CALIFORNIA RED-LEGGED FROG SURVEY AT MEADOW CREEK, GROVER BEACH, SAN LUIS OBISPO COUNTY, CALIFORNIA

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Prepared for

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ABSTRACT

This report details a May 2005 site assessment and field survey for California red-legged frogs (*Rana draytonii* (= *R. aurora draytonii*)) at Meadow Creek, Grover Beach, San Luis Obispo County, California. Methods followed the U.S. Fish and Wildlife Service protocol. The focal area was between the Grand Avenue Bridge and the Pismo State Beach Golf Course, and surveys were also conducted at the golf course ponds and Meadow Creek at the Pismo State Beach Ranger's Station. The site assessment included upland and aquatic habitats within 1.6 km of the focal area. California red-legged frogs (CRLF) were not detected during the surveys despite the presence of potentially suitable aquatic habitats, including sites that could be used for breeding. Potential terrestrial habitats were fragmented and occurred mainly on State Park property. A search of the California Natural Diversity Data Base, museum specimens and literature revealed that the CRLF has been recorded from Pismo Creek and is extant at Arroyo Grande Creek. No CRLF records were found from Meadow Creek. Introduced bullfrogs (*Rana catesbeiana*), crayfish (probably *Procambarus clarkii*), and mosquitofish (*Gambusia affinis*) were very abundant in the survey area. Pacific treefrogs (*Hyla regilla*) were calling during the night surveys.

Threats to CRLFs at Meadow Creek include introduced predatory bullfrogs, crayfish and mosquitofish. Past modifications to the stream channel and development of upland areas probably decreased habitat suitability for CRLFs. The creation of permanent ponds and lakes likely has facilitated bullfrog, crayfish and introduced fish populations.

1.0 INTRODUCTION

A site assessment and field survey for California red-legged frogs (*Rana draytonii* (= *R. aurora draytonii*)) following the U.S. Fish and Wildlife Service (1997) protocol was conducted at Meadow Creek, Grover Beach, San Luis Obispo County, California. Meadow Creek originates north of Hwy. 101 and east of Arroyo Grande (Figure 1). It curves around Grover Beach, feeds the Pismo Lake Ecological Reserve, passes through Pismo State Beach in what appears to be a modified channel paralleling Hwy. 1, becomes a lake at Oceano Campground, and joins Arroyo Grande Creek about 100 m east of the Pacific Ocean. West of Grover Beach, Meadow Creek is shown as a perennial drainage on U.S.G.S. topographic maps. This survey was conducted for Althouse and Meade, Inc. Biological and Environmental Services, Paso Robles, California.

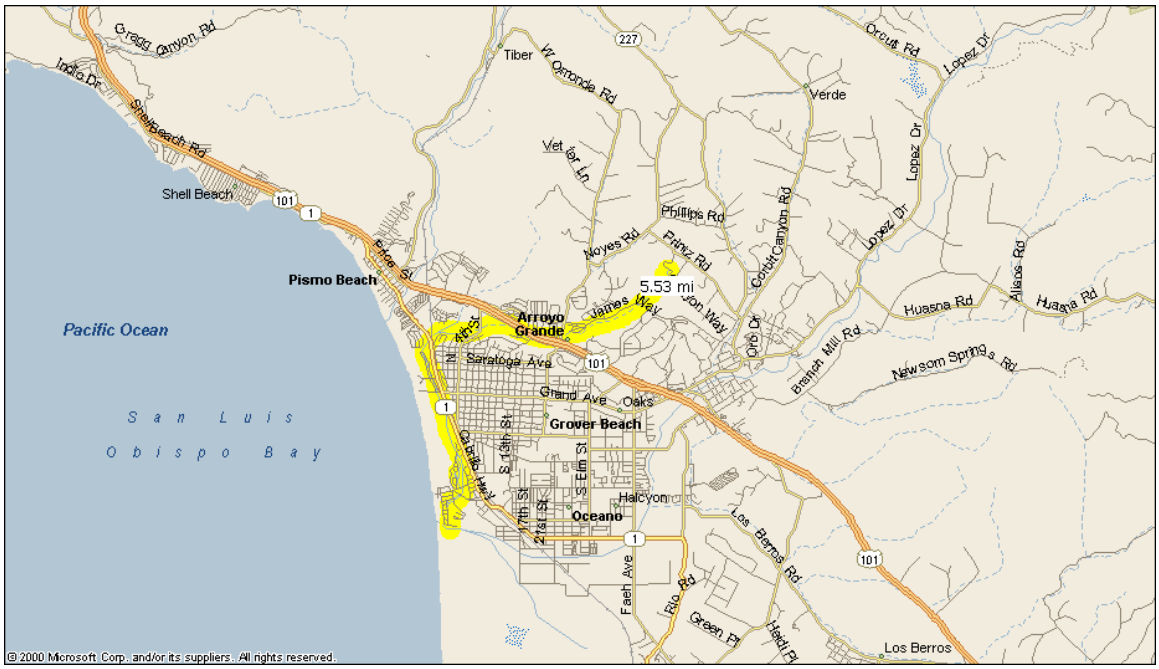

Figure 1. Vicinity map of Meadow Creek (highlighted), Grover Beach, San Luis Obispo County, California.

1.1 SURVEY LOCATION

The focal survey area was between the Grand Avenue Bridge and the Pismo State Beach Golf Course, and surveys were also conducted at the golf course ponds and Meadow Creek at the Pismo State Beach Ranger's Station (Figure 2). The site assessment included upland and aquatic habitats within 1.6 km of the focal area (Figure 3).

1.2 PHYSIOGRAPHIC SETTING

The section of Meadow Creek evaluated in this study was a narrow (<10 m) channel with near-vertical sides and a continuous depth of 0.8 - 0.9 m. It appeared that the stream had been channelized, and its route around Grover Beach and along Hwy. 1 may be the result of realignment. Riparian forest and wetlands exist at Pismo State Beach, but it is possible that these habitats developed adjacent to the channel after it was reconfigured. On State Park land wetland and riparian areas are bisected or have been eliminated by roads, trails, campground facilities, residences and offices. The riparian forest at the inlet to Pismo Lake appears to be along the stream's natural course, although the lake is an artificial impoundment. The lake at Oceano appears to be an artificial impoundment and it is possible this area historically was marshy wetlands or part of the dune lake system that remains south of Arroyo Grande Creek. Apart from these areas, residential development exists to within approximately 10 - 15 m of the channel edge.

2.0 SURVEY METHODOLOGY

Methods followed the U.S. Fish and Wildlife Service (1997) protocol.

2.1 SITE ASSESSMENT

The suitability of aquatic habitats for the California red-legged frog (CRLF) was assessed by visiting sites where there was public access and evaluating whether the characteristics of water depth, stream flow rates, and vegetative structure were comparable to sites known to be occupied by CRLFs (Hayes and Jennings 1989, Christopher 1997). The area covered was within 1.6 km of the focal area (Figure 3). Upland and aquatic habitats were mapped on U.S.G.S. topographic quadrangles using the software Maptech Terrain Navigator Edition 1.0. Photographs of the sites visited are given on the compact disc in Appendix A and field notes are in Appendix B.

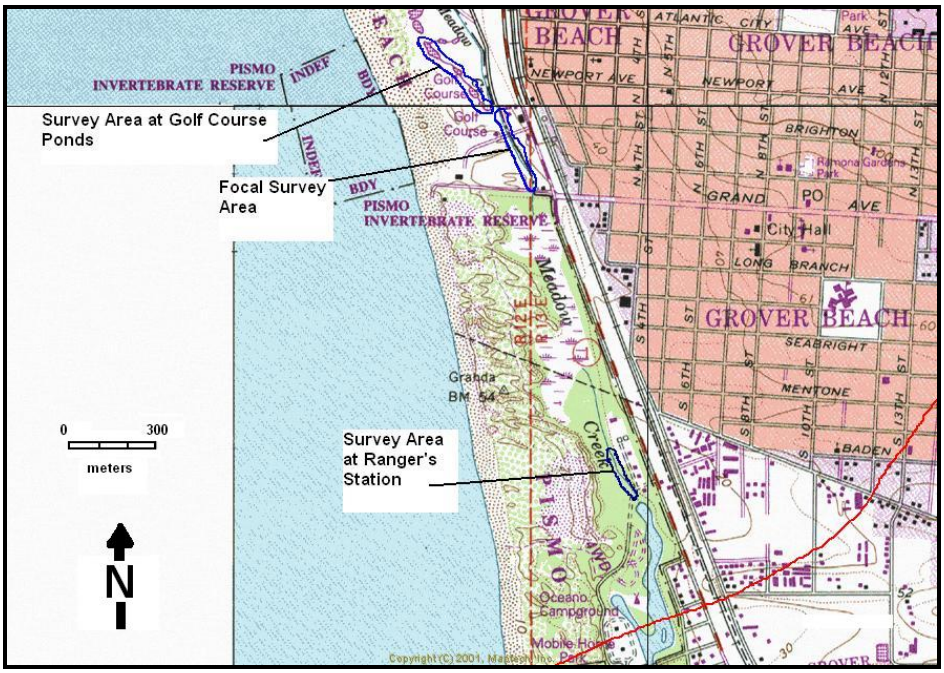

Figure 2. Survey areas at Meadow Creek, Grover Beach, San Luis Obispo County, California. Adapted from the U.S. Geological Survey 7.5′ Pismo Beach, Calif. and Oceano quadrangles.

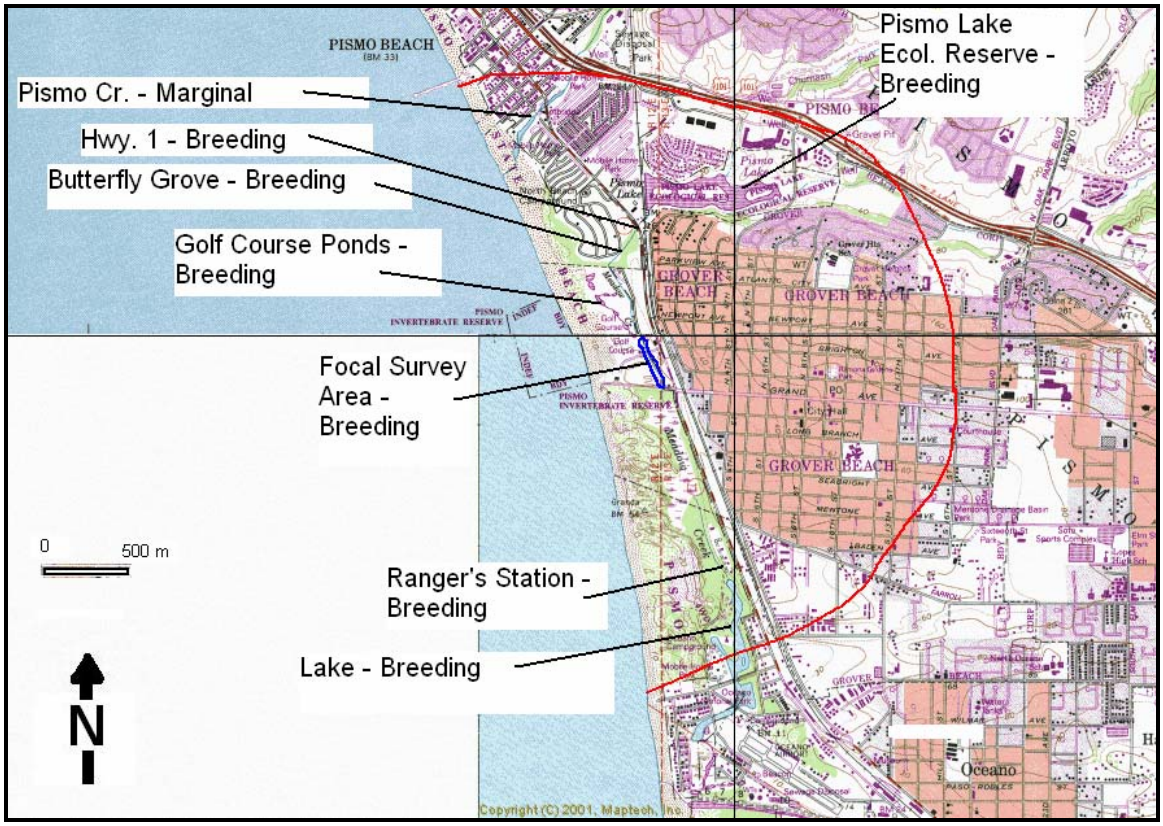

Figure 3. Site assessment area (red) within a 1.6 km radius from the focal survey area (blue). Aquatic habitat suitability for California red-legged frogs is rated from high to low quality using the terms breeding (could support all life stages), potential (vegetative and water depth characteristics meet criteria for adults but may not be high-quality breeding habitat), possible (less than high-quality adult habitat, but could be used by juveniles or dispersing frogs), marginal (poor quality adult habitat, unsuitable for breeding, but could be used by juveniles or dispersing frogs), and not suitable. Adapted from the U.S. Geological Survey 7.5' Pismo Beach, Calif. and Oceano quadrangles.

Known CRLF localities within 8 km of the focal area were determined by consulting the California Natural Diversity Database (CNDDB; RareFind Version 3.0.5; April 29, 2005), Museum of Vertebrate Zoology, Museum of Systematics and Ecology, the herpetology collection at CalPoly San Luis Obispo, unpublished survey reports, and personal communications with local biologists.

2.2 FIELD SURVEYS

Two daytime and two nighttime surveys were conducted at the focal area and Meadow Creek at the Pismo State Beach Ranger's Station (Figure 2). Only night surveys were conducted at the golf course ponds because access was unavailable during the day. Surveys were conducted on 19 May (1534 to 1800 hours, and 2052 to 2303 hours), 20 May (1457 to 1546 hours), and 24 May 2005 (2046 to 2242 hours). Surveys were conducted during warm temperatures and low to moderate wind speeds, and were planned to take place when the moon was not full. I independently conducted all surveys. At the focal area, I waded into sections of open water and searched all areas of the vegetation that were accessible. For the golf course ponds, I surveyed from the shore and waded into the water to search stands of emergent vegetation. The section near the Ranger's Station was surveyed from shore. Night surveys began after "full darkness", which is the inability to differentiate colors without a light source. Four-volt Kohler Wheat Cap Lamps (Wilkes-Barr, Pennsylvania) were used to detect frog eyeshine during night surveys. Each frog observed was carefully approached to gain a positive species identification without handling.

Weather conditions recorded for each survey were wind speed, cloud cover, percent fullness of moon (for night surveys), air temperature and water temperature. Data recorded were the number of amphibians seen by species and life stage or size class (egg mass, tadpole, metamorph=recently-transformed, juvenile, adult), an estimate of the number of male frogs heard calling, reptile species observed, the presence of introduced crayfish, fish species that could be identified through visual observations, and notes on the condition of the habitat as it relates to suitability for CLRFs. Nomenclature followed Crother et al. (2001, 2003) and Jennings (2004). The content of this report was based upon the protocol guidelines and a copy was sent to the U.S. Fish and Wildlife Service, Ventura Field Office.

3.0 RESULTS

3.1 ASSESSMENT OF EXISTING HABITATS

3.1.1 Focal Area

The habitat at the focal area was potentially suitable for CRLF breeding, adults, and juveniles. Water depth was 0.8 - 0.9 m throughout the channel and there were dense stands of emergent bulrushes (*Scirpus* sp.) alternating with patches of open water. Dense willows (*Salix* sp.) and blackberry (*Rubus* sp.) were present in and at the water's edge in the reach between Grand Avenue and LeSage Drive. Willows were absent from the reach surveyed in the golf course, and there were larger areas of open water surrounded by dense stands of bulrushes. Current speed was sluggish and the water was not visibly moving in some areas. The water had high turbidity, a foul odor, and a blue-green surface film. The substrate was sand and silt.

Adjacent to the channel in areas that were not developed was an assemblage of mostly introduced species growing in a dense thicket, including pampass grass, wild radish (*Raphanus sativus*), various exotic grasses, and iceplant (*Carpobrotus edulis*). Scattered shrubs were coyote brush (*Baccharis piluaris*) and bush lupine (*Lupinus* sp.). A chain-link fence surrounded the channel and adjacent areas.

3.1.2 Site Assessment Area

There was high-quality potential breeding, adult and juvenile CRLF habitat in Meadow Creek at the Pismo State Beach Ranger's Station (Figure 3). Water depth was estimated at > 1 m deep, and there was shoreline cover by bulrushes, cattails (*Typha* sp.) and willows. Emergent vegetation grew completely across the channel in some areas. There were large areas of open water and the channel was wider than at the focal area. A beaver dam and pond were present near the "old corral". On the west side of the road to the corral was a separate wetland that had a completely closed canopy of willow and no emergent vegetation. Meadow Creek broadens into a lake in the campground, which could be used by CRLFs and would be potential breeding habitat, but it is possible the lake is stocked with non-native predatory fish.

The golf course ponds had potentially suitable habitat for CRLF adults, juveniles and breeding. Although most of the shore was vegetated by low-cut grasses, the

banks were overhanging and there were stands of bulrushes. One pond also had willows. Water depth was > 0.5 m.

Meadow Creek at the Pismo State Beach North Beach Campground "Butterfly Grove" had potential breeding, adult and juvenile CRLF habitat. There were stands of bulrushes and sedge (*Carex* sp.) that in some areas grew completely across the channel. A paved trail along the channel edge decreased shoreline cover on one side.

Meadow Creek at Hwy. 1 bridge had potential breeding, adult and juvenile CRLF habitat. Northwest of the bridge was a *Scirpus* marsh with deep water. Near the main channel on the west side of the bridge in Pismo State Beach the trees were large and completely covered the water. Upstream from Hwy. 1 there were large willows and stands of *Scirpus*.

Pismo Lake Ecological Reserve is expected to have potential breeding, adult and juvenile CRLF habitat.

Pismo Creek at the old Cypress Road Bridge (that is now a footbridge) had marginal CRLF habitat. The water was < 0.7 m deep and was covered with mats of algae. There was no vegetation on the banks because the slope had been covered with slabs of concrete and boulders. Potentially suitable habitat may exist when the lagoon mouth closes. There were many dead and dying fish.

3.1.3 Upland Habitats

Potential CRLF terrestrial habitat does not exist east of the focal area where there is residential/light urban development. There is potential terrestrial and riparian habitat at Pismo State Beach and Oceano Dunes State Vehicular Recreation Area, but it has been fragmented by camping facilities, residences, roads, the golf course, maintenance facilities and the buildings at the ranger's station.

3.2 KNOWN LOCALITIES

Several CRLF localities exist from the vicinity of Grover Beach, but none were found from Meadow Creek. A 1959 CRLF CalPoly museum specimen exists from Price Canyon (Pismo Creek) and there is a 1960 specimen from "Halcyon Cypress and Temple St." (Appendix C). It is not known whether these localities are extant, but the California Coastal Conservancy (2003) considered the frog to be present in Pismo Creek and its lagoon. Several recent (1995 - 2004) sightings

from the Arroyo Grande Creek watershed were recorded in the CNDDB. The nearest (2.5 -3.5 km) locality was Arroyo Grande Creek south of the Oceano Airport to the Union Pacific RR Bridge. Sightings exist from this locality from December 2004.

Protocol CRLF surveys conducted in 2003 for the coastal trail at Pismo and Meadow Creeks failed to detect the species (California Coastal Conservancy 2003). Surveys conducted in January 1998 in Meadow Creek at Hwy. 1 in Pismo Beach did not detect CRLFs (Christopher 1998). Protocol CRLF surveys at an Oceano site lacking aquatic habitat, and an inspection of a marsh at the confluence of Meadow Creek and Arroyo Grande Creek did not reveal CRLFs (Althouse and Meade, Inc. 2004).

3.3 SURVEY RESULTS

No CLRFs were observed during the surveys. Adult and juvenile bullfrogs (*Rana catesbeiana*) were seen during each survey. The greatest number seen was on the night of 24 May 2005 with 3 adult and 6 juvenile bullfrogs at the focal area of Meadow Creek; and, at the golf course ponds there were 12 adults, 4 juveniles, 1 metamorph, 1 or 2 calling that were not seen and 2 large frogs that jumped in from under an overhanging bank without being positively identified. The greatest number of bullfrogs seen at the ranger's station was on the night of 19 May 2005 with 3 adults seen. Bullfrogs were calling only from the golf course ponds, and they seemed to prefer the third pond that remained very warm at night (21.0 to 23.0^{o} C; water temperature in Meadow Creek at night was 15.0 to 18.0^{o} C). No bullfrog tadpoles were seen. Pacific treefrogs (*Hyla regilla*) were calling in each of the areas surveyed, and there was a very large chorus from Meadow Creek between Grand Avenue and the ranger's station suggesting the presence of a marsh or other large body of water (see Figure 2). Introduced crayfish (probably *Procambarus clarkii*) were very abundant throughout the survey area, and were more conspicuous during the night surveys than during the day. Mosquitofish (*Gambusia affinis*) were present in Meadow Creek and the golf course ponds (Appendix B).

4.0 DISCUSSION AND CONCLUSIONS

Potential CRLF breeding, adult, and juvenile habitat is present in the areas surveyed, but they were not detected during the surveys. Several extant localities of the frog exist within 8 km of the focal area, although none are known from the Meadow Creek watershed. It is my opinion that CRLF probably

historically occurred in the drainage and that they may remain present in low numbers at some locations. Past modifications to the stream channel and development of upland areas probably decreased habitat suitability for CRLFs, but it is possible that they remain in areas on State Park property that are less impacted.

The creation of permanent ponds and lakes along Meadow Creek may have facilitated bullfrog, crayfish and introduced fish populations, and these species were observed to be abundant in the survey area. These species prey on early life stages of amphibians and likely contribute to population declines and extirpation of native species (Gamradt and Kats 1996, Batista 2002, Christopher 2004). The golf course ponds appeared to be prime breeding sites for bullfrogs. There were greater numbers of bullfrogs in Meadow Creek near the golf course ponds than in areas surveyed downstream, and it is possible that large numbers of bullfrogs are produced in the ponds and they disperse to other local aquatic habitats. The permanent slow-moving water of Meadow Creek would also be suitable for bullfrog breeding, but may be less attractive due to lower water temperatures (see Lillywhite 1970, Bury and Whelan 1984) especially in shaded reaches such as those seen on State Park property. Red swamp crayfish (*Procambarus clarkii*) are a preferred prey of bullfrogs (Corse and Metter 1980, Clarkson and DeVos 1986, Christopher 2004), and crayfish can attain extremely high densities despite the presence of bullfrogs due to high fecundity and rapid growth to maturity (Huner and Barr 1983). Red swamp crayfish can withstand a wide range of aquatic conditions, and their diet is varied including plants, organic sediment, detritus, insects, other crustaceans, fish, and amphibian eggs and larvae (Huner and Barr 1983, Huner and Lindqvist 1995, Gutierrez-Yurrita et al. 1998, Gamradt and Kats 1996). Crayfish can be thought of as efficient converters of energy driving bullfrog abundance. In addition to mosquitofish, other species of predatory introduced fish are likely to be present since the lake in Oceano is used for recreational purposes. Many game fish species can eliminate CRLF tadpoles from ponds (Christopher 2004).

In conclusion, I believe that CRLFs would have been detected if they were present in the locations surveyed at that time. It is possible that they occur in other reaches of Meadow Creek such as those that are shaded by willows or are otherwise unattractive for bullfrogs. Habitat alteration (channelization, removal of willows, loss of upland habitats due to development) and predation pressures by introduced predators (facilitated by the creation of permanent aquatic sites) probably depressed the CRLF population and may have resulted in their extirpation.

5.0 LITERATURE CITED

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APPENDIX A

PICTURES

GBCC – Meadow Creek CRLF Survey May 2005

1. Focal Area 1, Grande Ave.

2. Focal Area 2, Grand Ave.

3. Focal Area 3, Grand Ave.

4. Focal Area 4, Grand Ave.

5. Focal Area 5, Grand Ave.

6. Focal Area 6, Grand Ave.

7. Focal Area 7, Grand Ave.

8. Focal Area 8, Grand Ave.

9. Focal Area 9, Grand Ave.

10. Focal Area 10, Grand Ave.

11. Focal Area 11, Grand Ave.

12. Focal Area 12, Grand Ave.

13. Focal Area 13, Grand Ave.

14. Focal Area 14, Grand Ave.

15. Focal Area 15, Grand Ave.

16. Focal Area 16, Grand Ave.

17. Focal Area 17, Grand Ave.

18. Focal Area 18, Grand Ave.

19. Focal Area 19, Grand Ave.

21. Focal Area 21, Grand Ave.

20. Focal Area 20, Grand Ave.

22. Focal Area 22, Grand Ave.

APPENDIX B

FIELD NOTES

Date: 19 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek
Grand Ave. to Oceano State Beach Golf Course

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Day

Begin time: 1534 **End:** 1623

Wind: Windy away from creek, slightly windy near water	**Clouds:** 15%	**Moon:** NA
Air Temp (in °C): 23.0	**Water Temp (in °C):** 18.0	

At Grand Ave. the channel is almost completely grown over by *Scirpus, Salix,* and *Rubus*. There is a blue-green film on the water and it smells bad. Each side of the drainage is surrounded with a chain link fence. On the downstream side of the bridge you can see a good section of water. The channel is completely covered by willow and the water has almost no flow. Substrate is sand and silt. Water is murky and dark. Lots of crayfish seen. Trees gnawed by beaver seen. On the west side of the channel going north from Grand, it looks like the willows were once cut and there is an overgrown trail through the pampass grass, *Raphanus*, introduced grasses, *Baccharus pilularis*, iceplant and dead bush lupine. You can catch glimpses of the water from the bank, and there are some overgrown trails into small patches of open water, but most of the channel is overgrown with willow and you can't wade down it.
1 adult *Rana catesbeiana* seen downstream of LeSage Drive and 3 juvenile *RaCa* seen upstream. Mosquitofish seen. There were 2 guys scuba diving for golf balls in the putrid water. I talked to a golf course employee and he said they pay the divers. He said he brings his son out at night to look at frogs and there are a lot of them, especially after it rains, and there are 3 "types" – the big bullfrogs, one about 1/2 that size, and the little treefrogs. He said I could survey the golf course ponds at night but not to walk around them during the day when people were golfing.

Date: 19 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Within 1.6 km of Meadow Creek focus area (Grand Ave. to Oceano State Beach Golf Course)

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Site Assessment

Begin time: 1630 **End:** 1800

Wind: Breezy	**Clouds:** 15%	**Moon:** NA
Air Temp (in °C): 23.0	**Water Temp (in °C):** 18.0	

Meadow Creek at Pismo State Beach Ranger's Station – Very high quality *Rana draytonii* habitat. Channel is much wider but still is deep with open water that you could wade down, and a broader riparian area. There was a beaver dam near an old corral with mallards in the pond. The campground has put in roads and trails through the riparian, breaking up the water into separate areas. The west side of the road/trail is completely covered with willows, and the east side (main channel) is bordered by *Scirpus* and cattail with areas of large willows. The main channel broadens out into a large lagoon in the campground. No frogs seen.

Pismo Creek at Old Cypress Road Bridge (now a footbridge) – marginal *RaDr* habitat. Water is < 0.7 m deep at the bridge, the channel is wide, the water is covered with mats of algae. No vegetation is on banks because the slope has been covered with slabs of concrete and boulders. There possibly could be better habitat for *RaDr* when the lagoon mouth closes. There were lots of dead and dying fish. They were slender, silver, pointed nose, almost 1' long. Possibly smelt.

Meadow Creek at Hwy. 1 bridge – northwest of the bridge is a *Scirpus* marsh with deep water. Upstream from Hwy. 1 the willows have grown large and *Scirpus* has grown in since I surveyed it in 1998. Same bad smell to the water with a film on the surface. On the west side in Pismo State Beach the trees are

Date: 19 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Within 1.6 km of Meadow Creek focus area (Grand Ave. to Oceano State Beach Golf Course)

larger and completely cover the water. Very good habitat for *RaDr*.
Pismo Lake Ecological Reserve – Potential habitat.
Pismo State Beach North Beach Campground at "Butterfly Grove" – Wider channel than at Grand, but there is a paved trail and the campground on the west side of the channel has decreased the riparian area. Some areas of the channel are filled in with *Scirpus* and *Carex*. Murky water. Potential *RaDr* habitat.

Date: 19 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek
Grand Ave. to Oceano State Beach Golf Course

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Night

Begin time: 2052 **End:** 2152

Wind: Intermittent breeze/calm	**Clouds:** 5%	**Moon:** 70%
Air Temp (in °C): 16.0	**Water Temp (in °C):** 18.0	

Surveyed by wading into open water patches or from the edge where open water was very small. 1 ranid frog seen by eyeshine only (white) downstream of Grand Ave. Bridge in willow thicket. It dove under as I moved through the willows toward it.
1 juvenile *Rana catesbeiana* seen, and it possibly was one of the ones also seen during the day. 1 adult *RaCa* seen in the area on the golf course where the guys were diving. 3 *Hyla regilla* called briefly from the entire area surveyed. Lots of crayfish were seen.

Date: 19 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Oceano State Beach Golf Course ponds

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Night

Begin time: 2152 **End:** 2228

Wind: Intermittent breeze/calm	**Clouds:** 5%	**Moon:** 70%
Air Temp (in °C): 16.0	**Water Temp (in °C):** 23.0 (3rd pond)	

First pond – 2 huge adult *Rana catesbeiana* and 1 metamorph *RaCa* ~55 mm SUL. 2 *Hyla regilla* were calling. Mosquitofish seen. Stands of *Scirpus* and *Carex*.
Second pond – 1 *RaCa* calling with an unusual tone, 1 juvenile *RaCa* seen, mosquitofish seen. Very little *Scirpus*.
Third pond – 3 *RaCa* calling, 1 was also grunting (territorial call?), 5 adult *RaCa* seen (some of these may also have been calling), 1 juvenile *RaCa* seen. No *HyRe* calling or seen. Some patches of *Scirpus*.
Fourth pond – 1 juvenile and 1 adult *RaCa* seen. No *HyRe*. Willow and *Scirpus*.

Date: 19 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek at Pismo State Beach Ranger Station
Crossing of road to CG to old corral

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Night

Begin time: 2242 **End:** 2303

Wind: Calm	**Clouds:** None	**Moon:** 70%
Air Temp (in °C): 14.0	**Water Temp (in °C):** 15.0	

Surveyed from edge. > 10 *Hyla regilla* were calling at the beaver pond and there was a huge chorus somewhere upstream. 1 *HyRe* called at the road crossing. 3 adult *Rana catesbeiana* were seen upstream of the road crossing, and none were seen downstream or in the beaver pond. 1 raccoon seen.

Date: 20 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek
Grand Ave. to Oceano State Beach Golf Course

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Day

Begin time: 1457 **End:** 1528

Wind: Windy away from creek, slightly windy near water	**Clouds:** 20% high clouds	**Moon:** NA
Air Temp (in °C): 21.0	**Water Temp (in °C):** 18.0	

1 juvenile *Rana catesbeiana* seen in the section between Grand and Le Sage bridges. I cut better access ways into the water.
Upstream of LeSage I saw 5 juvenile and 1 adult *RaCa*.
Lots of crayfish seen.

Date: 20 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek at Pismo State Beach Ranger Station
Crossing of road to CG to old corral

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Day

Begin time: 1539 **End:** 1546

Wind: Breezy	**Clouds:** 25% high clouds	**Moon:** NA
Air Temp (in °C): 18.0	**Water Temp (in °C):** 18.0	

Road crossing to campground is at N 35° 06.747′, W 120° 37.587′, accuracy 30.9 m.
1 adult *Rana catesbeiana* seen downstream of the road crossing.
Upper end of beaver pond is N 35° 06.786′, W 120° 37.648′.

Date: 24 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek
Grand Ave. to Oceano State Beach Golf Course

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Night

Begin time: 2046 **End:** 2138

Wind: Calm	**Clouds:** 100% overcast	**Moon:** None
Air Temp (in °C): 14.0	**Water Temp (in °C):** 16.5	

1 adult *Rana catesbeiana* seen under the Grand Ave. Bridge. A very large chorus of *Hyla regilla* can be heard some distance downstream of the bridge, and they could also be heard from LeSage Dr., meaning it must be very large and the sound is carrying well tonight.
1 juvenile and 1 adult *RaCa* seen between Grand Ave and LeSage Drive bridges. No *HyRe* seen or heard.
1 adult and 5 juvenile *RaCa* seen upstream of LeSage, plus 1 *HyRe* called infrequently.
Lots of crayfish seen throughout the entire area surveyed.

Date: 24 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Oceano State Beach Golf Course ponds

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Night

Begin time: 2138 **End:** 2219

Wind: Calm	**Clouds:** 100% overcast	**Moon:** None
Air Temp (in °C): 12.5	**Water Temp (in °C):** 21.0 (3rd pond)	

First pond, east side – 4 adult *Rana catesbeiana* seen and 1 *Hyla regilla* was calling. Most of the bulrushes have been cut down.
Second pond – 1 juvenile *RaCa*. I waded inside the bulrushes to identify the frog since it wasn't out in the open on the edge like the others. Crayfish and mosquitofish seen. Night heron? seen.
Third pond, east side – 3 adult, 1 juvenile and 1 metamorph *RaCa* seen plus 3 calling (one or two may have also been seen). Mosquitofish seen. 1 *RaCa* is calling in a high pitched squeaky tone, without the characteristic reverberating bellow of har-rumm. I heard this unusual call during the last survey, and saw the frog emitting it, and it was a very large *RaCa*. Lots of floating green algae mats.
Fourth pond – 1 adult and 1 juvenile *RaCa*. Mosquitofish.
Third pond, west side – 3 adult *RaCa* seen, plus 2 frogs jumped in from under the bank overhang.
First pond, west side – 1 adult and 1 juvenile *RaCa* that eeped when it jumped in.

Date: 24 May 2005	**Observer(s):** Susan V. Christopher

County: San Luis Obispo

Location: Meadow Creek at Pismo Beach Ranger Station
Road to CG to old corral

Project: Althouse and Meade, Inc., Meadow Creek CRLF Protocol Surveys

Survey Type: Night

Begin time: 2233 **End:** 2242

Wind: Calm	**Clouds:** 100% overcast	**Moon:** None
Air Temp (in °C): 13.0	**Water Temp (in °C):** 15.0	

1 adult *Rana catesbeiana* seen and 1 *Rana* sp. seen by eyeshine only upstream of the road crossing. ~20 *Hyla regilla* were calling throughout the entire area surveyed, except there were none in the willow wetland on the west side of the road. Crayfish seen.

APPENDIX C

LOCALITY RECORDS

California Red-legged Frog Localities From the Vicinity of Meadow Creek
S.V. Christopher, June 2005

Museum	**Specific Locality**	**Date Collected**
CPSLO	Price Canyon	9-Feb-60
CPSLO	Halcyon Cypress and Temple St.	24-May-59
CNDDB:		
Occurrence No.	**Location**	**Gencom**
143	UNNAMED DRAINAGE, 0.5 MILE EAST OF HWY 101, 2 MILES SE OF ARROYO GRANDE.	3 JUVENILE FROGS OBSERVED ON 27 FEBRUARY 1995.
144	UNNAMED DRAINAGE JUST SOUTH OF PICACHO, 0.6 MILE EAST OF HWY 101, SE OF ARROYO GRANDE.	1 ADULT OBSERVED ON 28 MARCH 1995.
145	UNNAMED DRAINAGE JUST SOUTH OF PICACHO, 0.6 MILE EAST OF HWY 101, SE OF ARROYO GRANDE.	6 ADULTS AND 4 JUVENILES WERE OBSERVED ON 27 JULY 1995.
148	JUST WEST OF THE INTERSECTION OF HUASNA ROAD AND BRANCH MILL ROAD, ARROYO GRANDE.	6 JUVENILE FROGS OBSERVED ON 12 JULY 1995.
258	GRAGG CANYON, 0.7 MILE EAST OF HWY 101, EAST OF AVILA BEACH.	2 ADULT FROGS OBSERVED DURING A NIGHT SURVEY ON 5 SEP 1998; 3 ADULT FROGS OBSERVED DURING A NIGHT SURVEY ON 6 SEP 1998.
319	ARROYO GRANDE CREEK, 1 MILE EAST OF THE INTERSECTION OF CORBIT CANYON ROAD AND UPPER ARROYO GRANDE ROAD, ARROYO GRANDE	1 ADULT OBSERVED ON 12 SEP 1999; MANY MORE EXPECTED TO BE IN THE AREA.
418	CORBIT CANYON CREEK (AKA TALLY HO CREEK), AT THE JUNCTION OF CORBIT CANYON AND POORMAN CANYON, ARROYO GRANDE	1 INDIVIDUAL OBSERVED ON 20 OCT 2000.
459	TALLY HO CREEK, NEAR THE ENDS OF MAY STREET AND PASEO STREET, ARROYO GRANDE	ADULT FROGS OBSERVED IN 1999, 2000, AND 2001. 1 ADULT AND 10 JUVENILE FORGS OBSERVED ON 2 AUG 2002.
496	ARROYO GRANDE CREEK, FROM 0.3 MILE UPSTREAM FROM THE MOUTH TO 1400' WEST OF THE 22ND STREET, SOUTH OF OCEANO AIRPORT	1 JUVENILE OBSERVED ON 24 SEP 1996. 2 JUVENILES OBSERVED ON 11 OCT 2002. 1 ADULT OBSERVED ON 15 OCT 2002.
567	EAST OF THE NORTH END OF ARROYO GRANDE VALLEY. 0.5 MILE SE OF ORCUTT RD LOPEZ DR INTERSECTION.	1 ADULT AND 20 JUVENILES OBSERVED ON 3 SEP 2002.

CNDDB:		
Occurrence No.	**Location**	**Gencom**
629	MIDDLE TRIBUTARY TO LOS BERROS CREEK, ON THE WEST SIDE OF HIGHWAY 101, 0.8 MILE WEST OF PICACHO HILL	1 SUB-ADULT FROG OBSERVED ON 12 JUN 2002.
630	SOUTHERN TRIBUTARY TO LOS BERROS CREEK, ON THE WEST SIDE OF HIGHWAY 101, 0.7 MILE WSW OF PICACHO HILL	15+ ADULT FROGS OBSERVED ON 12 JUN 2002.
744	BLACK LAKE CANYON CREEK, AT THE ZENON WAY CROSSING, 1.75 MILES EAST OF HIGHWAY 1, NORTH OF NIPOMO MESA	4 SUBADULTS OBSERVED ON 22 APR 2004.
(SVC sent to CNDDB on 10 December 2004)	ARROYO GRANDE CREEK AT UPRR, OCEANO	1 ADULT OBSERVED ON 8 DECEMBER 2004