are flooded from the Rogue River during high water events. The Nancy Creek site that the OSU class reported was also surveyed and found to be an oviposition site.

Of the fifteen sites on the mainstem where no YLF were observed, there was little difference from positive locations except for bank and river gradient, and flow which was higher (Tyee Camp, Sanderson, Winkle Bar, Zane 1 and 2, Paradise, Half Moon Bar, Solitude I). This seems to confirm YLF habitat associations described in the literature as having open gravel bars with low vegetation cover, low gradient riffle and edge water habitats. However, no YFL were found at sites that were very similar to positive sites in terms of habitat (Tyee Side Channel, Tyee Island, Telephone Bar, Winkle Island, Zane III, Paradise Bar, and Solitude II). These sites looked to have the right conditions to support YLF however, none were found. It may be that more than one year of survey is required to detect YLF at suitable sites, Borisenko and Hayes (1999), reported finding no YLF at historic site one year and then finding them in subsequent years. There were also two occasions were egg masses were found (Brushy Bar and Nancy Creek); the area was resurveyed approximately week later and none were relocated. Both times the water level had risen approximately 15-20 cm. Given the relatively long breeding season, early May through June, multiple surveys during one year may also be need to detect occupied YLF sites.

Introduced Species

The literature suggests that introduced species may have impact to YLF including competition and predation by bullfrogs, bass, and other introduced fishes such as shiners and squawfish (Kupferberg 1997, Ashton et al. 1997, Rombough 2004). However, we did not detect introduced fish species or bullfrogs at five of the sites where YLF were also not found and three of the five sites were YLF were found we also observed bullfrogs. However, at the Brushy bar site where both bullfrogs and the oviposition site was observed the bullfrogs were in a small pond separated from the YLF site by several

meters. It might be that there was no direct interaction between the two species at this site which allows this site to persist. Bullfrogs were also detected at three other YLF sites; Foster Bar, Nancy Creek and Quosatana Creek. Only one juvenile was detected at Quosatana Creek; an unknown life stage bullfrog was heard at Nancy Creek. Several bullfrogs of all life stages, adults, subadults, and tadpoles, were observed at Foster bar in the slough adjacent to the River. There were no YLF observed in the slough, only in Foster Creek proper and a small side channel to the creek which may not be as suitable for bullfrogs due to water flow and temperature.

It is unclear as to the potential effect of bullfrogs on YLF in the Lower Rogue River. Bullfrogs were observed at YLF sites but usually not in close proximity to YLF and bullfrogs seemed to be using different habitat than YLF, deeper slough areas and a pond adjacent to YLF habitat. There might be some slight partitioning of habitat between YLF and bullfrogs which could account for the presence of both at some sites

We did observe thousands of shiners in shallow edgewater habitats that would be suitable for oviposition at three sites; this species could very well predate egg masses which might account for the lack of YLF at those sites. However, no interactions were observed between shiners and YLF so it is also unclear as to any direct effects to YLF from these fish in the Lower Rogue River.

Hydrological changes

There are suggestions in the literature that change in hydrologic regime from water impoundments may have adverse effects to YLF (Lind et al., 1996), either by reduced flows or poorly timed high flows which may affect breeding chronology and location or cause the loss of egg masses. Only one breeding site as found on the mainstem of the river and it may be that hydrologic changes caused by two dams upriver have had an effect on YLF. Typically, YLF breed on the "shoulders" of the high spring flow when spring flows begin to drop and the river lowers which uncovers edgewater breeding habitats. The breeding site on the Illinois River discovered by the OSU class was found to have egg masses the first week of May. We did not observe egg masses at the Brushy Bar site until the first week of June (some egg mass were becoming dried out) and when we returned the water level at the site had risen and egg masses were not found. If flow from the Illinois and R Lower Rogue are compared, it seems that the Rogue spring flow does not subside for at least one month after the Illinois spring flow (http://waterdata.usgs.gov/or/nwis/). This may account for the breeding occurring at least one month later on the Rogue than the Illinois. The Lobster Creek breeding site was also used at east one month after the Illinois River site, however this is likely due to temperature differences between the sites. The Lobster Creek site was at 19 degrees Celsius on June 27 when egg masses and tadpoles were observed. The other sites had temperatures similar to this as early as May and early June.

It is unclear whether or not egg masses are affected by flows as the Rogue River dams are impoundments built to control flooding and not hydropower dams such as on the

Trinity River where late spring and early summer high flows to produce power has had adverse affects to egg masses (Lind et al. 1996).

Recreation

There has been some concern expressed as to the potential for large jet boast that travel the lower river to dislodge egg masses as well as cause disruption to basking frogs. These boats can produce wakes of up to one meter high that can hit the shore line with some force and may also increase the width of the wetted zone.. The Brushy Bar site is one that could experience effects from boats as the oviposition site is open to the river. However no boast were observed passing while at the site and all other sites were YLF were observed are not likely prone to this potential disturbance.

Conclusions and Recommendations

It is unclear as to why we did not observe more sites on the mainstem of the river as there seems to be suitable habitat for YLF. The presence of introduced species did not seem to be a clear factor in the absence of YLF as we found sites with both, although at sites where there were numerous bullfrogs we did not observe YLF.

It is possible we did not detect YLF where there were animals; it may not be possible to detect all sites with only one year of survey or even one survey within a single season. There seem to be a narrower window of survey on the mainstem in contrast with the tributaries; this should be investigated further to determine if this is true. This protocol as well as other sampling protocols should be tested to determine if multi-year or multi season surveys are needed to consistently detect YLF.

The effect of dams on this river is not clear, the river may delay breeding both through temperature differences and water flow. This may be why more animals were found in tributaries to the mainstem, they may be using these sites as refugia from both introduced species and altered hydrological conditions. More study as warranted on both of these issues.

The potential effects of jet boats on oviposition sites still need to be studied. Surveys on the river below where we conducted our surveys might allow us to find and monitor oviposition sites at more accessible locations than the Brushy Bar site. There are more large gravel bars per mile in this section than in the section we sampled and more jet boat activity which would allow for relatively easy monitoring of potential impacts from jet boats.

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Personal Communications

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