



Klondike Gold Rush National Historical Park 2012 Amphibian Monitoring Report



ON THE COVER

The first Boreal Toad (*Bufo boreas*) in KLGO to be fitted with a radio transmitting unit.
NPS Photo by Peter Frank

Klondike Gold Rush National Historical Park 2012 Amphibian Monitoring Report

Jaime Welfelt
National Park Service
Klondike Gold Rush National Historical Park
Natural Resources Program P.O. Box 517
Skagway, AK 99840

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Introduction

National Park managers use many indicators to understand and help maintain the integrity of park natural resources. Amphibians are considered good indicators of ecosystem health because of their sensitivity to environmental change. The rapid decline of amphibian populations in Klondike Gold Rush National Historical Park (KLGO) and Southeast Alaska reflects a larger, global decline in amphibians that may have alarming implications for the world's environment (Becker et al. 2007).

Efforts to monitor amphibian populations in Klondike Gold Rush National Historical Park are part a worldwide push in the last 20 years to study and protect amphibian biodiversity (Anderson, 2004). In 2000, the National Park Service in Alaska prioritized amphibians as a taxonomic group to be inventoried. An Amphibian Monitoring Program was established in KLGO in 2004 and initially began by surveying wetlands and assessing the presence or absence of species. Since then, it has evolved from a purely inventory-based research strategy to a midlevel monitoring effort based on the USGS Amphibian Research and Monitoring Initiative (ARMI).

Two amphibian species have been confirmed in the park: Boreal Toad (*Bufo boreas*) and the Columbia Spotted Frog (*Rana luteiventris*). Prior to 2007, with the discovery of Columbia Spotted Frogs in the White Pass Unit of KLGO, the Boreal Toad was the only confirmed amphibian species within park boundaries. Although not yet confirmed, KLGO falls within the expected range of three additional amphibian species, the Northwestern Salamander (*Ambystoma gracile*), Rough-skinned Newt (*Taricha granulosa*), and Wood Frog (*Rana sylvatica*) (Alaska National Heritage Program, 2001).

Boreal Toads, due to their relative abundance in the Taiya River watershed are the primary focus of amphibian monitoring efforts in KLGO. This species, historically widespread throughout the western United States and Canada, has shown abrupt declines in abundance and distribution through large portions of their range in the last several decades (Hallock 2005). Boreal Toads are classified as a species of concern for Southeast Alaska and by the National Heritage Network (Carstensen et al. 2003). Incomplete information on Boreal Toad distribution, population size, and habitat range in Southeast Alaska prompted the development of a long-term monitoring protocol for KLGO and adjacent wildlands.



Figure 1. Amphibians are an important part of both the natural and cultural heritage of the area. Frogs and toads are depicted in many local Tlingit crafts and myth, these totem poles are located in Haines, AK.

In addition to intensive monitoring of Boreal Toad breeding progression, the 2012 season focused on disease testing and non-breeding habitat use. In recent years, emerging diseases have been detrimental to global amphibian populations. Chytrid Fungus (*Batrochochytrium dendrobatitis*), is a disease agent responsible for chytridiomycosis in amphibians. The disease was originally described in 1998 and is one of the main factors attributed to the loss of amphibian biodiversity worldwide (Berger et al., 1998). Although thought to have been spread throughout the world in just the last century, its extent and current distribution are unclear (Skerratt et al. 2007). Amphibians exposed to the fungus may die soon after their skin is infected and can quickly spread the fungus through an area, causing a rapid collapse of the entire population at the site. Sampling for chytrid in 2005 confirmed its presence in KLGO. Additional sampling was done in 2006, 2007, 2009, and 2010. In 2010 a dead boreal toad was sent to the National Wildlife Health Center for testing, the results confirmed the cause of death as chytridiomycosis (Surdyk, 2010).

The effective conservation of amphibians requires an understanding of core habitat usage, a challenge for animals with distinct life stages that use distinct habitats. Boreal toads for example, use shallow pools for breeding but use terrestrial habitats to feed and hibernate. Outside of their brief breeding period in spring and early summer, adult toads are very difficult to detect as they spend most of the time in upland habitats.

Information on the spatial behavior and movement patterns of individuals is necessary for a complete understanding of species' ecology. For most amphibian species, patterns of movement and habitat use are poorly known, especially in non-breeding habitats. One of the most valuable techniques for gaining information on the microhabitat use, home range and movement of a species is remotely tracking individuals in the field. The most commonly used method to track amphibians is radio-telemetry.

Objectives of the Radio-tracking Study at KLGO are to provide information about use and selection of upland habitat by Boreal Toads and locate key habitat elements (hibernacula, movement corridors and additional breeding locations) which are required to facilitate the conservation of the species. The data on Boreal Toad upland habitat use will be used to inform the planning process for any infrastructure development or enhancement proposed for Dyea.

2012 Amphibian Monitoring Objectives

The 2012 monitoring season was dedicated to implementing the long-term Amphibian Monitoring Protocol developed for KLGO in 2009 based on USGS Amphibian Research and Monitoring Initiative (ARMI) mid-level Monitoring Protocol. Thus the focus of park resources and staff was on monitoring species composition and abundance rather than conducting inventories on presence-absence data. The objectives of amphibian monitoring in Klondike Gold Rush National Historical Park are:

- Monitor long-term changes in amphibian distribution, abundance, reproduction, and survival rates at core breeding sites in Dyea.
- Determine the presence and distribution of Chytrid Fungus
- Locate important non-breeding habitat features

In addition to the broader monitoring objectives, the 2012 monitoring season had a strong emphasis on education and outreach. Natural Resources staff participated in the Skagway Recreation Center's Summer Camp Career Day (Figure 2), NPS sponsored Junior Ranger Day (Appendix A), a publication for the NPS

Alaska Region AK2Day website (Appendix B), a story in the Skagway News, and a story on the local radio station KHNS.



Figure 2. Local Skagway Recreation Center Summer Camp kids helped biologists look for Boreal Toads on Career Day, June 12, 2012.

Klondike Gold Rush National Historical Park Skagway, Alaska

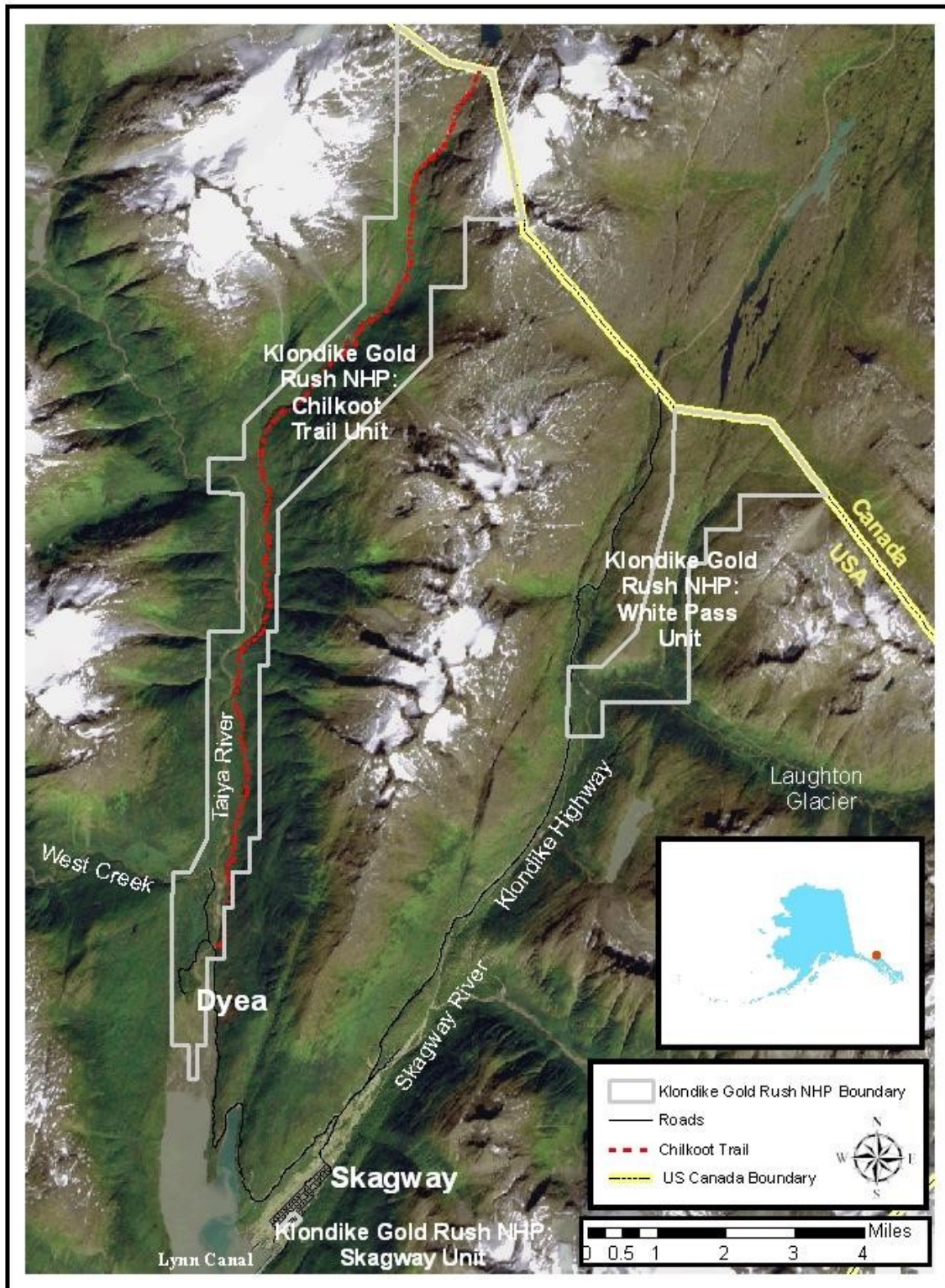


Figure 3. Area map including all units of KLGO and extensive monitoring sites.

Methods

In 2012, the Amphibian Monitoring Program was divided into three components: Visual Encounter Surveys, Chytrid Fungus Testing and a Radio-telemetry Movement Study.

Visual Encounter Surveys

One seasonal biological technician managed the amphibian monitoring program according to the Amphibian Monitoring Protocol and Standard Operating Procedures (SOPs) for routine amphibian Visual Encounter Surveys. The SOPs can be located in T:/NRM/Amphibians/Amphibian Monitoring Protocol. Additional field support was provided by Natural Resources staff and volunteers.

The amphibian monitoring strategy at KLGO is organized into intensive and extensive components of the project in order to focus efforts appropriately given the density of amphibians in each particular area. Therefore, the lower Taiya River watershed, with its multiple Boreal Toad breeding sites has been considered the intensive component. In this area, core sites (those with present or previous breeding occupancy) will continue to be visited multiple times throughout each season (approximately mid-April through mid-September) to monitor toad presence and development. The extensive component was given a stratified design in which the greater areas of White Pass, the remaining sections of the Upper Skagway River watershed, select areas of the lower Taiya River watershed and the entire upper Taiya River watershed, were divided into Panels 1-4, one to two of which will be monitored per given season. Unlike the intensive component, each individual site within a panel of the extensive component will be visited only once per season (SOP 1. Routine Amphibian Survey Field Methods, 1.1.2 Seasonal Monitoring Schedule).

The 2012 amphibian monitoring season focused on 9 core Boreal Toad breeding sites in Dyea. These sites were visited at least once a week between April 23 and September 30. During active breeding times, sites were visited more often; sometimes daily if needed and if resources allowed. A total of 63 routine amphibian surveys of the 9 intensive monitoring core sites were conducted during the 2012 season. Single surveys were conducted on extensive sites located in West Creek, along the Chilkoot Trail Corridor, Laughton Glacier, Lower Dewey Lake, and the White Pass Unit.

Temporal, climatic, physical, and vegetative habitat data metrics were collected on hard copy data forms (Appendix C) during the Visual Encounter Survey (VES) for amphibians present. The VES was performed by visually scanning the shoreline and all wadeable habitat of the site, estimating the relative abundance when large numbers of amphibians were present or making actual counts when feasible. Age class was defined according to Carstensen et al. (2003) with some minor changes as follows: metamorph- according to presence and timing at known tadpole locations; juvenile- <55mm SVL; and adult- >55mm. All attributes for amphibians observed were recorded on the species data form (Appendix IV). Counts for amplexing pairs, adults, and juveniles are “memory-less,” meaning it was assumed that the same individual was never detected twice and that there were no recaptures, as recommended by Nate Chelgren from USGS ARMI in 2005. Numbers for tadpoles and metamorphs are sums from the single survey with the highest counts.

A strict hygiene protocol is followed to reduce the transmission of infectious diseases between study sites. All footwear and field gear is disinfected using a diluted bleach solution. The exact procedure is outlined in the Hygiene SOP 3 of the Amphibian Monitoring Protocol.

Chytrid Testing

Chytrid Fungus is tested using recently-developed quantitative (real-time) polymerase chain reaction (PCR) assays to detect the presence of the fungal zoospores. PCR samples were collected by swabbing the ventral (underside) surface 20 times and the feet 5 times. Swabs are then placed in 2 ml vials of 70% ethanol. A detailed outline of the Chytrid Fungus testing procedure is located in SOP 4: Collecting Samples for Chytrid Fungus Testing.

Chytrid fungus tests were collected on all radio-belted Boreal Toads and all additional amphibians located in extensive surveys. One female Boreal Toad from the Laughton Valley, one sub-adult Boreal Toad located at Finnegan's Point campground along the Chilkoot Trail, and one Boreal Toad and two Columbia Spotted Frogs from the White Pass Unit were tested. A total of 11 samples were sent to Pisces Molecular for PCR testing.

Radio Tracking

Boreal Toad movement and habitat use was investigated by radio-tagging 6 adult toads through their active period (July through September), after breeding activity (amplexus and egg laying occurs in April through June) had concluded. Radio transmitters (Model BD-2, Holohil Systems, Ltd.; Carp, Ontario, Canada) were attached using adjustable plastic belts (Burow et al. 2012) and tracked using a Telonics radio receiver and antenna at least once per week. Anatomical data including SVL, weight and sex if known, was recorded. All belted toads were tested for chytrid fungus. Detailed belt instructions and telemetry methods are outlined in SOP 8: Amphibian Radio-Tagging Methods. Each transmitting unit has a unique serial number written on it from the manufacturer. These serial numbers are used to identify individual toads.

At least once per week all belted toads were located using radio-telemetry. Habitat data was collected on the Amphibian Movement Study Datasheet (Appendix D). Each location was recorded using a Garmin GPS Unit. The habitat was classified (large woody debris, human made structure, rock formation, moss, bare ground, cut bank/soil, leaf litter, grass, shrubs, water or other), % cover measured, and determined if the site was being used for hibernation. Each toad was checked to make sure the belts were fitting properly, adjusted if necessary and returned to the exact location.



Figure 4. Biotech Jaime Welfelt tracks a Boreal Toad at site TR01 using radio-telemetry (left), a radio-transmitting unit with a belt ready for attachment (right).

Overall Results

Visual Encounter Surveys

Five active Boreal Toad breeding sites were identified in the 2012 season, 4 of which had toads that successfully reached metamorphosis. Additional activity was observed at 7 total known monitoring sites (Table 1). A total of 47 adult toads, 8 (4 pairs) in amplexus, 22 juveniles, 25 egg masses, an estimated 46,000 tadpoles, and an estimated 10,000 metamorphs were detected. The 25 egg masses recorded in the 2012 season marks the greatest number of egg masses ever recorded at KLGO. All 2012 egg masses were found at core breeding sites with previously documented breeding history. Table 2 shows dates of first observed egg mass, tadpoles, and metamorphs for the 2012 season and since the monitoring program began in 2004. Adult and juvenile Boreal Toads were detected throughout the duration of the monitoring season. Tadpoles were still present at TR01 and DY14 at the end of the monitoring season in late September (Table 3).

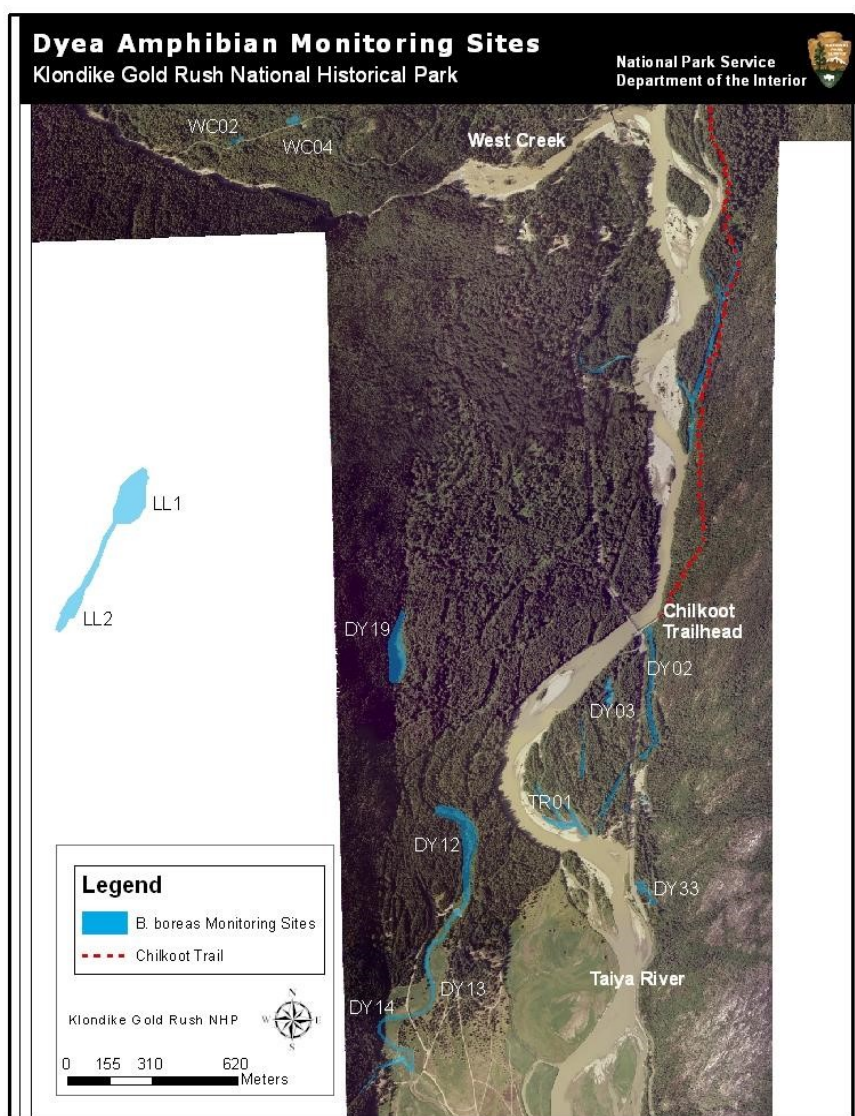


Figure 5. Locations of Boreal Toad Monitoring Sites located in Dyea, AK.

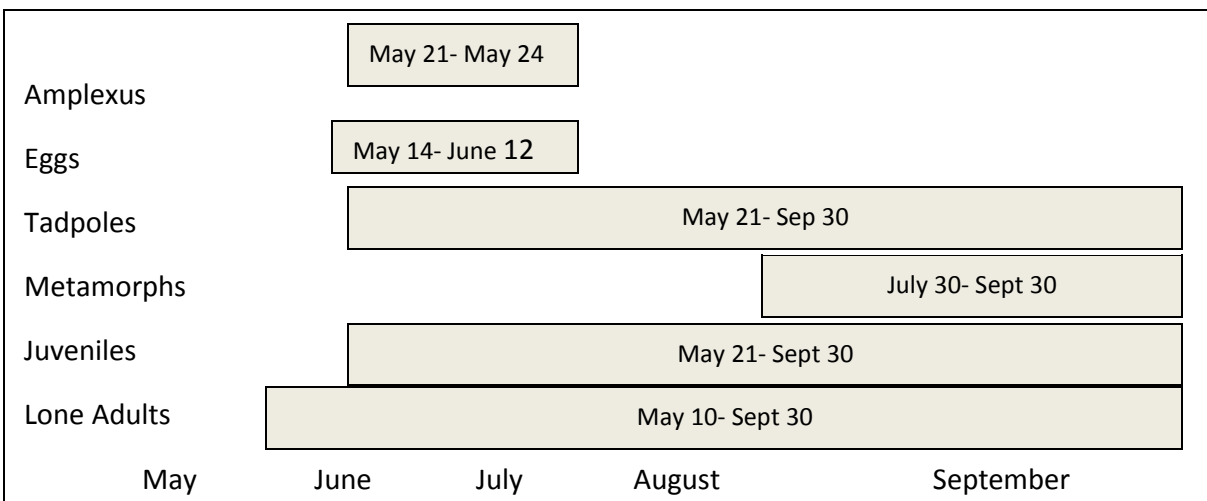
Table 1. Detected site occupancy during the summer season for each life stage from 2004-2012. “X” indicates positive detection, blank indicates no detection, and “--” indicates that the site was not surveyed.

Site ID	2004				2005				2006				2007				2008				2009				2010				2011				2012			
	Life Stages Observed				Life Stages Observed				Life Stages Observed				Life Stages Observed				Life Stages Observed				Life Stages Observed				Life Stages Observed				Life Stages Observed				Life Stages Observed			
	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	Egg Mass	Tadpole	Metamorph	Juvenile	Adult	
DY02									X					X																						X
DY03		X	X			X	X		X	X	X	X	X	X	X		X					X					X	X	X		X	X	X		X	X
DY12				X												X																				
DY13				X										X			X		X								X	X	X	X	X		X		X	X
DY14		X		X		X	X				X	X	X			X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X		X	X
DY19						X		X						X																						
DY33		X				X					X	X			X																				X	
TR01						X	X	X		X	X	X	X			X	X	X	X		X	X	X	X		X	X	X	X	X	X	X	X	X	X	X
WC02						X	X				X	X	X	X								X													X	X
WC03														X	X																				X	
WC04																	X	X			X	X		X		X	X	X		X	X	X	X	X	X	X

Table 2. Date of first observed Boreal Toad life stages for each year of KLGO Amphibian Monitoring Program.

Year	Egg Mass	Tadpole	Metamorph
2004	May 19	late May	July 1
2005	April 21	May 9	July 6
2006	mid -May	May 30	July 26
2007	May 14	June 5	Aug 15
2008	May 20	June 5	July 31
2009	May 8	May 21	Aug 4
2010	May 3	May 19	June 28
2011	May 11	May 16	July 14
2012	May 14	May 21	July 30

Table 3. Boreal Toad phenology date ranges observed at core sites in KLGO in 2012.



Individual Site Results

For each core breeding site and extensive site surveyed, a general habitat description for the 2012 season, summary of quantitative site data, and qualitative timeline in amphibian activity and significant morphology events are provided.

Core sites

Taiya River 01 (TR01)

Discovered in 2005, this productive breeding site is a wetland within the floodplain of the Taiya River, approximately 50 m west of the National Park Service Dyea campground. This series of 3 primary side channels intermittently receives flow from the Taiya River causing water levels to fluctuate widely and rapidly throughout the summer in response to temperature and the amount of recent precipitation. Such a regime produces 3 „lobes“ (East, Middle, and South) that typically maintain some water throughout the season supporting extensive areas of *Equisetum*, with the pond margins dominated by *Salix* and *Alnus* spp. These aquatic and riparian plants, along with a several others, increase significantly in size, density, and coverage as the summer season progresses. In addition to hydrological disturbances, this site is especially prone to disturbances by people, their pets, hares, otters, bears, and predation from shore birds.

The productivity of this site is ever dependent of the fluctuating hydrology of the Taiya River. In some previous years the old river braids used as breeding ponds have dried completely, resulting in 100% desiccation of eggs and larva. Reversely, high water levels have also caused the river to reshape and expand, ultimately overwhelming the site with turbid glacial runoff and washing away any amphibians inhabiting the site. This year both scenarios played out. In May and June, two egg masses in the southwest pool failed to develop due to desiccation. In late June, due to several days of warm, sunny weather the Taiya River reached the National Weather Service’s moderate stage flooding level with a max gauge height of 17.1 on June 23, 2012 (Figure 6). A significant portion of the newly hatched tadpoles were washed downstream.

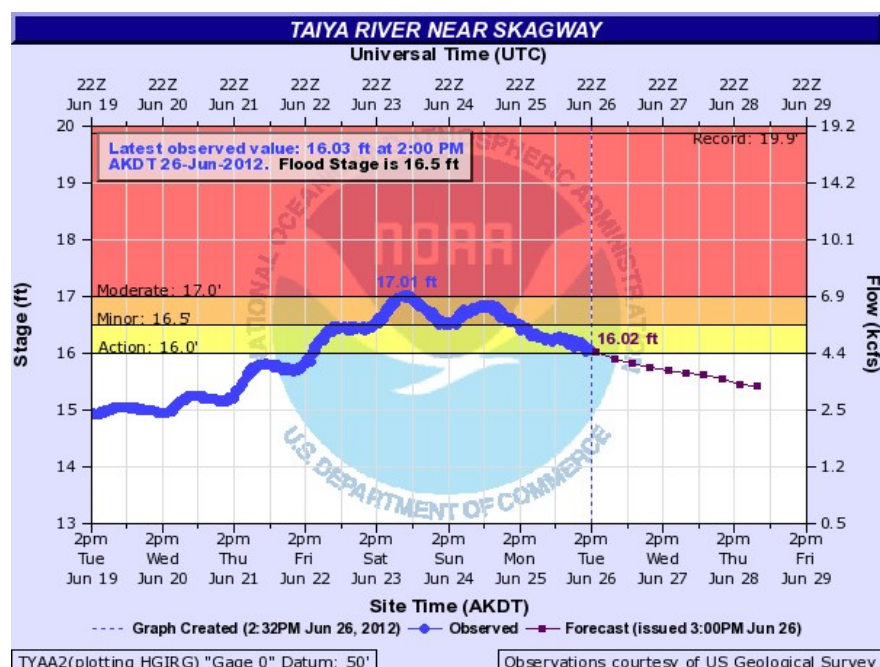


Figure 6. USGS Taiya River gage height (ft) graph showing the moderate flooding event on June 23, 2012.

During the 2012 monitoring season, TR01 received a total of 14 visual encounter surveys. Biotechs observed 8 egg masses (3 surviving to produce hatchlings and tadpoles), ~10,000 tadpoles, ~200 metamorphs, 6 adults in amplexus, and 29 lone adults. Two egg masses at TR01 failed to develop due to dessication and fluctuating water levels (Figure 7). Three egg masses at TR01 failed to develop due to water mold/fungal infections (Figure 7). A variety of biotic and abiotic factors are reported to damage or act as stressors on Boreal Toad egg masses including UV-B radiation, non-optimal temperatures, changes in pH, pollution, physical disturbances, and water-borne pathogens such as water-molds or fungi (Kiesecker, 1995). The reason for detected egg mass mortality in KLGO is not known but in the Oregon Cascades, Boreal Toad egg masses have seen 50-100% mortality due to a pathogenic fungus, *Saprolegnia ferax* (Kiesecker, 1995). After consulting several amphibian disease experts, it is believed that *Saprolegnia ferax* is most likely responsible for KLGO egg mass infections.



Figure 7. Site TR01 was plagued with egg mass mortality in 2012, 2 egg masses failed to develop due to dessication (left) and 3 of the eight egg masses at this site failed to develop due to water mold or fungal infections (right).

Dyea 02 (DY02)

This shallow, detritus-laden wetland is dominated by *Carex*, *Equisetum*, and several species of grass in the aquatic zone, with Sitka alder and cottonwood around the perimeter. Water levels fluctuate from completely dry to nearly two feet of depth during high water. Physical evidence of Boreal Toad breeding (amplecting adults, egg masses or tadpoles) has never been observed at DY02. However, it appears to be important habitat for juvenile and adult boreal toads. Juvenile toads were observed at this site in 2005, 2006, 2009, 2010, and in the 2011 season. Lone adult toads were seen in the 2007, 2010 and 2012 seasons.

During the 2012 Monitoring season, DY02 received a total of 3 visual encounter surveys. One lone adult was spotted by the Exotic Plant SCA intern, Peter Frank. Limited surveys were conducted at this site due to the high number of juveniles at this location in past seasons and the high probability of stepping on them.

Dyea 03 (DY03)

This shallow, anthropogenic wetland is susceptible to radical changes in water depth and may flood over an old road bed or dry out after breeding initiation. At average water levels at this site is composed of four distinct ponds. The northern-most pond has a thick layer of leaf debris along the shore but relatively little leaf debris on the bottom of the pond itself and no emergent or submergent vegetation. The north-center pond is the shallowest and thus the most vulnerable to water fluctuations. At high water, the north and center pond merge into one, and become water connected to the south-center pond, which expands over the decommissioned road leading into the site. The southernmost pond is the deepest, approximately 1.5 meters deep in the center. Leaf litter, canopy cover, and depth make this pond less suitable breeding habitat but it could be used as a migration area for metamorphs and adults. While water levels fluctuate throughout the season, there are no inlets or outlets to the site and the water remains stagnant and warm. In the early season and at low water levels, there are few aquatic emergent plants present. As the season progresses, plants grow and water levels rise, a larger portion of the pond supports emergent vegetation. Sitka alder comprises a majority of the riparian vegetation.

During the 2012 Monitoring season, DY03 received a total of 10 visual encounter surveys. Biotechs observed 1 egg mass and 6 lone adults. The one egg mass laid in the south-center pond was laid by a female not in amplexus, the eggs turned white indicating they had not been fertilized (Figure 8).



Figure 8. Unfertilized egg mass, eggs turn white and fail to develop (left). The first sub-adult toad found in the 2012 season, a rare sighting (right).

Dyea 12 (DY12)

This section of Nelson Creek above the Nelson Slough foot bridge is a slow-moving stream and is well filled with emergent vegetation. The channel becomes increasingly shaded as it moves north. The deepest parts of the channel are centrally located and can reach a maximum depth of ~.8m. The northern end of this

wetland maintains water on a regular basis while the southern portion typically dries out. Physical evidence of Boreal Toad breeding (egg masses or tadpoles) has never been observed at DY12.

In 2012, DY12 received 1 visual encounter survey. No amphibians were detected at this site. Water fluctuations and dense canopy cover make DY12 a less desirable breeding site. However, it should continue to be periodically searched throughout the breeding season. Lone toads have been seen at this site in the past.

Dyea 13 (DY13)

This is the section of Nelson Slough (West Branch of the Taiya River) between the old Dyea town site trail footbridge and the vehicle bridge, south of which it is considered Dyea 14. This slow moving channel is almost entirely filled (75%) with emergent *Carex spp.* with one narrow area of open water near the center of the channel. Changes in the hydrology of the Nelson Slough are related to fluctuating water levels and post-glacial rebound, or the slow uplift of land after the recession of a glacier. The Dyea flats rise an average 14 to 16 mm per year, one of the fastest rates found anywhere (Larsen et al. 2005). In 2012, water levels fluctuated between being entirely dry to full connection with DY14. Visibility and amphibian detection is very low at this site due to dense vegetation cover.

During the 2012 Monitoring season, DY13 received a total of 6 visual encounter surveys. No egg masses were observed at this site. However, over 100 tadpoles were observed and one sick adult Boreal Toad was seen on May 29, 2012 (Figure 9). The ~100 tadpoles observed were actually from the productive breeding that took place in DY14, since no egg masses were ever observed here and tadpole detection did not take place at this site until water connected DY13 to DY14, a highly active breeding site. Chytrid fungus testing supplies had not arrived at the time this sick adult toad was found. However, images of the toad were sent to multiple amphibian experts, chytrid fungus is believed to be a contributing factor to the condition of this toad. The toad was never relocated.



Figure 9. This sick adult Boreal Toad was found at site DY13 on May 29, 2012.

Dyea 14 (DY14)

DY14 encompasses the section of Nelson Slough extending southwest from the vehicle bridge to its confluence with Nelson Creek on the western bank. This slow-moving channel starts out with a dense cover of *Carex spp.*, except in the thalweg and has a substrate comprised of unconsolidated silt. As it nears a large bend, aquatic vegetation disappears almost entirely as depth increases and a large open pool forms with a

substrate that is consistent with the upstream portion. Moving downstream from the pool, the channel becomes increasingly covered with *Carex* spp as the average depth decreases over a primary substrate of fine gravel. This site is part of the larger Taiya River estuary and thus it is a slightly brackish environment. Water levels at DY14 are affected by tidal movement as well as glacial melt and rainfall. During high water events, DY14 is connected with DY13 to the north and Nelson Creek to the south. Brown bears, black bears, great blue herons, river otters, salmon and other fish share this dynamic environment with the boreal toad population that has been positively detected at the site every year since the monitoring program began in 2004. DY14 is consistently the most productive Boreal Toad breeding site currently monitored at KLGO.

In 2012 DY14 received a total of 10 visual encounter surveys. Biotechs observed 2 adults (1 pair) in amplexus (Figure 10), 12 egg masses, ~30,000 tadpoles, ~10,000 metamorphs, and 1 lone adult. No juvenile Boreal Toads were detected during the 2012 season.



Figure 10. Two adult toads in amplexus. The male is significantly smaller, on top. The larger female lays a double strand of up to 12,000 eggs.

Dyea 19 (DY19)

This large bog, dominated by emergent buckbean (*Menyanthes trifoliata*) and a fringe of sweet gale (*Myrica gale*), maintained some water throughout most of the summer, but became nearly dry by mid-August, except for the main channels running through the site. This site is located behind Slide Cemetery, accessed using a conspicuous trail located along the north side of the cemetery fence. Evidence of Boreal Toad breeding was

observed here in 2005 and 2006 and was not surveyed surveyed in 2009. Juveniles were found in high abundance in 2010 and 2011, indicating undetected breeding activity in the area.

During the 2012 monitoring season, DY19 received a total of 2 visual encounter surveys, none of which resulted in positive amphibian detection.

Dyea 33 (DY33)

This anthropogenic wetland, owned by the Municipality of Skagway, becomes 2 distinct areas during high water events. A relatively deep (< 2 m), circular pond, created by excavation, lies at the southern end of the site and maintains water throughout the summer. The larger portion to the north is less convex, with ephemeral water only. In 2009, gravel piles were placed in this site for road maintenance and the shallow depressions that previously supported breeding activity and egg masses were filled in. The majority of the deep pond substrate is gravel, but the western edge is dominated by plants typically associated with wet meadows and the perimeter of the pond is comprised mainly of Sitka alder. A productive breeding site in 2004, 2005 and 2006, evidence of Boreal Toad has not been detected since then. Vehicles regularly move through this area and it does not appear to be suitable Boreal Toad breeding habitat but should continue to be periodically monitored for activity as conditions change.

In 2012, DY33 received a total of 3 visual encounter surveys, none of which resulted in positive amphibian detection.

West Creek 02 (WC02)

Adjacent to West Creek Road, just west of the KLGO boundary in the Municipality of Skagway's jurisdiction, this small wetland, approximately 100 m², is a series of small ponds dominated by cotton grass, *Eriophorum spp.*, and sedge, *Carex spp.*, as well as sphagnum moss. After its initial discovery from aerial photographs in 2005, it was identified as an important breeding site in 2005, 2006, and 2007. One adult Boreal Toad was detected in 2009 but breeding activity has not been recorded at WC02 since the creation of an adjacent road-side ditch, WC04 in 2008. Shading and lower water temperatures make WC02 less suitable for Boreal Toad breeding and it is assumed that the breeding population now using WC04 is the same population once utilizing WC02.

During the 2012 Monitoring season, WC02 received a total of 2 visual encounter surveys, one adult Boreal Toad was located but no evidence of breeding was detected.

West Creek 04 (WC04)

Discovered in 2008 as a Boreal Toad breeding site after conducting a survey of WC02, this anthropogenic pool (approximately 50 m²) is part of the drainage ditch adjacent to the north side of West Creek Road, created when the road was „improved“ during the spring of 2007. This site has a shoreline substrate mainly comprised of fine gravel and large rocks with grass, sedge, and rush spp. as the dominant vegetation. The bed surface consists of relatively deep (20-50 mm), dark detritus, providing substantial cover for tadpoles, as did an increasingly abundant cover of algae. WC04 has little or no shading and consistently warm temperatures making it more suitable breeding habitat for Boreal Toad. Unlike the other core sites, WC04 is not directly dependent on the hydrology of the Taiya River and is less prone to abrupt shifts in water levels.

During the 2012 Monitoring season, WC04 received a total of 13 visual encounter surveys. Biotechs observed 4 egg masses, ~10,000 tadpoles, ~1,000 metamorphs, 3 juvenile, and one adult male Boreal Toad (Figure 11). The first egg mass of the 2012 season was detected at WC04, one week earlier than other sites.



Figure 11. One small adult male Boreal Toad suns on the edge of WC04, this small pond is a productive breeding site but adult toads are rarely encountered.

Extensive Sites

West Creek 03 (WC03)

This is an area of extensive wetlands, up the West Creek drainage, that can be reached by hiking approximately 2.5 km up the trail at the end of West Creek Road. The area surveyed in 2012 includes a Small Complex (WC03-SC; approximately 150m x 70m in area) that is separated from the much larger Main Complex (WC03-MC; approximately 750m x 300m) (Figure 12) by a thin band of forest to the northwest. The majority of the water surface area for each site, while relatively exposed in early summer, becomes increasingly enclosed with a dense cover of buckbean (*Menyanthes trifoliata*) with the margins dominated by various grasses, sedges, alder, and willow. Such vegetative phenology makes the detection of amphibian egg and larval stages progressively difficult, especially in the vast expanse of the Main Complex where approximately 70-80% of the area is covered by lentic bodies of water. Evidence of Boreal Toad breeding has been observed at this site in the past. Several juveniles, an adult and tadpoles were found in the Small Complex in 2009. During the 2012 Monitoring season, WC03 received just one visual encounter survey on July 16.

Approximately 1,000 Boreal Toad tadpoles were found at the Small Complex (Figure 12). Conducting a full search of the small complex and a partial search of the large complex took a team of 4 people 210 minutes.



Figure 12. WC03 is a vast wetland complex divided into two smaller units, the Main (left) and Small Complex. Approximately 1,000 Boreal Toad tadpoles were found in the Small Complex (right), evidence of breeding has only been detected at this site once before.

Lost Lake (LL1)

Lost Lake is a bedrock controlled lake with steep sides and very few shallow areas. The southern end of Lost Lake is fairly shallow with an area of buckbean that is similar to Dyea 19. Lost Lake was surveyed once during the summer on July 9, 2012. No amphibians were detected during the survey.



Figure 13. The view of Lost Lake from the north looking south.

Lost Lost Lake (LL2)

Lost Lost Lake can be found by continuing down a little-used trail at the southern end of Lost Lake. The vegetation community in and surrounding Lost Lost Lake is similar to the lakes and ponds of Canada that host Western Toad, Spotted Frog (*Rana luteiventris*), and Wood Frog (*Rana sylvatica*) breeding populations. However, the main body of water considered Lost Lost Lake has steep banks creating a deep shoreline, potentially not favorable for western toad breeding. On the other hand, a number of distinct pools lie in the meadow surrounding the north end of the lake which have much shallower water and appear to be ideal for breeding. Lost Lost Lake was surveyed once during the summer along with Lost Lake on July 9, 2012. No amphibians were detected.



Figure 14. The view of Lost Lost Lake from the north looking south.

Chilkoot Trail 07 (CT07)

This large series of beaver ponds is located on the Chilkoot Trail at mile three. There are several dead trees standing in the middle of the pond, and the entire pond is surrounded by closed forest. The sides of the pond are fairly steep, the water appears to be at least 1m deep, lacks emergent vegetation, and requires the use of chest waders to effectively survey.

An adult was found at CT07 by the trail crew in 2007 and 2010. Two adults were reported in 2011, one by the vegetation mapping crew and another reported by a Chilkat River guide. Evidence of breeding has never been detected at this location. However, the large size and complexity of the beaver ponds makes detection very difficult. No amphibians were detected during the survey conducted on June 28, 2012.

Chilkoot Trail 11 (CT11)

CT11 is a wide open sand flat which is an old river braid that can receive river water flow during periods of high water. The lack of cover for much of the shore, the regular presence of spotted sandpipers, a density of spotted sandpiper footprints at the pond's shoreline, and the sand substrate on this uplift pond is reminiscent of TR01, a consistently productive breeding site in Dyea. CT11 can be reached with a short bushwhack from the raft put-in spot, 1.6 miles down the Chilkoot Trail. The bank starts to undercut downstream of the put-in spot so wading just offshore is not an option. When traveling North on the trail, after descending the first hill, Saintly Hill, there is a spot where the trail opens up to the river bank is just after a bridge. This spot is a viewpoint used by raft guides for interpretation, and affords a view of the site. No amphibians were found here during the search on June 28, 2012.

Extended Chilkoot Survey

In 2011, reports from multiple hike and float guides in of Boreal Toads on the Chilkoot Trail between the trailhead and the rafters put-in prompted a survey of the area to try and locate additional breeding sites along this corridor. While no new breeding sites were identified, an adult and multiple yearling toads were located on a sandbar adjacent to the stream flowing out of the beaver ponds. The high number of sightings and distance from known breeding locations suggests that there are additional undiscovered breeding sites located in the upper Skagway River Valley.

The Chilkoot Trail was resurveyed in 2012, focusing in areas with previous sighting reports. One sub-adult Boreal Toad was spotted at Finnegan's Point Campground. No other amphibians or evidence of breeding was detected.



Figure 15. A wolf track spotted while conducting amphibian surveys along the Chilkoot Trail.

White Pass Unit

In early August 2004, a White Pass & Yukon Route employee spotted a large amphibian sunning on a rock near White Pass (J. Mcdermott, pers. comm. 2004). This prompted the survey of Pumphouse Lake (WP01), immediately to the south of the pass, in which a single Boreal Toad adult was found that same year. Subsequent surveys in 2005 and 2006 of this same site did not reveal any amphibians, but in 2007 an additional 9 lake sites (WP02A-C, WP04, WP04B, WP05WP08) were visited, up to 2 km south of WP01. This effort produced a single Columbia Spotted Frog sighting, the range of which, prior to this discovery, was only documented to extend within 4 km north of the Canadian Border at White Pass. Additional Columbia Spotted Frogs were found in surveys conducted in 2009 and 2011.

In 2012, Natural Resources staff found 9 Columbia Spotted Frogs and a single adult female Boreal Toad. No evidence of breeding was detected. Two Columbia Spotted Frogs and the Boreal Toad were tested for chytrid fungus (Figure 16). All amphibians found during the 2012 White Pass surveys were located adjacent to the White Pass Railroad tracks.



Figure 16. Biotech Jaime Welfelt tests a Boreal Toad for chytrid fungus in the White Pass Unit on August 30, 2012 (left). Capturing Columbia Spotted Frogs is considerably more difficult than Boreal Toads. When disturbed, Columbia Spotted Frogs dive into the deepest part of the pond where they are well camouflaged (right).

Laughton Glacier

Located in the upper Skagway Valley, Laughton Glacier is accessed via the White Pass & Yukon Route railroad at mile 14. The three mile trail leading to the glacier is lined with many small wetlands and pools suitable for amphibian habitat. Over the years, many local guide services have reported seeing Boreal Toads along the trail. One adult was captured and PIT tagged in 2005 but suitable breeding habitat or evidence of breeding has never been detected in the Laughton Glacier valley. Following several amphibian sighting reports in July, two biotechs spent one full day searching for amphibians on July 31, 2012. One adult female Boreal Toad was found at mile 1.5, just off the trail in dense grass (Figure 17). The toad was captured and swabbed for chytrid fungus, the first ever chytrid swab collected from the Laughton Valley.



Figure 17. The only Boreal Toad found in the Laughton Glacier Survey on July 31, 2012.

Lower Skagway River Valley

In 2011, two adult boreal toads were reported in the lower Skagway Valley for the first time since monitoring efforts began in 2004. Historically, boreal toads were found in abundance in both the Skagway and Taiya River Valleys but recent reports have been confined to the Laughton Glacier Valley. One life-long Skagway resident recalled breeding ponds adjacent to the mouth of the Skagway River, the current location of the Skagway Airport and in Icy and Lower Dewey Lake (Kalen 2010, Albecker 2010).

In 2012, one toad was found by NPS interpretive ranger, Taylor Bracher at Lower Dewey Lake on July 1. Two Resources staff members searched the area on July 6 but were unable to locate any amphibians. Suitable habitat was identified at the north end of the lake. The second toad sighting was recorded by NPS maintenance worker, Scott Logan on his property in Liarsville, adjacent to the Skagway River.

Chytrid Fungus Testing

Of 11 samples, 3 tested positive for chytrid fungus (Table 4). All positive results came back as “Very Strong Positive Signal” detections. Two of the positive results were from site TR01 and one from DY03. DY03 has tested positive for chytrid in previous years but this is the first positive test results for TR01. Both sites TR01 and DY03 are core breeding sites with active breeding activity in 2012. All 3 positive results were from radiotagged Boreal Toads, the samples were collected prior to radio-belt application.

Table 4. Chytrid Fungus (*Batrochochytrium dendrobatitis*) Testing Results 2012.

Date	Site ID	Species	Results
7/17/12	TR01	Boreal Toad	+++
7/18/12	TR01	Boreal Toad	+++
7/19/12	DY03	Boreal Toad	-
7/30/12	TR01	Boreal Toad	-
7/30/12	DY03	Boreal Toad	+++
7/30/12	WC02	Boreal Toad	-
7/31/12	Laughton	Boreal Toad	-
8/21/12	Chilkoot	Boreal Toad	-
8/29/12	White Pass	Columbia Spotted Frog	-
8/30/12	White Pass	Boreal Toad	-
8/30/12	White Pass	Columbia Spotted Frog	-

Scoring: +++Very Strong Positive Signal, ++ Strong Positive Signal, + Positive Signal, w+ Weak Positive, - Negative/No Signal.

Radio-tracking Study

Radio-transmitting units were attached to 6 adult male Boreal Toads in Dyea (Table 5). Toads were tracked between June 17 and September 25, 2012.

Two toads escaped from the belts within 24 hours. One belt fell off inside of a large log and could not be recovered. Another belt fell off when the copper wire holding the belt together broke. One transmitter stopped transmitting a signal, the toad was located in its usual sunning spot and the failed belt was removed. The same toad was later recaptured and fitted with a new belt which eventually fell off in a dense brush pile. One toad entered a hibernation site deep below a large rock and the belt could not be located.

No skin sores or irritation was detected from the belt attachment. The main problems encountered were animal escapement and the transmitter units flipping to the underside of the animal. The belts did not appear to noticeably hinder movement. Most toads stayed within 100 meters of their capture location. The longest distance travel by a tracked toad was 277 meters.

Dyea Amphibian Monitoring Sites

Klondike Gold Rush National Historical Park

National Park Service
Department of the Interior

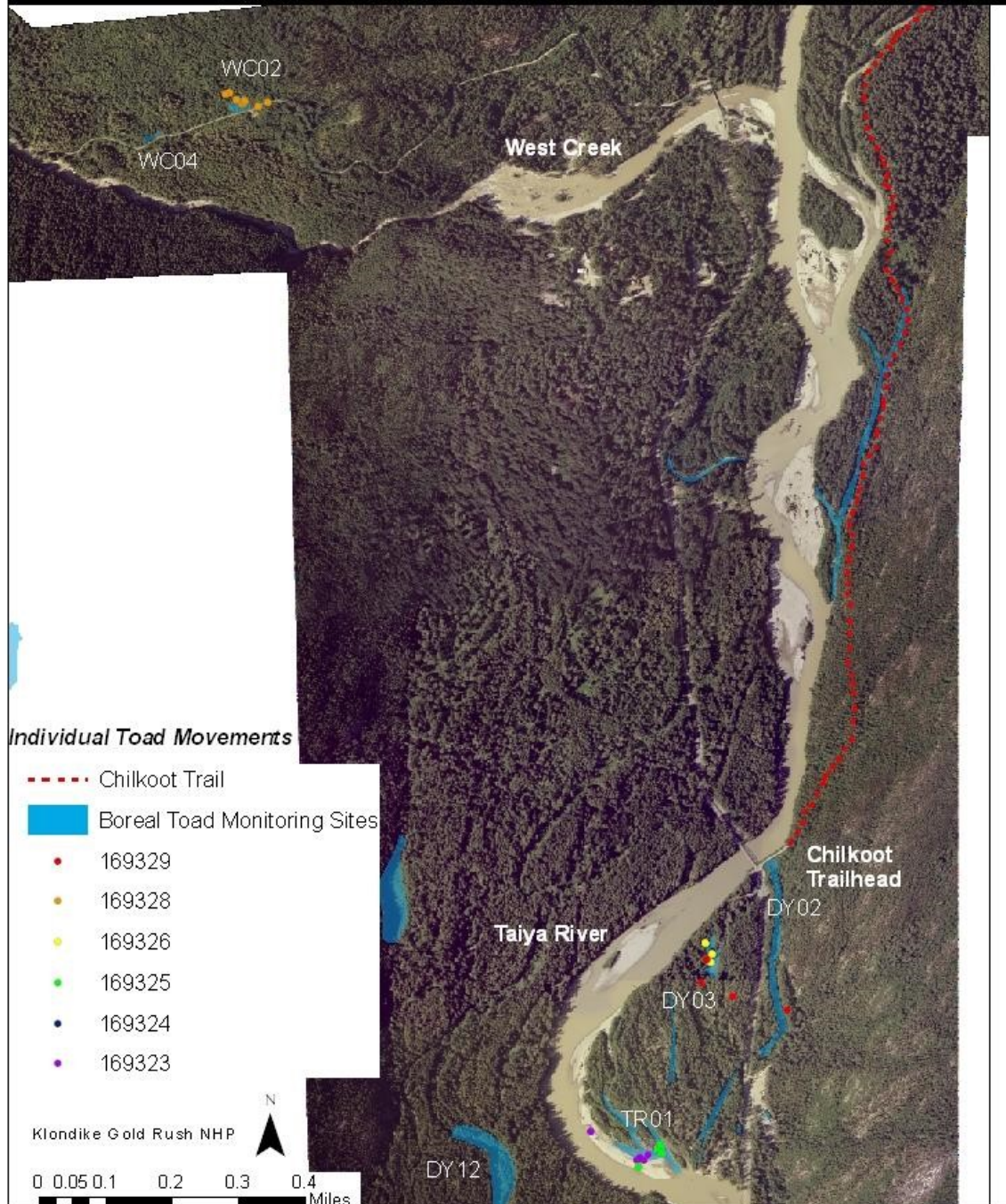


Figure 18. Map showing individual toad movements. Individual toads are identified by the unique serial number on the transmitting unit. Additional information about each toad is located in Table 5.

Table 5. Transmitter serial number, capture date, capture location, capture weight, SVL, sex, release date, and notes for all radio-tagged Boreal Toads in 2012.

Transmitter #:	Capture Date:	Serial	Capture Location:	Capture Weight (g):	SVL (mm):	Sex:	Release Date:	Notes:
169322	7/17/12		TR01	61	83	M	7/17/12	Came out of belt same day
169323	7/18/12		TR01	65	79	M	8/8/12	Belt came off inside log
169324	7/19/12		DY03	51	68	U	7/20/12	Came out of belt
169325	7/30/12		TR01	56	72	M	8/30/12	Copper wire on belt broke
169326	7/30/12		DY03	56	74	M	8/8/12	Lost signal, found and cut off belt
169328	7/30/12		WC02	49	74	M	9/25/12	Belt could not be located
169329*	8/14/12		DY03	54	80	M	9/25/12	Belt fell off in brush pile

*The toad with transmitter #169326 was recaptured and belted again with transmitter #169329.

Boreal Toads utilize a variety of different habitats. The most common daytime habitat used by Boreal Toads was grass (39%), next was water (19%), leaf litter (17%), large woody debris (11%), shrubs (6%), rock (6%), and other (3%) (Table 6). Only one toad was tracked to a hibernation site, under a large rock. However, one toad was tracked to a large, hollow log (~18 inches in diameter) (Figure 9). Three additional toads were found in or around the log.

Table 6. Habitat use of Boreal Toads by number of occurrences and percent used (n=36).

Habitat Type	Number of Occurrences	Percent Used
Large Woody Debris	4	11
Human Made Structure	0	0
Rock	2	6
Moss	0	0
Bare Ground	0	0
Cut Bank	0	0
Leaf Litter	6	17
Grass	14	39
Shrubs	2	6
Water	7	19
Other	1	3

Habitat Type Definitions:

Large Woody Debris – logs, large sticks, root wads

Human Made Structure – not a natural feature (i.e. culvert, wooden trail feature, cabin)

Rock – on or under rocks

Bare Ground – burrowed or on top of exposed and unvegetated soil

Cut Bank – burrowed into a cut bank along a water way

Leaf Litter – on top of or under leaf litter

Grass – grass including, sedges and rushes

Shrubs – deciduous vegetation less than 10 feet tall

Water – part of or all of the body is located in the water



Figure 19-1. (1) The opening to a large hollow log at site TR01. Three additional toads were found along with the belted toad. (2) The belt eventually fell off inside the log and could not be recovered. (3,4) Dense grass, sedge and rush wetland at WC02. The toad was tracked to this site multiple times. (5) Multiple toads were found burrowed into the leaf litter by the Taiya River at TR01. (6) The toad in the center of this photo is well camouflaged in leaf litter at site DY03.



Figure 19-2. (7) On sunny days, toads often sit on top of small, exposed logs. (8) The toad at WC02 was often inside this log/root feature. (9) The small opening to a hibernation site at WC02. The tunnel leads below a large rock (~3 feet in diameter). (10) A human-made brush pile where a toad from DY03 lost its belt. This toad crossed the Dyea Road and moved onto private property, traveling 277 meters from where he was initially captured.

Discussion

Visual Encounter Surveys

Oral history accounts and anecdotal evidence indicates that Boreal Toads were once abundant in both the Skagway and Taiya River Valleys. Elders from both communities have commented that the bottom of ponds were not visible in the spring from all of the black egg masses and tadpoles (Kalen 2010, Albecker 2010, Fairbanks 2010). The small, isolated Boreal Toad population in Dyea today is a small fraction of this seemingly once abundant species.

While greatly reduced from historic accounts, strong numbers from the 2010, 2011 and 2012 monitoring seasons indicate an increase in breeding activity. In 2012, 25 egg masses were recorded; the greatest number at KLGO since monitoring efforts began in 2004. Rather than continued precipitous decline, the remnant KLGO population appears to be relatively stable.

Similar population crashes of Boreal Toads are documented in Juneau, Ketchikan and Haines between 1970 – 1990 (Carstensen et al. 2003). Anecdotal evidence suggests that amphibians in southeast Alaska may have already experienced a mass mortality event (Green 2010) and now continue to be subject to variation in breeding site occupancy and breeding productivity due to natural metapopulation dynamics (Shmetterling 2009).

A wide-spread amphibian die-off in the Dyea and Skagway valleys could have been triggered by many possible causes. The reasons for abrupt population crashes in Southeast Alaska are most likely a combination of factors. Habitat loss, climate change, increased UV-B radiation, introduction of predators (such as stocked fish in the Skagway Valley) or the pathogenic chytrid fungus, are all suspected causes.

A variety of factors, both natural and human related, influence the current Boreal Toad population. Evidence of amphibian disease, egg mass fungal infections and amphibian deformities were all detected during 2012 Visual Encounter Surveys. Natural phenomena, such as changes in water levels causing desiccation or flooding, were common in 2012. Changes in climate patterns could have an impact on the timing and success of Boreal Toad breeding events. Predators like Great Blue Herons and Spotted Sandpipers are often seen at breeding sites.

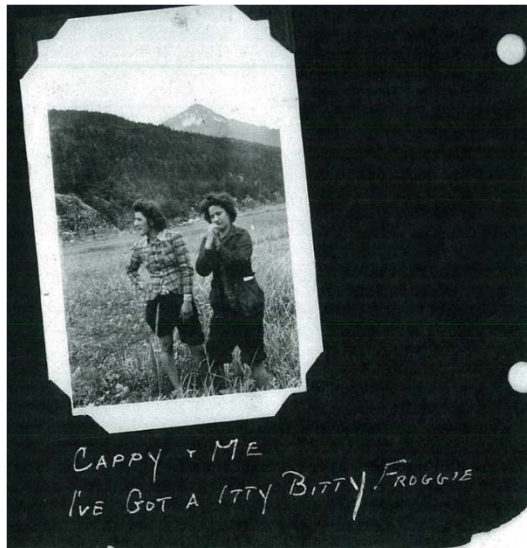


Figure 20. A scanned copy of a photo album taken during WWII in the Skagway area. One woman is holding a frog, most likely a Boreal Toad.

Human activities, while mostly unintentional, have a major impact on current Boreal Toad survival in KLGO. Each season multiple toads are killed by vehicles. Unknowing visitor's spread pathogens on their footwear and step on the tiny newly metamorphosed toads. Community and visitor education should remain an integral part of the KLGO amphibian monitoring program to mitigate these impacts. Amphibian observations from visitors, community members and local guides have been instrumental in piecing together the extensive distribution of amphibians in the area.

The discovery of two toads in the lower Skagway Valley is encouraging. While evidence of breeding was not detected, the discovery of Boreal Toads several miles from known breeding sites along the Chilkoot Trail, lower Skagway and Laughton Glacier area indicates that toads are dispersing and suggests the possibility of undiscovered breeding locations.

Chytrid Fungus Testing

Of the two sites that tested positive for chytrid fungus, DY03 has tested positive for chytrid in the past (2005, 2010). This is the first positive chytrid results for site

TR01. Though not water connected, these two sites are in very close proximity to one another (less than ½ mile) (Figure 5). Of all the monitoring sites, these two sites receive the heaviest human traffic. TR01 is located along the river, adjacent to the NPS Campground. DY03 is located along an old road connecting the campground to the Chilkoot Trailhead. Unintentional human transport of chytrid on footwear is a likely cause of the spread to TR01 for DY03. Based on the close proximity of the sites, infected amphibians could also be traveling between the two breeding ponds and spreading the disease.

The original trail that used to connect the campground to the trailhead was moved in 2009 and redirected further east to avoid the breeding ponds. However, traffic through the area is not uncommon. The site TR01 is a popular area behind the campground and access to this area would not easily be restricted.

In previous years, DY03 has been one of the more productive breeding sites. This season only one egg mass was laid. The female was observed laying eggs without a male, the resulting egg mass was unfertilized and

never developed. Males typically outnumber females at breeding sites and it is unclear why there was no male present to fertilize the eggs. This site has seen a significant reduction in breeding activity and amphibian numbers.

The negative chytrid results in extensive sites are encouraging. All of the additional sites tested, with the exception of the Chilkoot Trail, are well away from regular human traffic and isolated geographically from TR01 and DY03. In most cases, park staff would be the most likely vector of contamination and diligent disinfection methods should be continued.

Radio-tracking Study

Protecting breeding habitat and detection of disease are both essential factors in conserving the small remaining Boreal Toad populations in Dyea and Skagway. However, very little is known about where the toads spend the remaining 11 months of the year, apart from the short breeding season in the spring. Knowledge of habitat use is especially important for the successful management of the toad population in Dyea, as development and changes to the area may impact the Boreal Toad populations during non-breeding times when their presence is likely to go undetected.

The results from the 2012 Radio-tracking Project suggest that toads are dependent on a variety of habitat features. Grassy areas were used most commonly by adult toads during the day. Water was the second highest habitat feature used, though this may be a misrepresentation due to the fact that toads often escape to water when disturbed. Leaf litter and woody debris were also important features. While Boreal Toads are habitat generalists, they are more commonly found in open canopies.

Boreal Toads in KLGO seem to maintain relatively small summer home ranges. Most tracked toads were within 10 meters of the closest known breeding site. Many of the tracked toads would be in the exact same location for several weeks. All 6 of the tagged toads were males (this was not intentional, the only individuals found during scouting were all male), previous studies found that female Boreal Toads tend to travel further from breeding ponds and utilize terrestrial habitats much more than males (Schmetterling et al. 2008, Bartelt et al 2004). Future studies should attempt to compare male and female movements.

On several instances, tracked toads lead to the discovery of additional toads using the same habitat. Boreal Toads are known to use communal hibernation sites (Browne and Paszkowski (2010) found twenty-nine Boreal Toads in one hibernation site in Alberta, Canada) but evidence of communal daytime habitat use has not been documented. Communal habitat use could be attributed to a lack of suitable upland habitat available in the area. The Dyea River Valley is relatively small and bisected by human development at the southern end where Boreal Toads are most commonly observed.

Results from the Radio-tracking project indicate that habitat fragmentation can have a significant impact on Boreal Toads. Two of the radio-tracked toads crossed roads. Because they are very slow moving, Boreal Toads are more susceptible to being run over by vehicles. The multiple habitat requirements of Boreal Toads (shallow breeding ponds, upland foraging habitat and limited hibernation sites) make the impacts of fragmentation more severe. Proposed development in West Creek and the Dyea subdivision are likely to further impact the Boreal Toads.

Recommendations

Education and Outreach

Community observations are fundamental to piecing together the entire picture of amphibian distribution throughout the area. Education efforts are essential in reducing the spread of chytrid and mitigating human impacts on sensitive breeding sites. Education efforts should continue to be a focus of the KLGO amphibian monitoring program. Outlines of the 2012 education efforts are included in the appendix. Increased outreach efforts should focus on local guide companies, school groups and community members.

Individual Toad Identification

Recapturing individual Boreal Toads allows insight into the movement patterns, growth rate and life span of this elusive species. Being able to track individuals over time would also provide data on the effects of chytrid and local survival rates. The most common methods for marking amphibians are toe clipping or PIT tagging, both of which are invasive and have the potential to harm the study species. In 2011, Shelby Surdyk contacted Tom Morrison from Dartmouth University. He is working on a photo identification software that can be used to identify toads based on the unique marking patterns on their backs. The implementation of an automated digital amphibian identification program would greatly improve the usefulness of the data collected by giving an estimation of recapture rates, population numbers, movement patterns and site fidelity, and life span of individual toads. In 2012, photographs were used to identify toads in the radiotracking study but no official protocol was used.

Columbia Spotted Frog Surveys

The detection of 9 additional Columbia spotted frogs in the White Pass Unit of KLGO in 2012 merits the continuation of extensive surveys. In order to observe breeding activity, surveys should be conducted in mid-July rather than August. Testing for chytrid on *R. luteiventris* in the White Pass Unit would also be advised every few years in order to detect the distribution of chytrid within the entire range of the park.

Upland Habitat Use Study

The first year of the radio-tracking project was a lot of trial and error. Most belts were fitted to loosely at first and quickly fell off. The techniques for locating toads with telemetry were greatly improved with practice over the season. The 2012 study only included males, this was not intentional; the only toads found during searches were all male. Future studies should include more animals and both males and females. In order to locate hibernation sites, toads should be tracked at least into the start of October.

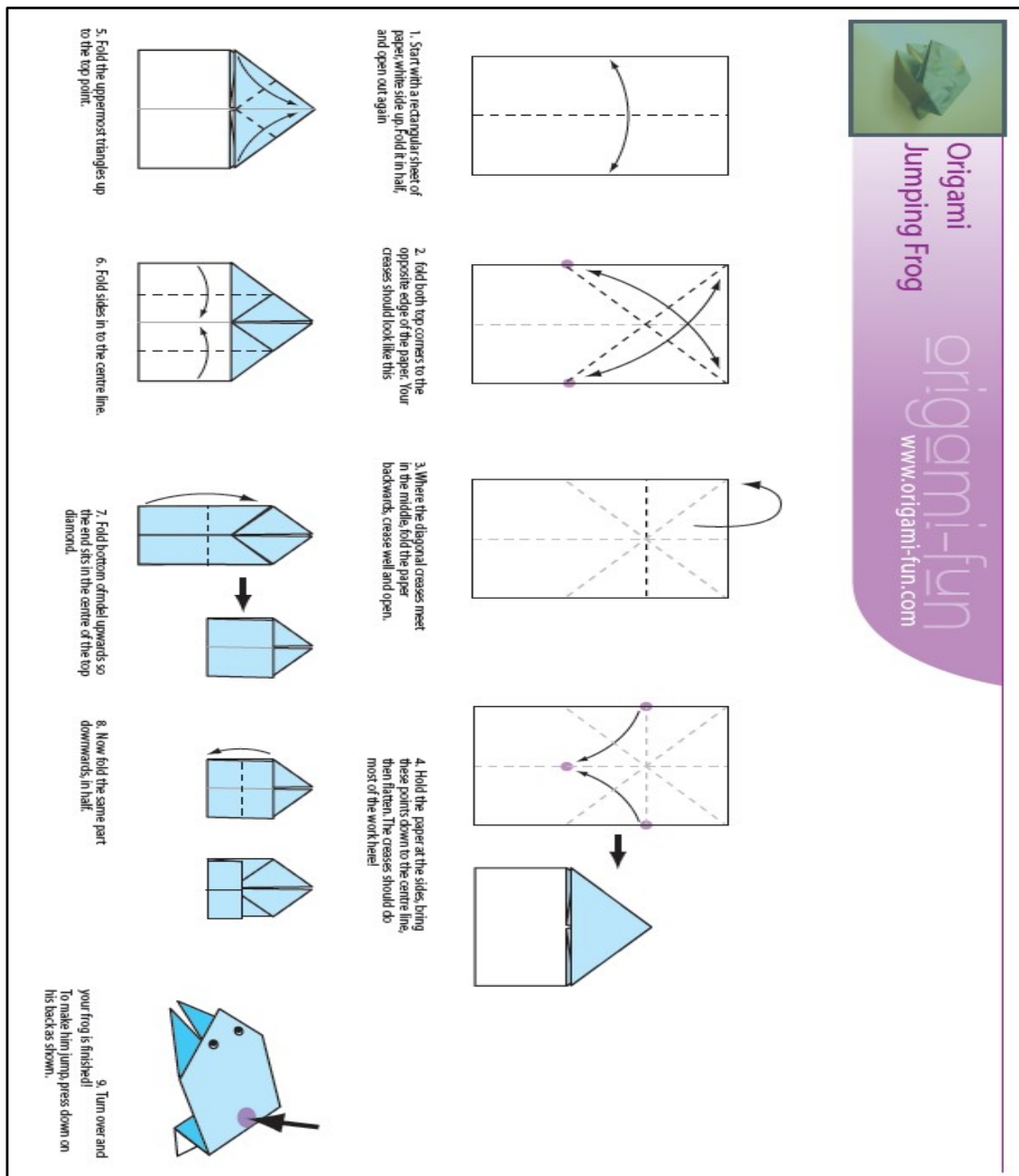
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Appendix A KLGO Junior Ranger Day July 26, 2012

Natural Resources staff made origami toads with participants of the KLGO Jr. Ranger Day while using the opportunity to talk about the amphibian monitoring efforts at the park. Instructions for the origami toads are located below.



Appendix B AK2Day Amphibian Bulletin

Boreal Toads on the Move



Just like wolves in Yellowstone and grizzlies in Glacier National Park, this summer Klondike Gold Rush National Historical Park is outfitting boreal toads with radio transmitters that will allow biologists to follow the movements of these elusive amphibians.

Local and regional declines of boreal toad populations prompted the initiation of the Klondike Gold Rush NHP Amphibian Monitoring Program in 2004. Until the 2012 season, efforts have focused mainly on monitoring breeding success and disease testing. Very little is known about where these animals go after they leave the breeding ponds. Unlike frogs, toads spend a majority of their time out of water in upland habitat.

Weighing less than 2 grams and attached using specially designed plastic belts, each radio unit transmits a unique signal that can be located using radio telemetry. This radio tracking study will help researchers locate important habitat features such as hibernation sites, additional breeding ponds and migration corridors. Discovering where these animals spend the other 11 months of the year, away from the breeding ponds, is crucial in helping to conserve this areas small remaining boreal toad population.

Because of their unique life cycle, between water and land, amphibians are very sensitive to environmental changes and pollution. Even in remote Southeast Alaska we are finding amphibian deformities, introduced diseases and significant population declines. By monitoring the health of amphibian populations, we can also detect larger environmental problems.

If you spot an amphibian in the area we want to hear about it. Contact Jaime Welfelt at Jaime_Welfelt@nps.gov

Appendix C Routine Amphibian Survey Data Form used on the Visual Encounter Surveys

Routine Amphibian Survey Form		Observer(s)	
Date	Time Start	Time at Site Arrive:	
Pond ID	Time End	Leave:	
Air Temp	Ripples none some significant		
Precip dry lt rain heavy rain snow/sleet	Wind calm light mod heavy		
Clouds clear partially cloudy overcast	Surface Glare none some significant		
Precip last 2 days? none fog light rain medium rain heavy rain snow			
Habitat	Water level high average low dry		
Clarity clear stained	Turbidity clear cloudy iron floc absent present severe		
Sheen none organic petro	Pictures? Yes No Picture #'s:		
%Shallow	% surface area w/ emergent vegetation		
% bottom cover by submergent veg	% surface area w/ floating vegetation		
% shoreline covered by snow	% surface area covered by snow		
Water Temp	loc'n	Temp Logger deployed collected	
Water Temp	loc'n	Under water? Yes No Light?	
Water Temp	loc'n	Temp Time	
Water Temp	loc'n		
Water Temp	loc'n		
Amphibian Search Full? Yes No		% Shore Searched	
Connection inlet outlet both neither		Recent disturbances?	
% bottom visible	Fish Present? Yes No		
Fish Species	Other Predators?		
Survey Method visual hand ID boards traps net sweep			
Amphibian Species Seen (if any seen, complete back of form also)		Where?	
Comments:			

Location within Site:							
Individual ID (e.g. A1,J2)							
SVL (mm)							
Gape (mm)							
Forearm (mm)							
Weight (g)							
Nuptial pads?							
Calling?							
Tag? (Y/N)							
Swab?(Y/N)							

Egg Masses and Larvae							
Location within Site:							
Individual ID (EM1, L1)							
Estimated # in egg mass							
Estimated total # larvae							
Tot. Length							
Body Length							
Gosner stage							

Recaptures		
Individual ID	Tag #	Swab ID

Appendix D Amphibian Movement Study Datasheet

Amphibian Movement Study Datasheet	
Observer(s):	
Date:	
Start Time:	
End Time:	
Animal Identification Information	
Animal ID (Transmitter Serial #) :	
Radio Frequency:	
Attachment Date:	Total Days:
Weight (g):	Sex: Male Female Unknown
Belt/skin Condition: (Skin sores present?)	
Chytrid Swab?	
Location	
GPS Coordinates:	
Last Location:	
Habitat Pick one that best describes the animals location	
Large Woody Debris	Cut Bank/Soil
Human Made Structure	Leaf Litter
Rock Formation	Grass
Moss	Shrubs
Bare Ground	Water
Other _____	
% Covered When Located: (0% = fully visible, 100% = not visible at all)	
Closest Known Breeding Site:	
Other Toads Present?: Yes No How many?	
Possible Hibernation Site? : Yes No	

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

NPS September 2012

National Park Service
U.S. Department of the Interior



Natural Resource Stewardship and Science
1201 Oakridge Drive, Suite 150
Fort Collins, CO 80525

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