Protocol Development Summary

Amphibians and Reptiles (Updated 03/17/10)

Parks where protocol will be implemented: Pinnacles National Monument

Justification/Issues being addressed:
Amphibian and reptile populations represent important populations in the San Francisco Bay Area (Adams et al. 2005). The protected legal status of several of these taxa (San Francisco gartersnake [federally endangered], California red-legged frog [federally threatened], Western pond turtle [California species of concern], and coast horned lizard [California species of concern]) require the NPS to evaluate the condition of these populations. Due to their habitat and physiology, herpetofauna are particularly sensitive to environmental degradation, such as air and water pollution. Because they are mid-level predators, population trends in these taxa may indicate trends in populations of animals at both higher and lower trophic levels.

Various related monitoring efforts are underway or recently completed, including:

- Demographic and migration studies of California red-legged frogs at GOGA, PORE
- California red-legged frog surveys at PINN
- General amphibian stream surveys and riparian aquatic species inventory at PINN
- Terrestrial vertebrate inventories at EUON, JOMU, PINN, PORE
- US Fish and Wildlife-sponsored study of the effects of habitat enhancement on San Francisco gartersnake at GOGA
- Investigation of Amphibian Chytrid Fungus at PINN, PORE.

In August and September 2005 a workshop of government and non-government herpetologists assisted network staff to identify and prioritize long-term monitoring questions for amphibians and reptiles on network park lands (Denn 2006). The workgroup formulated a list of the six most important amphibian and reptile monitoring targets for SFAN parks :

1. Pond-breeding amphibians
2. San Francisco gartersnake
3. Stream-inhabiting amphibians and reptiles
4. Terrestrial amphibians and reptiles
5. Turtles
6. Coast horned lizards

For each of these monitoring targets the group identified a) *specific monitoring questions*, b) *focal taxa to be monitored,* c) *monitoring objectives*, d) *potential monitoring techniques*, e) *monitoring locations*, f) *potential sampling design,* and g) *suggested monitoring regime*.

Given limited resources at this time, the decision was made that monitoring for the San Francisco Bay Area Network will focus on amphibians and reptiles at PINN only, with the following focal taxa:

1. Pond-breeding California red-legged frogs and California tiger salamanders
2. Coast horned lizards

Once these protocols are completed and their budgets approved, we will asses whether to move forward with developing a protocol for stream-inhabiting taxa (amphibians, reptiles, fish, and non-native species) at PINN. In the remainder of this document, items referring to the stream taxa protocol will be indicated with an asterisk (*).

Monitoring questions to be addressed by the protocol:

1. Is the abundance of pond-breeding California red-legged frog and California tiger salamander changing over time?

2. Is the distribution and abundance of coast horned lizard, harvester ant, and the non-native Argentine ant changing over time?

*3. Is the distribution and diversity of stream-inhabiting amphibians and fish changing over time?

*4. Are there new infestations of non-native stream-inhabiting fauna?

Specific monitoring objectives are:

1. Determine whether the abundance (as indicated by an index of egg masses and young-of-the-year) of California red-legged frogs and California tiger salamanders is changing over time in ponds at PINN.

   Associated sampling objective: Detect any 50% or greater change in abundance (index) between any two years of California red-legged frog/California tiger salamander egg masses or young-of-the-year at Bear Gulch Reservoir and other ponds at PINN.

2. Determine the distribution and abundance of coast horned lizard, harvester ant, and the non-native Argentine ant over time.

   Associated sampling objective: Detect a 25% change (between an initial 3-year baseline and any single year monitored) in the number of sites occupied by coast horned lizards, harvester ants, and Argentine ants at PINN.

*3. Determine whether the distribution and diversity of native stream-inhabiting amphibians and fish is changing over time at PINN.

*Associated sampling objective: Detect any 25% or greater site occupancy change between any two years for target native aquatic amphibian species (California red-legged frog, Pacific tree frog, and Western toad) and three-spine stickleback at PINN.

*4. Determine whether the distribution of non-native mosquitofish is changing over time at PINN.

*Associated sampling objective: Detect any 25% or greater site occupancy change between any two years for non-native mosquitofish at PINN.

*5. Detect new infestations of non-native stream-inhabiting fauna at PINN.

*Associated Monitoring Objective: Detect any new infestations of non-native stream-inhabiting vertebrate (other fish species, turtles, bullfrogs) or target non-native invertebrate species (crayfish, New Zealand mud snails; more species may be added as necessary).

Basic Approach:

Because of separate sampling methodologies, three separate stand alone protocols will be developed.

Protocol 1: Addresses monitoring objective 1: Pond-breeding California red-legged frogs and California tiger salamanders.

All five ponds at PINN will be sampled for both species. Tiger salamander egg sampling will include the temporary installation of artificial egg-attachment substrate in each pond. Because of differences in timing of breeding and detectability of various developmental stages of the two species, surveys for both species may be performed simultaneously approximately half the time.

Protocol 2: Addresses monitoring objective 2: Coast horned lizard, harvester ant and Argentine ant.

The coast horned lizard protocol involves minimal survey effort and requires little training. Surveys will primarily be conducted by the raptor monitor en route to raptor monitoring sites, eliminating time wasted in traveling to the study sites.

Protocols for monitoring coast horned lizard will be based on a draft study proposal by Dr. David Morafka (copy in PINN Resource Management office), protocols developed by USGS (Robert Fisher, pers. comm.), and ant trapping methods described by Suarez et al. (1998). Assistance from national I&M staff or the CESU will be utilized for using GRTS to select sampling sites from a pool of known horned lizard sites. Visual

encounter surveys will be conducted for horned lizards and ants, and ants will also be collected passively in small pitfall traps.

*Protocol 3: Addresses monitoring objectives 3, 4, and 5: Stream fish and amphibians.

> Stream sampling sites will be selected using GRTS with assistance from national I&M staff or through the CESU. Visual encounter surveys for target species will be conducted at each site, with duplicate visits to establish species detectability.

The MEDN has a protocol for monitoring stream-inhabiting herpetofauna, fish, and non-native invertebrates that is nearing approval. This protocol will serve as a guide for developing Protocol 3, although some of the more intensive sampling methods may not be used. There will be a set of core sites and species that will be monitored every year. Additional sites and species will be added as resources allow. Efficiencies may include sampling non-core sites on a rotational basis. Funding from PINN may supplement I&M funding to allow for sampling additional sites and species.

Because the annual budget for this protocol is $15K, protocols will be developed in sequence to ensure funding level is appropriate and adequate for each protocol.

Principal investigator and NPS lead:

Project Lead and Principal Investigator: Paul Johnson, PINN Wildlife Biologist; Marcus Koenen, SFAN I&M Network Program Manager.

Proposed Development schedule, budget, and expected interim products:

YEAR	BUDGET	TASKS/PRODUCTS
FY10	$14,000	Begin protocol development
FY11	$15,000	Submit protocol to peer review. Complete protocol development.
FY12	$15,000	Implement monitoring at PINN
FY13	$15,000	Implement monitoring at PINN

Literature:

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Suarez, A. V., D. T. Bolger, and T. J. Case. 1998. The effects of fragmentation and invasion on the native ant community in coastal Southern California. Ecology **79:** 2041-2056.