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Tennessee and Oakwood Valley  
Introduced Aquatic Animal Management Plan  
Annual Report

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Prepared by

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## INTRODUCTION

The Golden Gate National Recreation Area (GOGA) initiated a project to improve habitat conditions for native aquatic wildlife including the federally threatened California red-legged frog (*Rana aurora draytonii*). Control of introduced fish and bullfrogs within Oakwood and Tennessee Valleys, Marin Co. were considered a major component of this project. Because Tennessee and Oakwood Valley watersheds are relatively small with discrete locations of bullfrogs and non-native fish, successful control actions will likely persist without outside recolonization. The actions involve three phases: 1) hand removal of metamorphosed bullfrogs, egg masses, and introduced fish, 2) seasonal draining to remove bullfrog tadpoles and introduced fish in Haypress, Backdoor, and Oakwood Valley Ponds in fall, and 3) aquatic trapping of bullfrog adults and tadpoles. Details regarding the project are available from the Tennessee and Oakwood Valley Introduced Aquatic Animal Management Plan (Shinomoto and Fong 1997).

This year's activities represent the first year of a 2-3 year project. Post-project monitoring activities are planned for assessing red-legged frogs and bullfrog numbers from this project. The information provided below is meant to comply with reporting requirements of GOGA's Section 10(a) Endangered Species Act permit (Subpermit No. GGNRA-2).

## SUMMARY OF YEAR 1 ACTIVITIES

In late winter 1997, Darren Fong and Dave Cook (Sonoma State graduate student) conducted a breeding survey of Rodeo Lake, Big Lagoon, and Tennessee Valley ponds and wetlands, Marin Co. We intended the surveys to form a baseline dataset to assess the effectiveness of restoration activities for red-legged frogs. Survey results indicate that breeding activities for red-legged frogs were occurring within Rodeo Lake and Big Lagoon area, but neither calls, egg masses, or metamorphosed red-legged frogs were detected from Tennessee Valley. No bullfrogs were detected in Rodeo Lake or Big Lagoon surveys. Survey details are included in the attached report (Cook 1997).

In late September-October 1997, we drained three ponds: Haypress and Backdoor Ponds (Tennessee Valley) and Oakwood Pond (Oakwood Valley) (Figure 1). A 6" trailer mounted diesel suction pump was used at Backdoor Pond. A smaller, hand-carried 3" diesel suction pump was used at the other two ponds. The pumps were operated continuously until drained as far as possible. In all cases, several feet of "muck" was present on the bottom. In addition, significant inflow seepage at Backdoor Pond prevented the draining of all surface waters.

Trash screens were attached on the inlet ends of the suction pumps to prevent intake of bullfrog tadpoles and other organisms. Despite trash screens, some organisms were sucked into the pump. Two rough-skinned newts were sucked into the pump at Backdoor pond. We modified the trash screen to reduce the effective mesh size to 1/2 inch using baling wire. However, at Haypress Pond, small bullfrog tadpoles and mosquitofish were still entrained. However, at

Haypress pond, we discharged across a dry outlet swale and the vegetation caught the fish and tadpoles. It is unlikely that any fish or tadpoles reached downstream waters.

During pond drainings, we rescued any newts that were present in the drained ponds. About 313 newts were relocated to Tennessee Cove Pond. A large red-eared slider observed in Backdoor Pond during pond draining activities was captured one day later on a nearby hillslope.

Following pond drainings, repeated efforts to manually capture bullfrogs through gigging and trapping were conducted by volunteers, Park biologists, and contractor. An overall summary of bullfrog removal totals is provided below in Table 1.

**TABLE 1: Summary of Bullfrog Removal Totals for Fall 1997**

| <b>Locale</b>       | <b>Adults</b> | <b>Subadults</b> | <b>Juveniles</b> | <b>Tadpoles</b> | <b>TOTALS</b> |
|---------------------|---------------|------------------|------------------|-----------------|---------------|
| Oakwood             | 7             | 14               | 12               | 0               | 33            |
| Tennessee Cove Pond | 1             | 0                | 0                | 0               | 1             |
| Haypress Pond       | 43            | 48               | 14               | 47*             | 152           |
| Backdoor Pond       | 8             | 11               | 106              | 17              | 142           |

\*Many uncounted tadpoles were removed through discharge across dry swale

Summary of this data is included on Tables 3-6.

A significant number of bullfrogs were NOT captured from gigging activities at Haypress pond. About 35 bullfrogs were counted on our last survey/capture night. The night eyeshine surveys indicate that most remaining bullfrogs were either subadults or juveniles.

Existing permit conditions state that the number of frogs "allowed to be incidentally injured or killed during capture and handling is...one adult or juvenile frog, and three tadpole frogs in any calender year." For 1997, no California red-legged frogs were observed during pond draining activities or during manual removal of bullfrogs. No injury or mortality of observed red-legged frog egg masses, tadpoles, or metamorphosed individuals occurred during breeding surveys.

We kept track of the amount of field time related to draining of the ponds, as well as physical removal of the bullfrogs. Most of the person-hours were spent maintaining the pumps (e.g., filling gas tank with gas and clearing debris from trash screen). The total field times cited below does not include travel, mobilization, and planning/environmental compliance which would likely add another 25-50% increase in time (Table 2).

TABLE 2: Personnel Costs for Bullfrog Control - Fall 1997

| Locale                 | Person<br>-Hours |
|------------------------|------------------|
| Oakwood                | 7                |
| Tennessee Cove<br>Pond | 1                |
| Haypress Pond          | 43               |
| Backdoor Pond          | 8                |

By January 1998 (and probably sooner), winter storm activities had refilled all of the drained ponds.

#### FUTURE YEAR 2 ACTIVITIES

Currently, we are conducting winter breeding surveys in three watersheds, including the watersheds that we initiated bullfrog and introduced fish control programs. In the spring-early summer, we will also be conducting breeding surveys for bullfrogs and will be removing observed bullfrog egg masses concurrently.

In the late summer, we will continue to drain the same ponds using the same techniques. Giggling will remain the primary means of capturing metamorphosed bullfrogs. It is unlikely that any trapping will be done because of heavy personnel costs. Once the ponds have been drained as far as possible, we will likely seine for any remaining bullfrogs.

#### LITERATURE CITED

Cook, D. 1997. Tennessee Valley: California red-legged frog breeding survey report

Shinomoto, O. and D. Fong. June 1997. Tennessee and Oakwood Valley Introduced Aquatic Animal Management Plan. Prepared for the Golden Gate National Recreation Area.  
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Table 3: Summary of bullfrog and fish capture results for 1997, Backdoor Pond

| DATE     | SPECIES | CAPTURE | ADULTS | SUBADULTS | JUVENILES | LARVAE | COMMENTS                         |
|----------|---------|---------|--------|-----------|-----------|--------|----------------------------------|
| 9/30/97  | BF      | gig     | 2      | 4         | 29        |        | gigged 50%. 31 eyeshine post-gig |
| 10/1/97  | BF      | gig     |        |           | 17        | 1      |                                  |
| 10/2/97  | BF      | gig     | 6      | 6         | 37        | 14     |                                  |
|          | RS      | hand    | 311    |           |           | 2      |                                  |
|          | GS      | hand    | ~100   |           |           |        |                                  |
| 10/3/97  | BF      | gig     |        | 1         | 2         |        | *4 minnow traps @ 4 hrs          |
|          | BF      | trap    |        |           | 1         |        |                                  |
|          | GS      | trap    | 1      |           |           |        |                                  |
|          | MF      | trap    | 2      |           |           |        |                                  |
| 10/4/97  | BF      | gig     |        |           | 8         |        | 27 juv eyeshine BF. 1 captured   |
|          | BF      | efish   |        |           | 1         |        |                                  |
|          | GS      | trap    | 3      |           |           |        | 4 minnow traps @24hr             |
| 10/5/97  | BF      | efish   |        |           | 3         | 1      |                                  |
|          | BF      | trap    |        |           | 1         |        | 4 minnow traps @24hr             |
|          | GS      | trap    |        | 3         |           |        |                                  |
| 10/6/97  | BF      | gig     |        |           | 3         |        | 8 juvenile eyeshine              |
|          | GS      | trap    | 2      |           |           |        | 6 minnow traps @24hr             |
|          | MF      | trap    | ~12    |           |           |        |                                  |
| 10/7/97  | GS      | trap    |        |           | 1         |        | 6 minnow traps @24hr             |
|          | BF      | trap    |        |           | 2         |        |                                  |
| 10/8/97  | BF      | trap    |        |           | 2         | 1      | 8 visual ID                      |
|          | GS      | trap    |        | 2         |           |        | 6 minnow traps @24hr             |
| 10/30/97 | BF      |         |        |           |           |        | 12 BF eyeshines                  |

KEY: BF-bullfrog (*Rana catesbeiana*), GS-green sunfish (*Lepomis cyanellus*), MF-mosquitofish (*Gambusia affinis*), RS-rough-skinned newt (*Taricha granulosa*)

Table 4: Summary of bullfrog and fish capture results for 1997,Tennessee Cove Pond

| DATE     | SPECIES | CAPTURE | ADULTS | SUBADULTS | JUVENILES | LARVAE | COMMENTS   |
|----------|---------|---------|--------|-----------|-----------|--------|------------|
| 10/30/97 | BF      | gig     | 1      |           |           |        | 1 eyeshine |

Table 5: Summary of bullfrog and fish capture results for 1997,Haypress Pond

| DATE     | SPECIES | CAPTURE | ADULTS | SUBADULTS | JUVENILES | LARVAE | COMMENTS                        |
|----------|---------|---------|--------|-----------|-----------|--------|---------------------------------|
| 10/4/97  | BF      | gig     | 10     | 11        | 3         |        | observed 120 eyeshine adult/sub |
| 10/5/97  | BF      | gig     | 33     | 35        | 11        |        | big fish kill mostly 4-6" BG    |
| 10/6/97  | BF      | gig     |        |           |           | 1      |                                 |
| 10/14/97 | BF      |         |        |           |           |        | approximately 20 eyeshines      |
| 10/30/97 | BF      |         |        |           |           |        | approximately 35 eyeshines      |
| 11/4/97  | BF      | trap    |        | 1         |           | 10     | 3 modified minnow traps @24hrs  |
| 11/5/97  | BF      | trap    |        |           |           | 9      | 3 modified minnow traps @24hrs  |
| 11/6/97  | BF      | trap    |        |           |           | 16     | 3 modified minnow traps @24hrs  |
| 11/7/97  | BF      | trap    |        | 1         |           | 11     | 3 modified minnow traps @24hrs  |

Table 6: Summary of bullfrog and fish capture results for 1997, Oakwood Valley Pond

| DATE     | SPECIES | CAPTURE | ADULTS | SUBADULTS | JUVENILES | LARVAE | COMMENTS                  |
|----------|---------|---------|--------|-----------|-----------|--------|---------------------------|
| 10/4/97  | BF      | gig     | 1      | 8         | 3         |        |                           |
| 10/6/97  | BF      | gig     | 5      | 3         | 5         |        |                           |
| 10/7/97  | BF      | efish   |        |           | 2         |        | 2 observed,<br>not caught |
|          | RS      | efish   | 1      |           |           |        |                           |
| 10/7/97  | BF      | gig     |        |           | 1         |        | 1 eyeshine                |
| 10/14/97 | BF      | gig     | 1      | 1         | 1         |        | 3 observed,<br>not caught |
| 10/30/97 | BF      | gig     |        | 2         |           |        | 2 observed,<br>not caught |