**Final Report**

# Red-legged Frog Surveys at Horseshoe Pond Point Reyes National Seashore

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## Introduction

The California red-legged frog (*Rana aurora draytonii*) was once an abundant frog throughout much of California and is widely believed to have inspired Mark Twain's fabled story "The Celebrated Jumping Frog of Calaveras County." Now this frog is completely eliminated from the floor of the Central Valley (Fisher and Shaffer, 1996) and is nearly gone in both the Sierra Nevada foothills and throughout the southern quarter of its range (southern California). In a few parts of the central Coast Range, there are still large, vigorous populations, some of which probably rival what was present 200 years ago (Fellers, *in press*).

Some of the largest populations of red-legged frogs are at Point Reyes National Seashore (Marin County) where there are more than 120 breeding sites with a total adult population of several thousand frogs. Most of the breeding sites are artificial stock ponds constructed on lands that have been grazed by cattle for 150 years. There are good populations elsewhere in the San Francisco Bay area (especially Alameda and Contra Costa Counties) and in the coastal drainages from San Mateo County (just south of San Francisco) south to Santa Barbara County. One of the largest single populations consists of an estimated 350 adult frogs at Pescadero Marsh (San Mateo County) (Fellers, *in press*).

The California red-legged frog was Federally listed as a Threatened species on June 24, 1996. The listing was necessary because the frog is absent from more than 70 percent of its original range and is threatened within its remaining range by a wide variety of human activities including urban encroachment, construction of reservoirs and water diversion, contaminants, agriculture, and livestock grazing (Draft Recovery Plan, January 2000). The role of non-native bullfrogs in the decline of red-legged frogs is unclear. While bullfrogs have frequently been called a threat, or even a primary cause of the declines, there is almost no direct evidence that this is true. Most reports of bullfrog impacts (e.g., Moyle, 1973) have been based merely on a correlation between the presence of bullfrogs and the lack of red-legged frogs. It is at least

as likely that non-native fish (e.g., bass, sunfish, catfish, mosquitofish) play a significant role in the decline of native ranid frogs (Hayes and Jennings, 1986).

California red-legged frogs need ponds and/or pools for breeding (December through March). At Point Reyes NS, stock ponds are the most commonly used breeding sites. There is much less information on non-breeding habitat requirements. While some frogs occupy breeding ponds all year, data from radiotagged red-legged frogs at Point Reyes and elsewhere suggest that riparian areas provide critically important habitat for frogs, especially those that breed in non-permanent ponds or pools. It is likely that the riparian habitat is essential for the continued survival of red-legged frogs, particularly in dry years when breeding ponds are more likely to dry up.

A short-term population study of California red-legged frogs at Horseshoe Pond (Point Reyes National Seashore) was initiated in the fall of 2001. The study was undertaken as part of a planning process to evaluate the feasibility of restoring the pond to its natural estuarine state. The findings of this study, along with data from previous surveys, are intended to aid in decisions concerning habitat loss that may result from removing some or all of the levee at the south end of Horseshoe Pond.

## Methods

*Habitat Assessment*

Reconnaissance was conducted to assess the extent of potential red-legged frog breeding and non-breeding habitat in the vicinity of Horseshoe Pond. All potential habitat was subsequently surveyed for red-legged frog adults, eggs, and larvae.

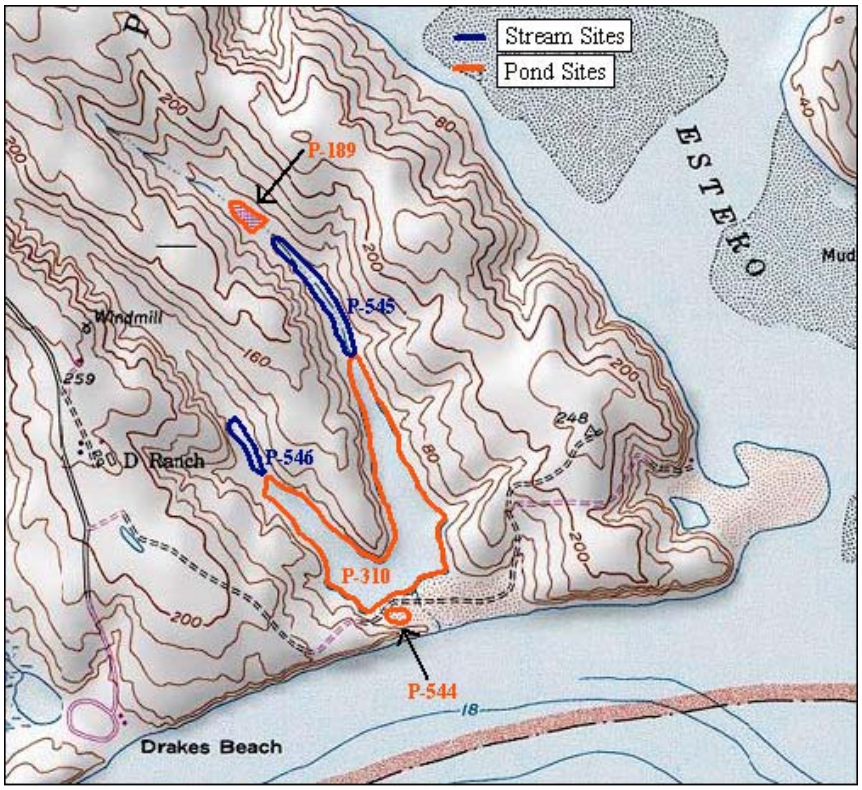
The habitat in the vicinity of Horseshoe Pond was divided into five sites. As shown in Figure 1, these were Horseshoe Pond (P-310), the stock pond approximately 500 meters upstream from the eastern arm of Horseshoe Pond

(P-189), the shallow pond on the ocean side of the dam (P-544), the stream flowing into the eastern arm of Horseshoe Pond (P-545), and the stream flowing into the western arm of Horseshoe Pond (P-546).

Surveys were performed following the protocol of Fellers and Freel (1995): A Protocol for Surveying Aquatic Amphibians. Nocturnal surveys were augmented by using spotlighting techniques described by Corben and Fellers (2001). Surveys for adult frogs were conducted throughout the breeding season so as to maximize the number of adult frogs detected. Similarly, egg surveys were timed to coincide exactly with egg laying at other sites on the west side of Inverness Ridge (e.g., Coast Guard Pond, Abbotts Lagoon Trail Pond). Tadpole surveys were initiated a few weeks after egg hatching. Tadpole surveys at earlier dates are unlikely to detect frogs since the tadpoles are not likely to be captured and/or identified because of their small size. Dates for all surveys are given in Table 2. Note that some of our surveys fall well outside dates that have been suggested in protocols developed by FWS and others. We felt it was preferable to conduct surveys during the time we know was optimal, rather than following guidelines intended to cover the range of activity across the entire range of the species. Also, the various draft FWS protocols were designed to merely detect presence, not to estimate population size. Our work was much more extensive and greatly exceeded the normal expectations of other protocols. By timing our surveys to local phenology, the surveys were appropriate for both detecting frogs and for providing data on population size.

All biologist conducting surveys for red-legged frogs (Greg Guscio, Patrick Kleeman, and Gary Fellers) were highly qualified field ecologists with extensive experience with many species of frogs.

Figure 1. Horseshoe Pond Survey Sites.




*Daylight surveys*

Daylight surveys were conducted by systematically searching all sites for red-legged frogs, egg masses, and larvae (Fellers and Freel, 1995). These searches consisted of a combination of walking and kayaking the perimeter of Horseshoe Pond, walking the perimeter of the stock pond, and walking the shallow pond and stream channels. During these surveys, banks, rocks, logs, pond and stream bottoms (water clarity permitting), and the surface of floating vegetation were carefully scanned. Surveys included stopping intermittently to look ahead with binoculars, increasing the likelihood of detecting frogs, which might otherwise have been startled prior to detection.

All sites were initially surveyed before the onset of breeding. Known breeding sites (e.g., Cemetery Pond, Coast Guard Pond, and Abbotts Lagoon Trail Pond) were also monitored on a regular basis to determine the start of the red-legged frog breeding season at Point Reyes NS. Once egg laying had begun at known breeding sites, surveys of Horseshoe Pond were performed on a regular basis (approximately once every 10 days), while surveys of associated sites were conducted less frequently. Data on the presence and abundance of other amphibians were recorded, along with information on reptiles, fish, and potential predators. Daylight surveys were not performed in rainy conditions, as disturbance of the surface of the water by raindrops greatly reduces visibility into the water column.

*Nocturnal Surveys:*

Nocturnal surveys were conducted from a canoe. One person paddled the boat slowly along the shoreline, while a second used a 30-Watt sealed beam light (358 Lux at 5 meters) and binoculars to look for eye shines of red-legged frogs (Corben and Fellers, 2001). Surveys of the stock pond and shallow pond by the dam were conducted by using the same technique while walking the perimeters of each. The binoculars were placed on the light, and the two were moved in tandem to scan nearby habitat (up to about 20 meters away). Occasional stops were made to more thoroughly examine areas of thicker vegetation. Unidentified eye shines were investigated by slowly approaching the animal until a positive identification could be made. If a positive identification was not possible, the frog was recorded as an unidentified species. Data on the presence and abundance of other amphibians were recorded along with information on reptiles, fish, and potential predators. Horseshoe Pond was surveyed at night approximately once a month beginning on December 3, 2001. The stock pond was surveyed on February 21, 2002.

The shallow pond by the dam was surveyed on January 6 and February 21, 2002.

Nocturnal surveys were not performed if visibility was less than 100 meters due to fog or rain, or if the temperature dropped below 5° Celsius. Salinity and Conductivity were measured during surveys conducted at Horseshoe Pond on January 4 and 7, February 10, 21, and 25, and March 19, 2002.

## Results

The results of both daylight and nocturnal surveys are summarized in Table 1 and detailed in Table 2. Locations where red-legged frogs and western pond turtles were found are depicted in Figure 2.

*Horseshoe Pond*

Seven daylight and five nocturnal surveys of Horseshoe Pond were completed. Prior to March 19, red-legged frogs were found to be patchily distributed around the perimeter of the pond, with the majority of both frogs and egg masses located along the southern edge. Moderately high concentrations of both frogs and eggs were also found near the head of the eastern arm.

During the nocturnal survey on March 19, red-legged frogs were found evenly distributed along the shores of both arms, while very few were found along the southern edge of the pond.

Eight red-legged frogs were found during the first nocturnal survey while subsequent surveys yielded numbers ranging from 113 to 148 frogs. The lower number of frogs seen during the first survey may have been due to dense vegetation occluding them from view. The water level of the pond dropped

considerably (approximately 0.4 meters) after a breach occurred (January 2002) near the spillway. This drop in water level left much of the previously available cover higher up on the banks. Hence, there was less cover at the waters edge where most of the frogs were typically observed.

Only one egg mass was found prior to the February 10, 2002 survey. Nineteen new masses were found on February 10, and 13 new masses were found on February 25, 2002.

Western pond turtles (*Clemmys marmorata*) were frequently seen on the eastern bank on the east arm of the pond. The maximum number seen during a single survey was eight (February 25, 2002; Table 2).

Salinities at Horseshoe Pond ranged from 0.2 ppt at both the spillway (January 4, 2002) and the gauge (January 6, 2002) to 1.1 ppt in the vicinity of egg masses at the southern edge of the pond (February 10, 2002). The salinity reached much higher levels during the summer and fall of 2001.

*Stock Pond*

Five daylight surveys and one nocturnal survey of the stock pond were conducted. The majority of red-legged frogs seen were sub-adults; most of those were located along the eastern shoreline.

Two egg masses were found in the stock pond, one at each end. The maximum number of western pond turtles seen during a single survey was one.

*Shallow pond by dam*

One daylight and two nocturnal surveys were conducted at this pond. Low numbers of red-legged frogs were seen during both of the night surveys, but no egg masses were found.

*Streams*

Two daylight surveys and no nocturnal surveys of each of the streams flowing into Horseshoe pond were conducted. The majority of red-legged frogs seen were sub-adults. Some pools in both streams have potential as breeding habitat, but no eggs were found in either.

Figure 2. Locations of Frogs and Turtles.

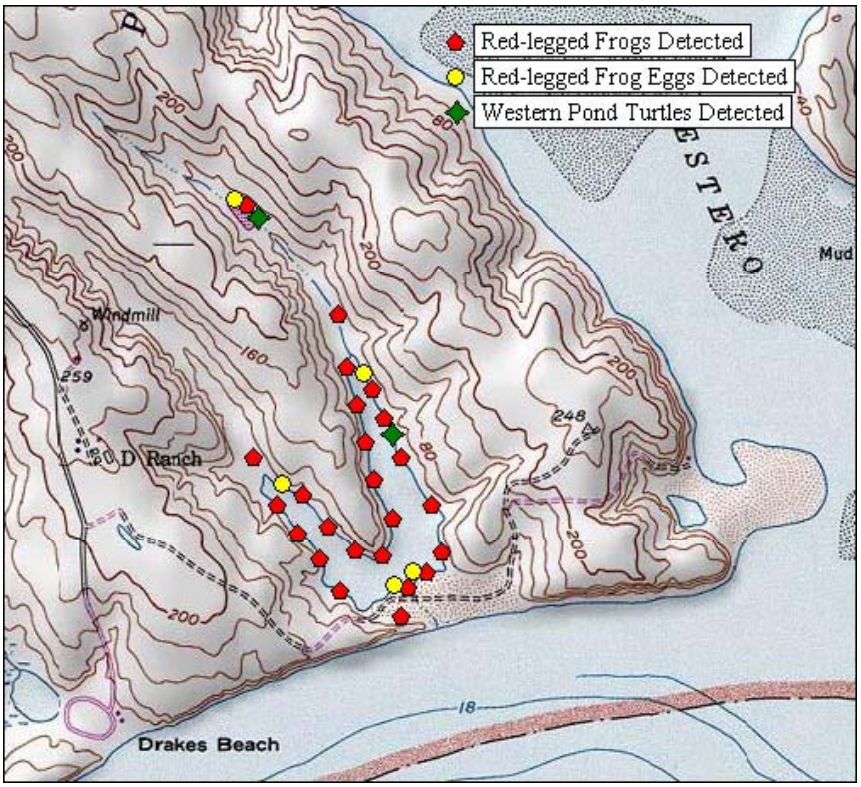


Table 1. Summary of Red-legged Frog Surveys.

| SITE | TOTAL # OF DAY SURVEYS | TOTAL # OF NIGHT SURVEYS | MAXIMUM # OF FROGS FOUND IN A SINGLE VISIT | MAXIMUM # OF EGG MASSES FOUND IN A SINGLE VISIT | ESTIMATED TOTAL # OF EGG MASSES |
|---|---|---|---|---|---|
| Horseshoe Pond | 5 | 1 | 148 | 33 | 33 |
| Stock Pond | 4 | 1 | 20 | 2 | 2 |
| Shallow Pond by Dam | 1 | 2 | 6 | 0 | 0 |
| Stream Flowing Into East Arm of Horseshoe Pond | 2 | 0 | 2 | 0 | 0 |
| Stream Flowing Into West Arm of Horseshoe Pond | 2 | 0 | 7 | 0 | 0 |

Table 2. Results of Individual Surveys.

| DATE | Horseshoe Pond (P-310) | Stock Pond (P-189) | Shallow Pond By Dam (P-544) | Stream Flowing Into East Arm of Horseshoe Pond (P-545) | Stream Flowing Into West Arm of Horseshoe Pond (P-546) |
|---|---|---|---|---|---|
| 25-Aug-94 | | Daylight Survey<br>no red-legged frogs | | | |
| 22-Aug-95 | Daylight Survey<br>8 red-legged frogs | | | | |
| 03-May-01 | Daylight Survey<br>2 red-legged frogs<br>1 western pond turtle | | | | |
| 02-Jul-01 | 2 red-legged frog tadpoles<br>caught in minnow trap | | | | |
| 05-Jul-01 | salinities<br>at gauge: 8.6ppt<br>at spillway: 8.6ppt<br>west arm: 8.6ppt | | | | |
| 10-Aug-01 | salinities<br>at gauge: 10.4ppt<br>at spillway: 11.1ppt<br>west arm: 10.3ppt<br>east arm: 10.3ppt | | | | |
| 21-Aug-01 | Nocturnal Survey<br>93 red-legged frogs | | | | |

| | | | | | |
|---|---|---|---|---|---|
| 17-Sep-01 | salinities<br>at gauge: 13.0ppt<br>west arm: 13.4ppt<br>east arm: 12.9ppt | | | | |
| 03-Dec-01 | Nocturnal survey<br>7 red-legged frogs<br>2 unidentified Rana | | | | |
| 10-Dec-01 | salinities<br>at gauge: 5.8ppt<br>at spillway: 6.2ppt | | | | |
| 03-Jan-02 | salinities<br>at gauge: 0.2ppt<br>at spillway: 0.2ppt<br>west arm: 0.2ppt<br>east arm: 0.1ppt | Daylight Survey<br>2 red-legged frogs<br>1 western pond turtle | | | |
| 04-Jan-02 | Daylight Survey<br>2 red-legged frogs<br>4 western pond turtles<br>salinities<br>at gauge: 0.3ppt<br>at spillway: 0.2ppt | | | | |
| 06-Jan-02 | Nocturnal survey<br>113 red-legged frogs<br>9 unidentified Rana<br>salinities<br>at gauge: 0.2ppt | | Nocturnal survey<br>4 red-legged frogs<br>salinity: 0.3ppt | | |

| | | | | | |
|---|---|---|---|---|---|
| 17-Jan-02 | Daylight Survey<br>no red-legged frogs<br>2 western pond turtles | Daylight Survey<br>6 unidentified Rana<br>1 western pond turtle | | Daylight Survey<br>2 red-legged frog<br>4 unidentified Rana | Daylight Survey<br>7 red-legged frogs<br>5 unidentified Rana |
| 29-Jan-02 | Daylight Survey<br>1 red-legged frog egg mass<br>5 western pond turtles | Daylight Survey<br>1 red-legged frog<br>2 unidentified Rana | Daylight Survey<br>no red-legged frogs | | |
| 10-Feb-02 | Daylight Survey<br>1 red-legged frog<br>20 red-legged frog egg masses<br>10 red-legged frog tadpoles<br>7 western pond turtles<br>salinities<br>eggs by dam: 1.1ppt<br>west arm: 0.3ppt (at eggs) | Daylight Survey<br>11 red-legged frogs<br>2 red-legged frog egg masses<br>1 unidentified Rana | | Daylight Survey<br>1 red-legged frog<br>2 unidentified Rana | |
| 21-Feb-02 | Nocturnal survey<br>131 red-legged frogs<br>2 red-legged frog egg masses<br>2 unidentified Rana<br>salinities<br>at gauge: 0.6ppt<br>at spillway: 0.6ppt<br>east arm: 0.2ppt | Nocturnal survey<br>20 red-legged frogs<br>3 unidentified Rana | Nocturnal survey<br>6 red-legged frogs | | |

| | | | | | |
|---|---|---|---|---|---|
| 25-Feb-02 | Daylight Survey<br>7 red-legged frogs<br>33 red-legged frog egg masses<br>6 unidentified Rana<br>8 western pond turtles<br>salinities<br>at gauge: 0.6ppt<br>at spillway: 0.5ppt<br>west arm: 0.6ppt<br>east arm: 0.8ppt | | | | Daylight Survey<br>4 red-legged frogs<br>12 unidentified Rana |
| 19-Mar-02 | Nocturnal Survey<br>148 red-legged frogs<br>salinities<br>at gauge: 0.6ppt<br>at spillway: 0.7ppt<br>west arm: 0.6ppt<br>east arm: 0.6ppt | | | | |
| 02-Apr-02 | Daylight Survey<br>13 red-legged frog tadpoles<br>1 red-legged frog egg mass | | | | |

## Discussion

Horseshoe Pond supports a significant population of California red-legged frogs. We found over 30 egg masses. If we make the assumption that the minimum number of adult frogs at the site is twice the number of egg masses found (one male and one female per egg mass), there were at least 60 adult frogs occupying the pond. Nocturnal surveys support this conclusion; we had a high count of 148 frogs on March 19, 2002. While it is generally difficult to estimate size of frogs at night, it appears that most of the frogs seen during these surveys were adults. If so, the population of adult red-legged frogs at Horseshoe Pond is the largest known population anywhere in the Point Reyes area, and one of the largest anywhere within the range of California red-legged frogs.

For such a large population, it was surprising that we did not find more egg masses. The turbidity of the water made it difficult to see very far underwater, but red-legged frogs typically lay their eggs at or just below the water surface where egg masses are fairly visible. If we had not been surveying all of the adjacent ponds, we might suspect that frogs at Horseshoe Pond were using other nearby habitat for breeding, but this does not seem to be the case. Since our egg mass searches were about as thorough as possible, it is unlikely that we overlooked a significant portion of egg masses.

Tadpole surveys are useful for evaluating breeding activity. We searched for tadpoles at Horseshoe Pond as well as the other ponds and streams in the immediate area. We found very few tadpoles (Table 1 and 2). However, Horseshoe Pond is so large that it is difficult to survey with our normal dip netting technique. Minnow traps (used for catching tadpoles) offer one alternative that should be considered for future surveys. Traps can be effective in certain habitat types, but the traps require careful monitoring to assure that tadpoles are not killed by low oxygen levels during the warmer parts of the day.

We observed a variety of native predators at or near Horseshoe Pond. These include great blue heron, great egret, black-crowned night heron, and garter snakes. None of these predators appeared to be present in unusually

high numbers, and their presence and diversity of the native species are both expected and welcome. No bullfrogs were observed during our surveys.

High salinity is potentially a problem for red-legged frogs at Horseshoe Pond. The highest level measured during our work was 1.1 ppt, measured at the gauge on January 6, 2002. This is well below the 4.5 ppt that red-legged frog egg masses can tolerate, and much lower than the 7.0 ppt that adults and tadpoles can tolerate (Jennings and Hayes, 1989). It is of some concern, however, that the highest salinity we measured was in mid-winter. This is the time when red-legged frogs lay eggs, and also when saltwater from the ocean is most likely to wash into the pond.

## Summary

If winter storms regularly move saltwater into Horseshoe Pond, or if the levee is further breached so that ocean water flows into the former lagoon, the habitat will become unsuitable for red-legged frogs. The U.S. Fish and Wildlife Service and the National Park Service will need to consult to determine what actions are appropriate for the long-term survival of red-legged frogs at Horseshoe Pond.

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| DATE | BEGIN | TIME | OBSERVER | ADULT | SUBADULT | UNKNOWN | LARVAE | MASSES | EGGS | DATE | COMMENT |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 08/22/95 | 1115 | 120 | K. Freel | 4 | 4 | - | - | - | - | 08/22/95 | Hundreds and hundreds of meters of shoreline at this lake. Cattle impact (hoofing and grazing and manure) very heavy in many areas. RAAU found in areas of shoreline where emergent & bankside vegetation was present (not grazed). Pop of RAAU |
| 05/03/01 | 1430 | 45 | P. KLEEMAN, D. PRESS | 1 | 1 | - | - | - | - | 05/03/01 | Surveyed the east side of the lake, concentrating on shoreline with emergent vegetation. Subadult RAAU was found seen at the N end of the western area of the lake. Dave Press saw several RAAU adults along E shoreline in April of this year. |
| 07/02/01 | - | 0 | D. PRESS | - | - | - | 2 | - | - | 07/02/01 | Dave Press caught two RAAU in minnow traps set out along the SW shore of the penninsula that juts into the lake from the N. See data sheet for diagram. |
| 08/21/01 | 2045 | 90 | P. KLEEMAN, D. PRESS | 93 | - | - | - | - | - | 08/21/01 | RAAU were patchily distributed around the lake; 12 were along the SW shoreline, 78 were along the NE shoreline, other three scattered (see map on data sheet). Many of the frogs along the NE shoreline were seen along the waters edge where |
| 12/03/01 | 1825 | 120 | G. GUSCIO, P. KLEEMAN | 7 | 1 | - | - | - | - | 12/03/01 | Nocturnal survey from canoe - paddled repeatedly to the N end of each arm of the lake and scanned one shore per return trip as wind blew boat southward. See survey sheet for details. |
| 01/04/02 | 1430 | 140 | G. GUSCIO | 2 | - | - | - | - | - | 01/04/02 | Egg survey - none found. RAAU and CLMA all seen on East side of East arm of pond. See data sheet for details. |
| 01/06/02 | 1835 | 103 | P. KLEEMAN, G. GUSCIO | 113 | - | - | - | - | - | 01/06/02 | Lake has dropped in depth (now 1.67 at depth marking pole) since the earthen beerm next to the concrete spillway partially breached. Lower water levels may had led to increased detection |
| 01/17/02 | 1000 | 148 | G. GUSCIO, P. KLEEMAN | - | - | - | - | - | - | 01/17/02 | Egg survey from kayaks and wallking when possible. Water level lower than last visit. Gauge read 1.29 ft. |
| 01/29/02 | 1120 | 71 | P. KLEEMAN, G. GUSCIO | - | - | - | - | 1 intact | 2,125 | 01/29/02 | Depth marking pole in pond read 1.5. See data sheet for details. |
| 02/10/02 | 1030 | 100 | P. KLEEMAN, G. GUSCIO | 1 | - | - | 10 | 1 SPENT, 19 INTACT, 20 TOTAL | 36,261 | 02/10/02 | Salinity at RAAU egg mass at S (ocean end) of pond: 1.1 ppt at 10.0 degrees C, 2181 mS 1556 mS. Salinity at RAAU egg mass at inlet of E arm:0.7 ppt at 13.0 degrees C 1368 mS 1049. Salinity at inlet of W arm: 0.3 ppt at 17.2 degrees C 664 S |
| 02/21/02 | 1933 | 79 | G. GUSCIO, T. PARSONS | 131 | - | - | - | 2 | ~4000 | 02/21/02 | Nocturnal survey- water level appears lower than last survey. Great Egret seen by spillway at ~1810 hr water level at gauge 1.44 ft water flowing out of pond at spillway. Half full moon high in the sky. Salinity/conductivity East arm 0.2ppt |
| 02/25/02 | 1307 | 134 | G. GUSCIO | 5 | 2 | - | - | 18 masses, 15 spent: 33 total | 21,032 | 02/25/02 | See data sheet for egg mass tables. Salinity/Conductivity: Gauge (1.24') 0.6ppt, 15.2 degrees C, 1212 uS, 985 uS. West arm 0.5ppt, 19.1 degrees C, 10.85 uS, 962 uS. East Arm 0.8 ppt, 19.1 degrees C, 1589 uS, 1421 uS. Spillway 0.6 ppt, 15.3 |
| 03/19/02 | 1907 | 132 | G. GUSCIO, G. FELLERS | 148 | - | - | - | - | - | 03/19/02 | Nocturnal survey. Quarter moon out. 2 black crowned night herons seen along bank. 1 muskrat swimming. Salinity/Conductivity: gauge (1.09') 0.6 ppt, 14.3 C, 1282 uS, 1020 uS. West arm 0.6 ppt, 13.7 C, 1276 uS, 997 uS. East arm 0.6ppt, 14.2 C |
| 04/02/02 | 1135 | 181 | G. GUSCIO | - | - | - | 13 | 1 | 100 | 04/02/02 | Surveyed for tadpoles-much dipnetting. HYRE and RAAU tadpoles found at upper end of eastern arm and in grass along dam (both places where eggs had been found previously.)3-spined sticklebacks found all around perimeter of pond, most 1 to 2 |
| 08/13/02 | 14:01 | 28 | P. KLEEMAN, G. FELLERS | - | - | - | - | - | - | 08/13/02 | Part of day-night comparison surveys. Water level is so low that there are currently two separate ponds, one in each arm. Large exposed mud flats surround much of the perimeter. Western, least, and Semi-palmated sandpipers at pond. |
| 08/13/02 | 21:30 | 35 | P. KLEEMAN, G. FELLERS | 2 | - | - | - | - | - | 08/13/02 | Part of day-night comparison surveys. One RAAU found in W arm, one in E arm. Both in pond about 5 m from shoreline. Salinity readings at 16.9 C: 5.7 ppt,10.16 ms, 8.58 ms. |
| 02/06/03 | 13:54 | 107 | P. Kleeman | - | 5 | - | - | 15 | 14500 | 02/06/03 | Salinity at: canoe 1.7 ppt at14.1C, 133.5%, 2591uS; cove near dam 2.5 ppt at 18.1 C; head of east arm1.0 ppt, 15.1C, 1513uS. Two RAAU egg masses in a small cove near the breached dam. One of these egg masses had many embryos that were not |
| 02/26/03 | 19:05 | 130 | P. Kleeman, G. Guscio | 78 | 1 | - | - | - | - | 02/26/03 | Rain towards the end of the survey meant that we were unable to survey ~200 m of shoreline from the blown out dam to the W of there. Typically there are few frogs in that area anyway, so the overall count of frogs should not be greatly |
| 03/11/03 | 19:06 | 99 | G. Guscio, G. Fellers | 59 | 1 | - | - | - | - | 03/11/03 | Half-full moon. Foggy, but probably not enough so to affect count. |
| 11/04/03 | 18:00 | 75 | P. Kleeman | 3 | 1 | - | - | - | - | 11/04/03 | Three-quarter full moon was partially obscured by cloud cover. Lake is shallow, but vegetation comes to within a meter of the shoreline along maybe 60% of perimeter. Three adult RADR seen were quite small. More wading birds (killdeer, |