SR-74 (Ortega Highway) Safety Improvement Project Improving the Road While Protecting the Toad

Presented By:

Arianne Preite
Caltrans District 12

Sam Stewart
BonTerra Consulting

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BonTerra CONSULTING

SR-74 Ortega Highway
Safety Improvement Project

Project Description

Safety project to widen lanes, add shoulders, improve drainage facilities, and add rock catchment due to narrow lane widths, absent shoulders, limited sight distance, and high accident rates.

Location

San Juan Creek Bridge in Orange County to Riverside County Line in the Cleveland National Forest (CNF).

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Vicinity Map

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Environmental Review

- IS/ND & EA/FONSI

Constraints

- Aesthetics/Design
- Topography
- San Juan Creek
- Arroyo Toad

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Resource Agency Permits

- ACOE Nationwide Permit
- CDFG Streambed Alteration Agreement
- RWQCB Section 401Certification
- USFWS Section 7 Consultation
- Special Use Permit from USFS

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Conservation Measures

- Restrictions on Activities
- Construction Crew Briefing
- Arroyo Toad Barrier Fencing
- Biological Monitoring
- Arroyo Toad Surveys
- Invasive Species Removal
- Habitat Restoration

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Arroyo Toad Fence

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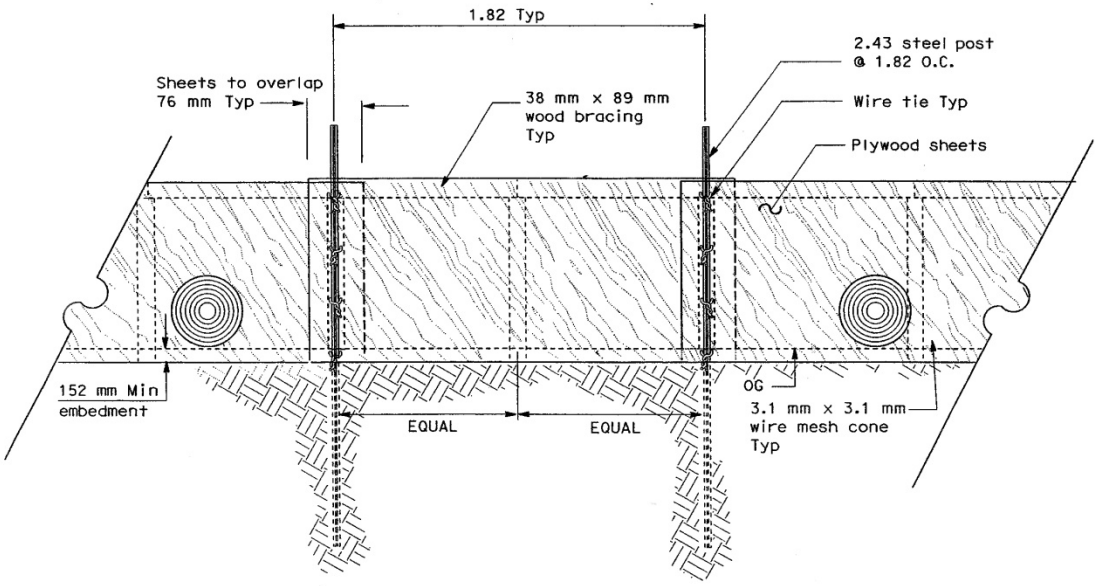
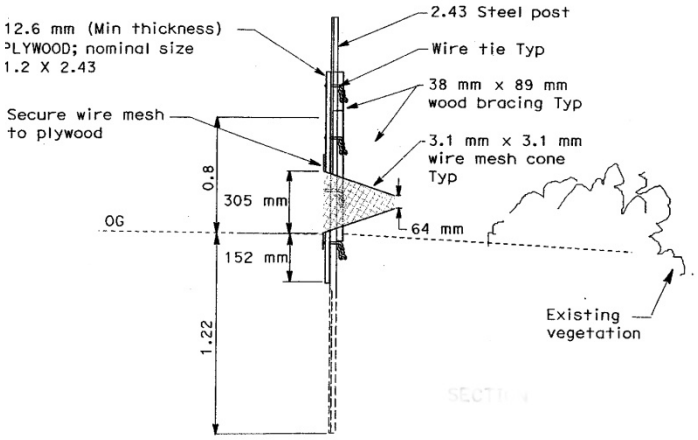
Arroyo Toad Fence Design





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Construction

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Ongoing Coordination

- U.S. Forest Service
- U.S. Fish & Wildlife Service
- California Highway Patrol
- Casper's Regional Park
- Private property owners

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Status Update

- Roadway work is complete.
- Mitigation starts fall 2009.
- Arroyo toad surveys and invasive species eradication began in 2007.
- Extension of surveys and eradication through 2009 for 3 years of results.

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Arroyo Toad Status

- Listed by USFWS as Endangered in 1994.
- In 2001, USFWS designated 182,630 acres of Critical Habitat in Monterey, Santa Barbara, Ventura, Los Angeles, Riverside, Orange, and San Diego counties.
- Designation vacated in response to lawsuits by the building industry.
- In 2005, USFWS designated 11,695 acres of Critical Habitat.

Arroyo Toad Status (continued)

- Currently no Critical habitat in Monterey, Orange, or San Diego Counties.
- Approximately 67,584 acres excluded based solely on economic considerations.
- San Juan Creek, originally largest area of Critical Habitat in Orange County, now excluded from designation.

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2001 Critical Habitat (Before BIA Lawsuit)

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2005 Critical Habitat (After BIA Lawsuit)

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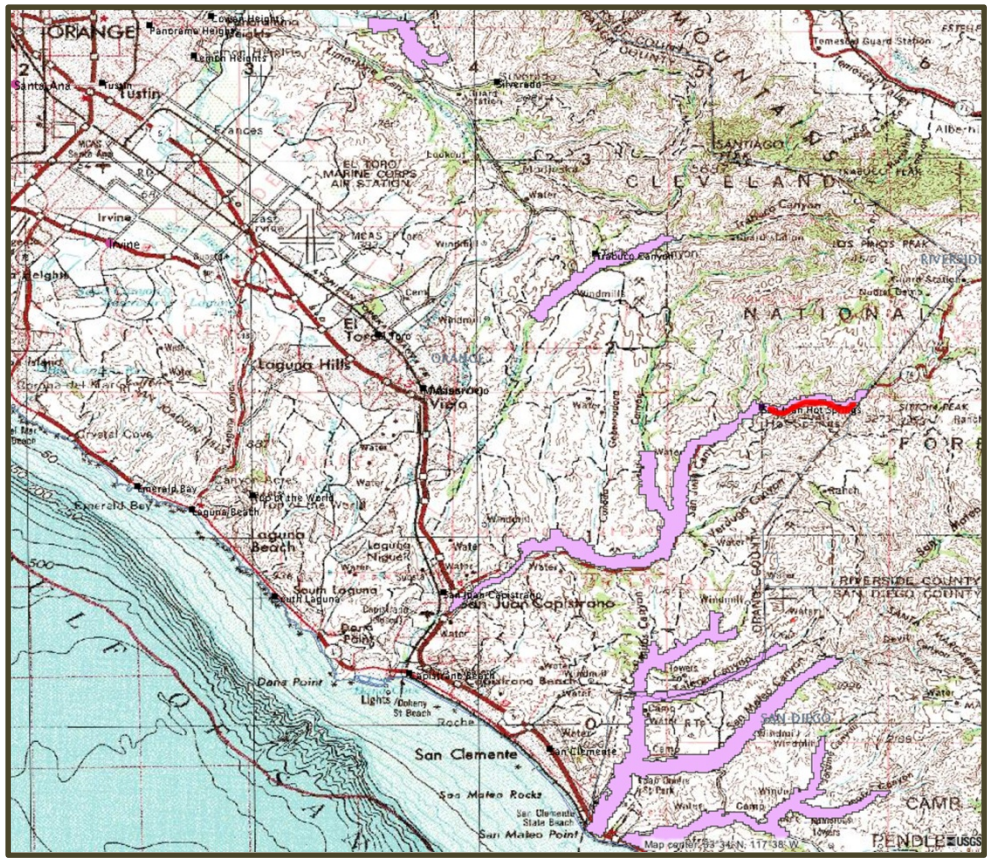
Arroyo Toad Status



- Project alignment parallels upper extent of area designated critical habitat in 2001.

Arroyo Toad Status (continued)

- In 2007, the Center for Biological Diversity sued the Department of Interior decisions reducing critical habitat for 13 species, including the arroyo toad.
- In 2008, a settlement was reached in which USFWS will propose a new critical habitat designation for the toad by October 2009.
- A new final decision is due by October 2010.

Arroyo Toad Identification

- Uniformly warty, stocky toad reaching lengths of approximately 9 centimeters (3.4 inches).
- Light-colored stripe across the head between and including the eyelids.
- Parotoid glands oval-shaped, widely separated, and pale toward the front.
- Underside usually buff-colored and unspotted,
- Cranial crests absent or weak.

Arroyo Toad Identification (continued)

Arroyo Toad Identification (continued)

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Arroyo Toad Identification (continued)

Light Colored Stripe

Widely Separated Oval Paratoid Glands Pale Toward Front

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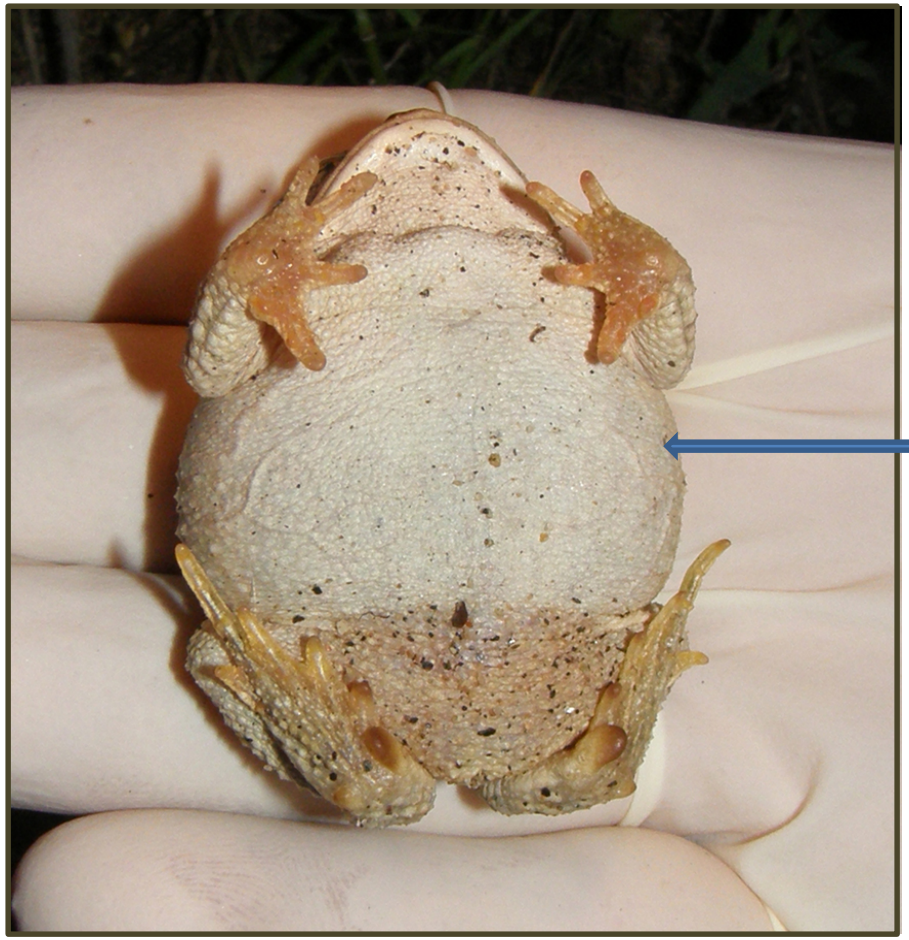
Arroyo Toad Identification (continued)



Buff-colored unspotted underside

Arroyo Toad Identification (continued)

- Most often confused with the common western toad within its range.

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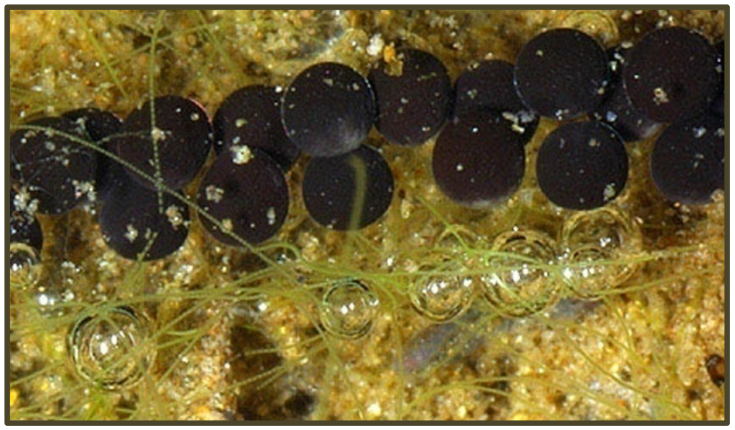
Arroyo Toad Identification (continued)

- W. toad does not have a mating call.
- W. toad has a pointier snout, spotted underside, vertebral stripe (almost always), and more rounded paratoid glands.
- W. toad warts irregularly sized.
- W. toad hops but more frequently walks.

Arroyo Toad Identification (continued)

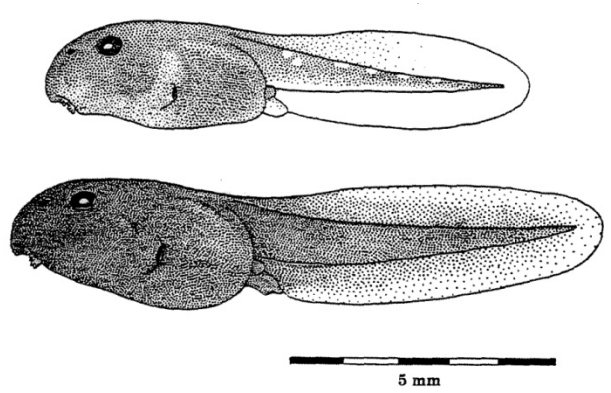
Arroyo toad egg strings have multiple rows of eggs within each string.

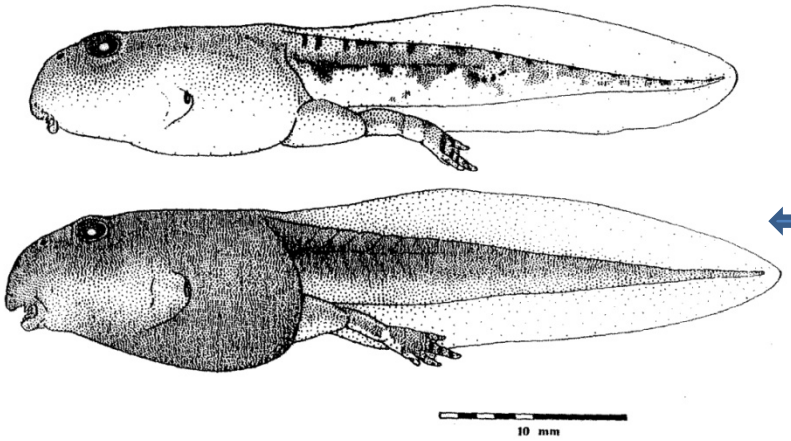


W. toad egg strings have a single row of eggs.

Arroyo Toad Identification (continued)

Tadpoles difficult to distinguish during early development.





At 3 to 4 weeks, faint gold crossbars appear on the arroyo toad tadpole's tail.

Arroyo Toad Habitat

- Third order washes, streams, and arroyos.
- Stream substrates range from sands to small cobble, with sandy banks and shelves.
- Vegetation typically includes mule fat, willows, cottonwoods, or sycamores.
- Breeds within streams and in small backwater pools that form along the stream margins.

Arroyo Toad Habitat (continued)

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Arroyo Toad Habitat (continued)

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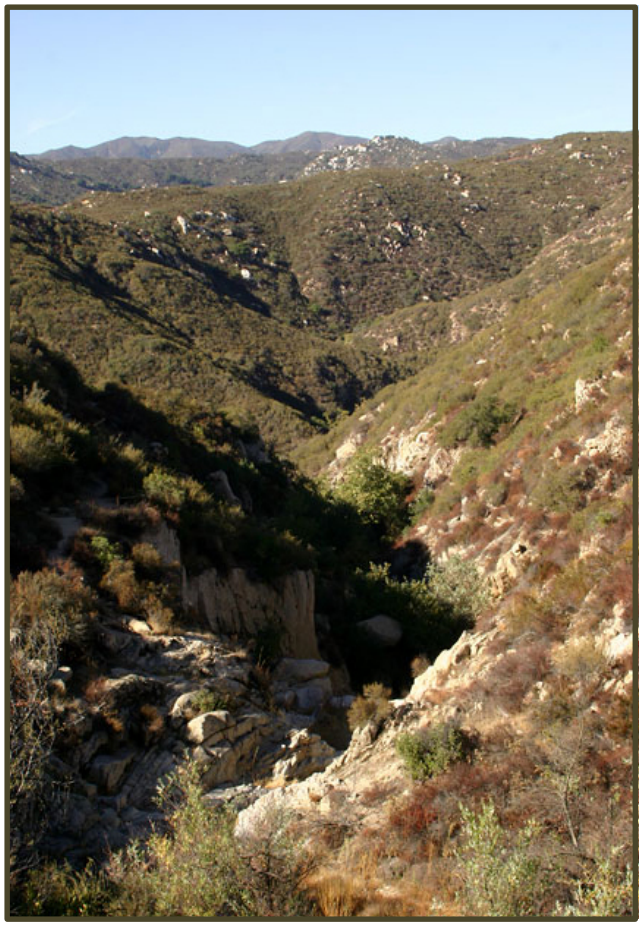
Arroyo Toad Habitat (continued)



- San Juan Creek alongside project site has atypical conditions for breeding.
- 2nd order stream in narrow canyon.
- Higher flow velocities.
- Limited sandy substrate.

Arroyo Toad Habitat (continued)

Arroyo Toad Survey Protocol

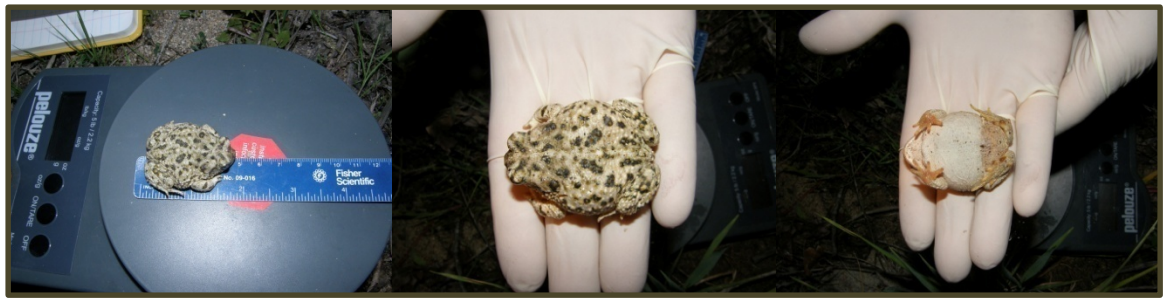
- Six surveys at least seven days apart during the breeding season (March 15 to July 1).
- Minimum of one survey during each month of April, May, and June.
- Each survey must include a daytime and nighttime component.
- Diurnal surveys involve scanning pools and stream margins for eggs, larvae, and juveniles.

Arroyo Toad Survey Protocol (continued)

- Nocturnal surveys between one hour after dusk and midnight for detection of breeding and calling adults and foraging individuals in adjacent riparian and upland areas.
- Suitable weather conditions with temperatures above 10° Celsius (50° Fahrenheit) and avoiding nights with full or near full moon.

Additional Data Collection

- Individual toad records
  - Sex, weight, snout-vent length
  - GPS location and location relative to stream
  - Dorsal and ventral photographic record
  - Description of activity (e.g., calling, breeding, foraging, burrowing)



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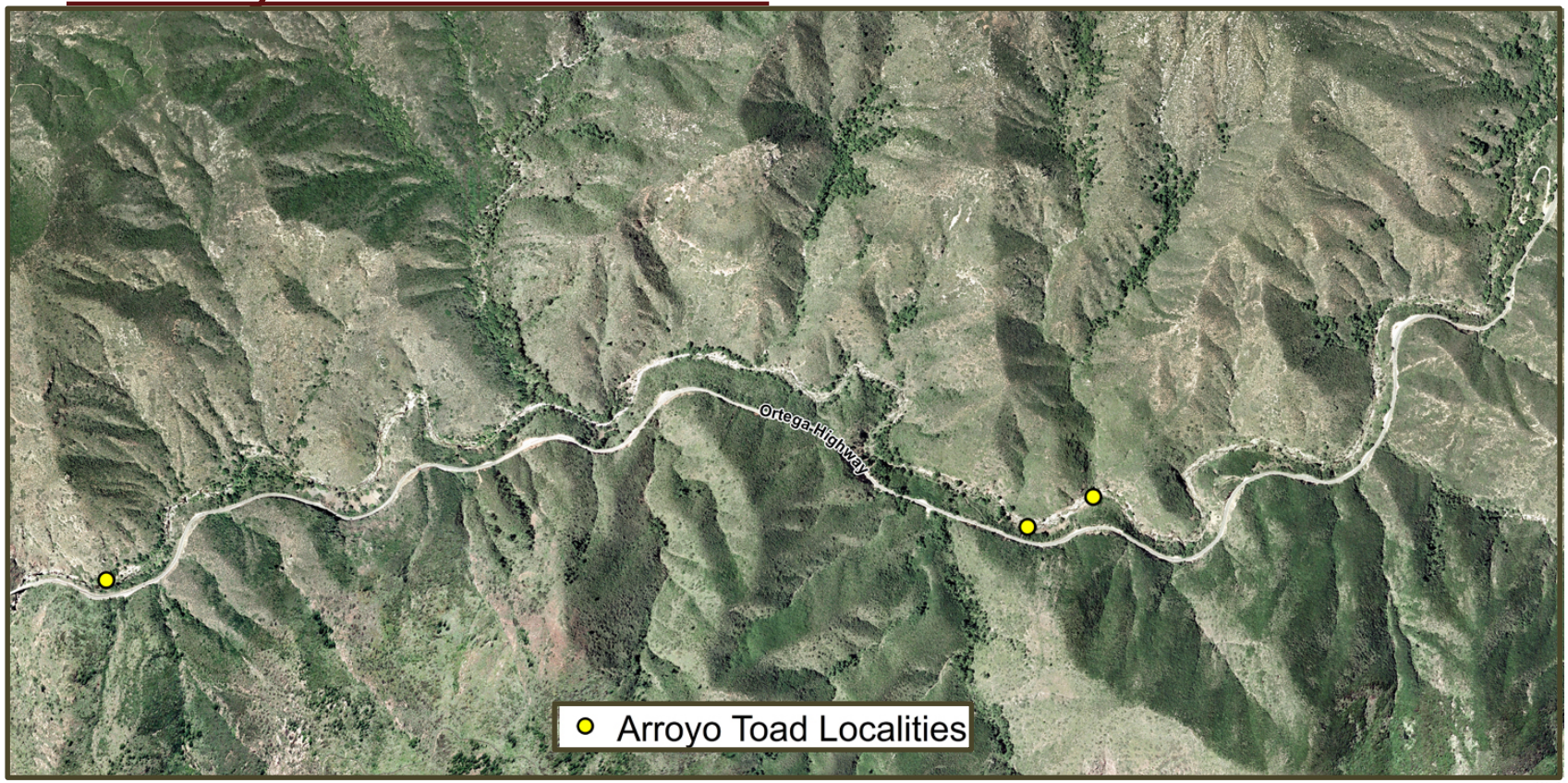
Survey Results in 2007



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Survey Results in 2007

- Based on data, seven arroyo toad observations likely representing four individual toads.
- Toads observed unusually small.
- Max. mass/SVL: 21 mm/50 g.
- Mean mass/SVL: 19.75 mm/46.25 g.
- No breeding behavior, eggs, tadpoles or metamorphosed toadlets observed.

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Invasive Species

- Invasive species observed during initial focused surveys for arroyo toad:
  - Red swamp crayfish
  - American bullfrog
  - African clawed frog
- Adaptive eradication methodology developed and approved by USFWS.

Red Swamp Crayfish (*Procambarus clarkii*)

- Native to Eastern and Midwestern U.S.
- Introduced to California in early 1900's from aquaculture (farming) and recreational angling (popular bait for largemouth bass).
- Now found throughout southern California in freshwater and brackish environments.
- Grows to 5 inch (~13 cm) body length.

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Red Swamp Crayfish (*Procambarus clarkii*)

- Feeds on plants, benthic invertebrates, flocculent, tadpoles, snails, and newt larvae.
- Apparently immune to newt toxins and blamed for declines in California native newt populations.

American Bullfrog (*Rana catesbeiana*)

- Native to Eastern and Midwestern U.S.
- Original invasion west of Colorado River accidental introduction during fish stocking operations (early 1900's).
- Aquarium trade and aquaculture (farming in early 1900's) likely facilitated spread.
- Largest true frog in North America, adults often exceeding one pound in mass and 8 inches (20.32 cm) SVL.

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Invasive Species – American Bullfrog

- Breeds February to July with single clutch size of 20,000 eggs.
- Tadpoles may not metamorphose for up to 3 years, overwintering and exceeding lengths of 3 inches (7.62 cm).
- Distinctive “jug-o-rum” call.

Invasive Species – American Bullfrog

- Larvae eat organic debris, algae, plant tissue, suspended matter and aquatic invertebrates.
- Adults eat anything that can be swallowed.
- Predation of amphibians (cannibalism), reptiles, birds, and mammals is common.
- Highly aquatic, hibernating at the bottom of pools by means of cutaneous respiration.
- Will move long distances over land.

Invasive Species – African Clawed Frog

- Native to cooler areas of sub-Saharan Africa.
- Shipped around the world in the 1940's and 50's for use in human pregnancy tests.
- Intentionally released from labs by well-meaning researchers.
- Popular in the aquarium trade and pet releases are frequent.

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Invasive Species – African Clawed Frog

- Prefers stagnant or still waters of ponds or sluggish streams.
- Rarely exceeds 3 inches (7.6 cm) SVL.
- Almost completely aquatic surfacing only briefly for air and rarely emerging.

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Invasive Species – African Clawed Frog

- Able to aestivate for up to eight months.
- Clutch size up to 27,000 eggs with multiple clutches a year.
- Conditions in California suitable for year-round breeding.
- Mating call a serious of clicks made underwater.

Invasive Species – African Clawed Frog

- Tadpoles feed primarily on zooplankton.
- Adults feed primarily on benthic invertebrates; however, it is a non-specific predator that hunts on the surface and forages on the bottom for a wide taxonomic range of prey.
- Documented eating fish, amphibians, and even birds.

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Invasive Species – Control Methodology

- Bullfrog primary target (directly impacts toad).
- Eradication concurrent with focused surveys.
- Equipment constraints from OSHA regulations, fire hazard, and topography.
- Additional data collection:
  - Reproductive bullfrog sex, mass, SVL
  - Field analysis of stomach contents
  - GPS Data

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Invasive Species – Control Methodology

- Analysis of aerials and topographic maps to determine locations of perennial water beyond the limits of the project area.
- Coordination with agencies and private property owners to obtain access to potential off-site breeding habitat.
- Invasive species control program enhanced by drought conditions in 2007 and 2008.

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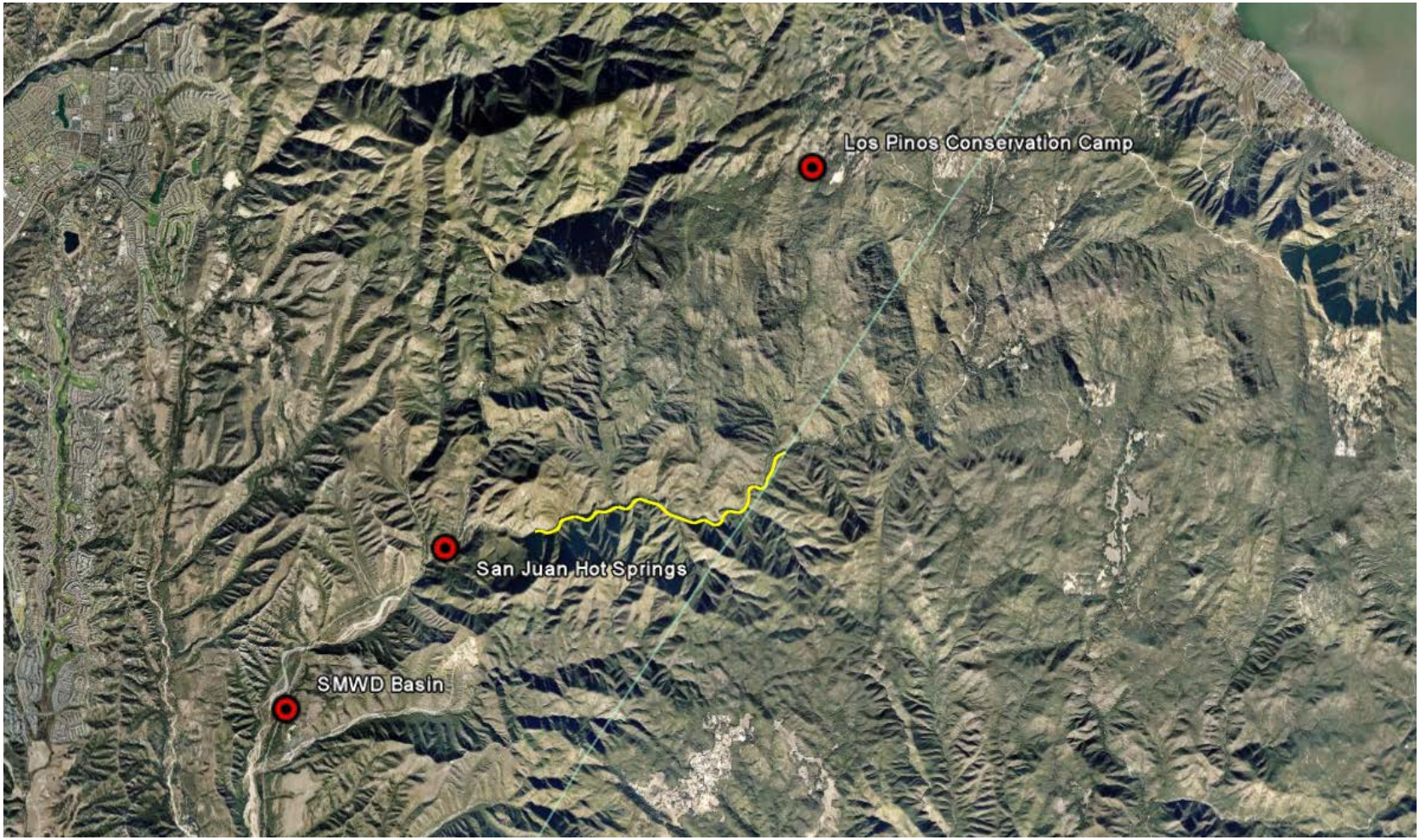

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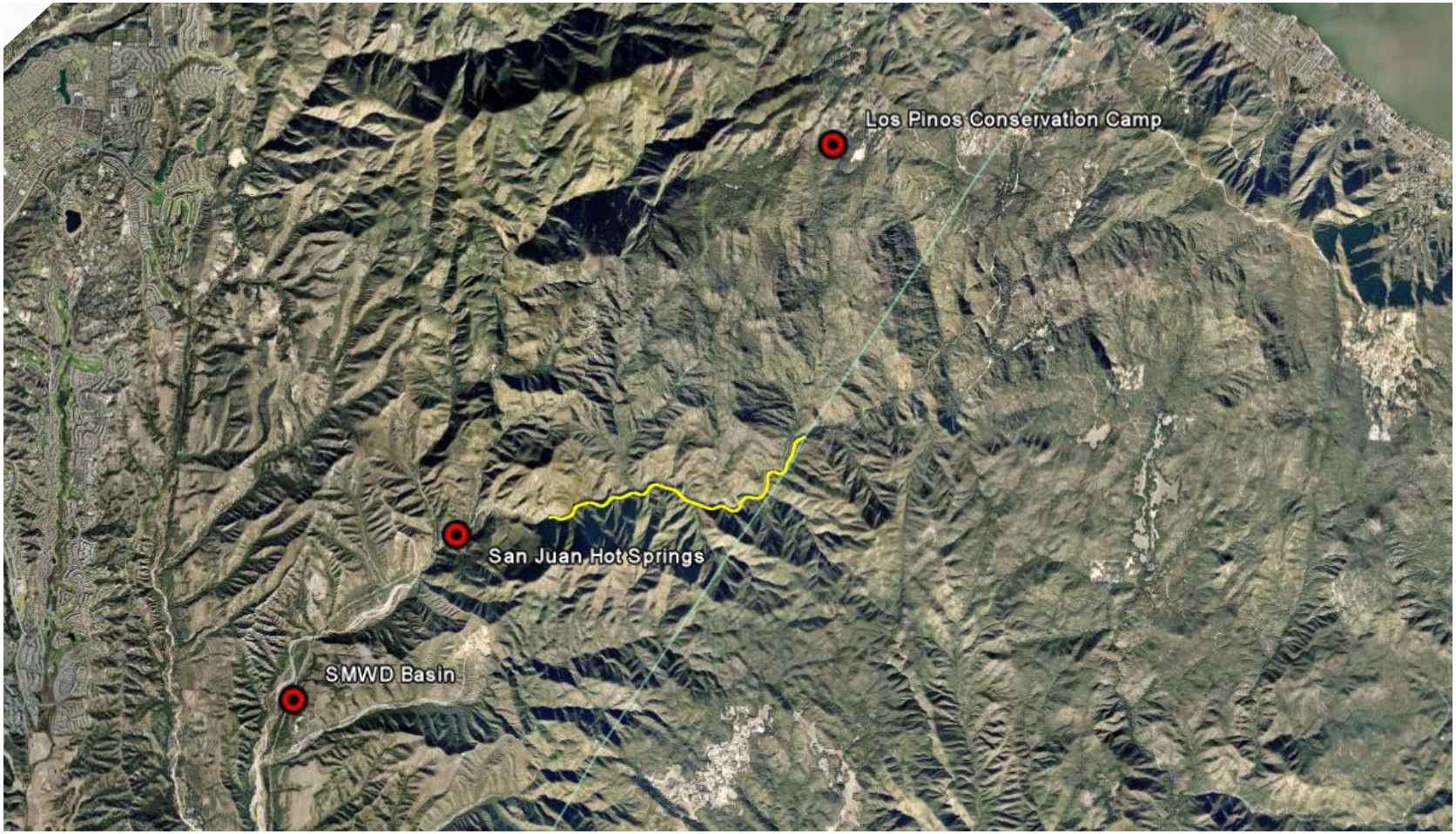

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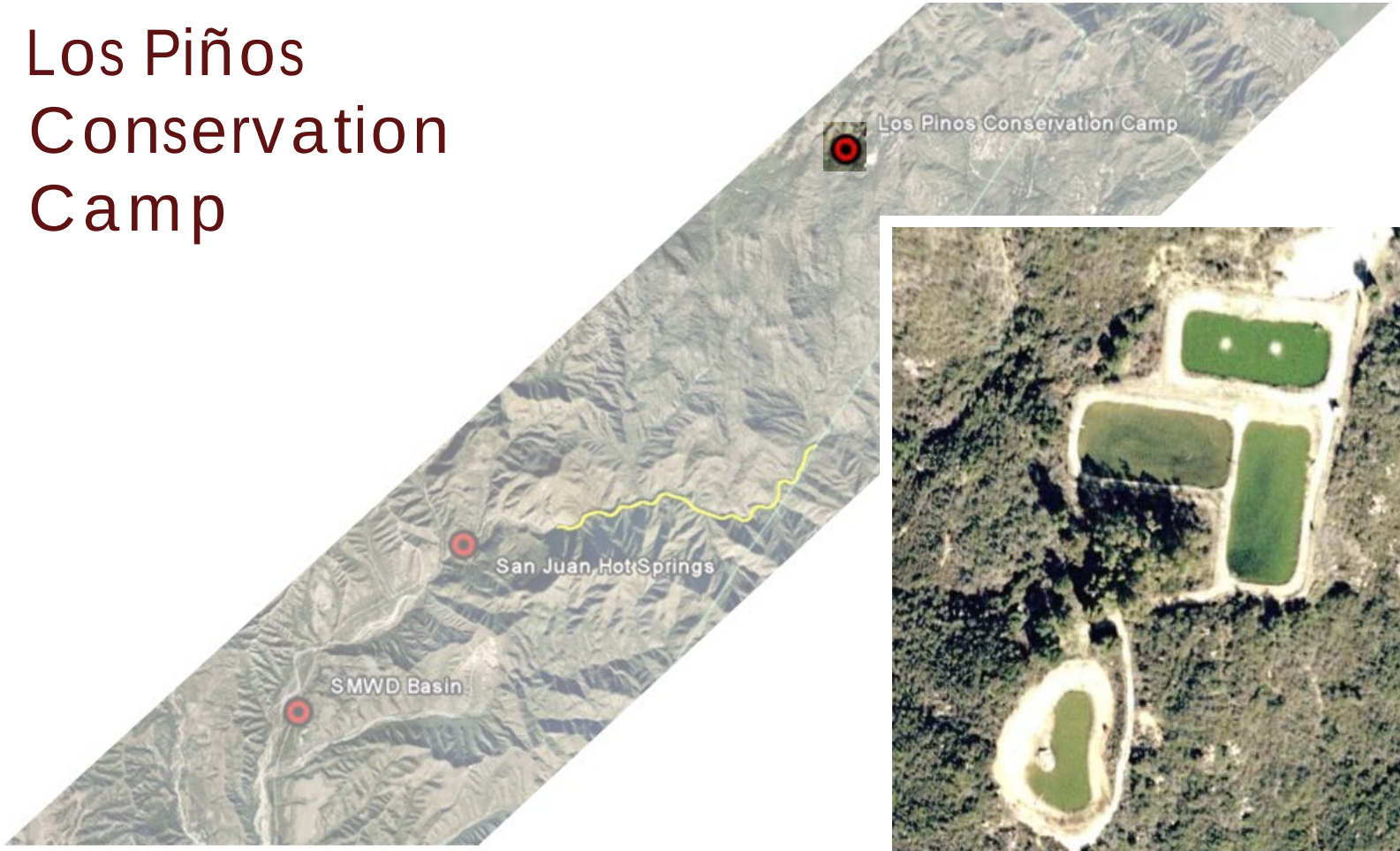
Los Piños Conservation Camp



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San Juan
Hot Springs

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SMWD Basin

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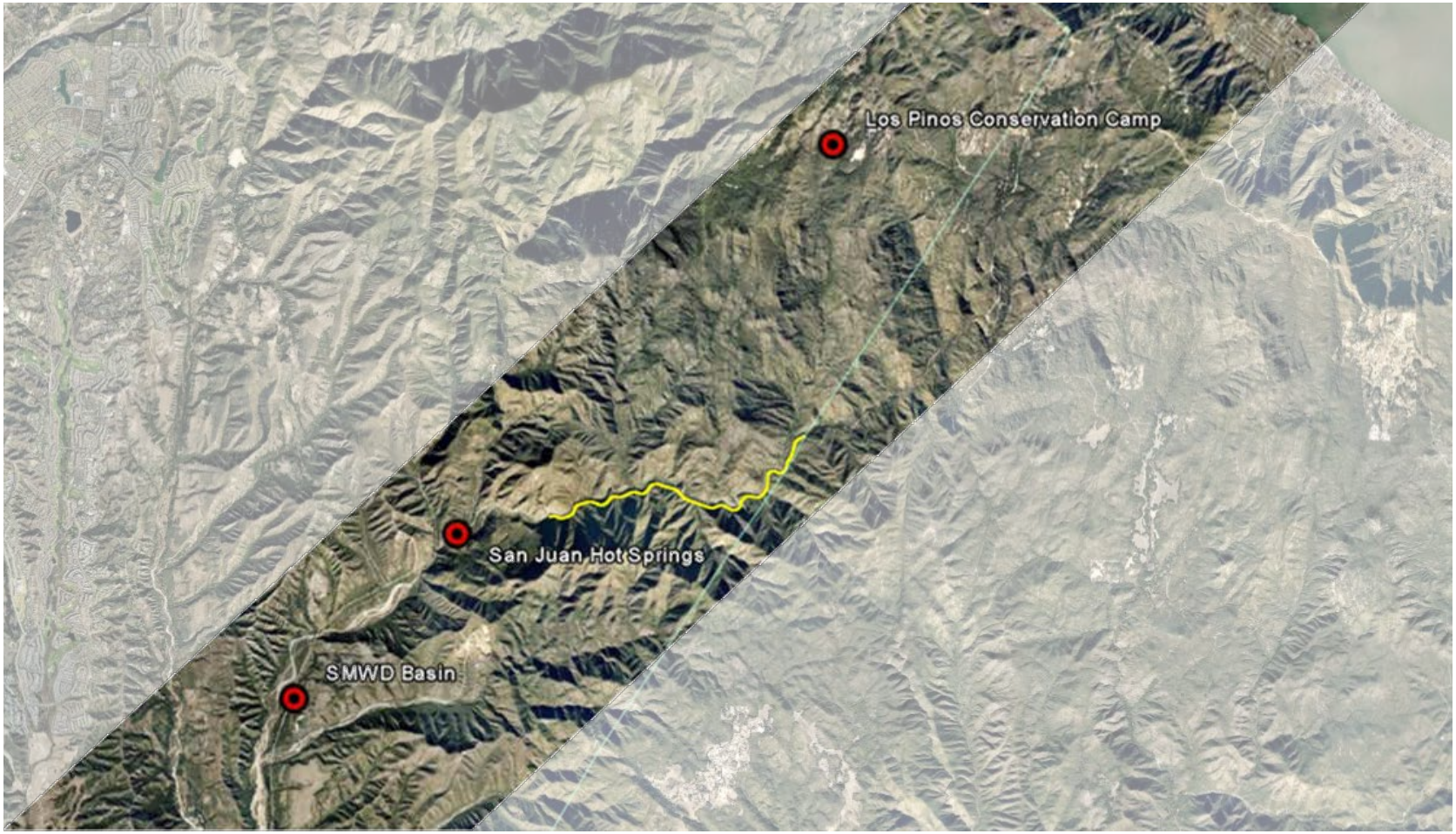

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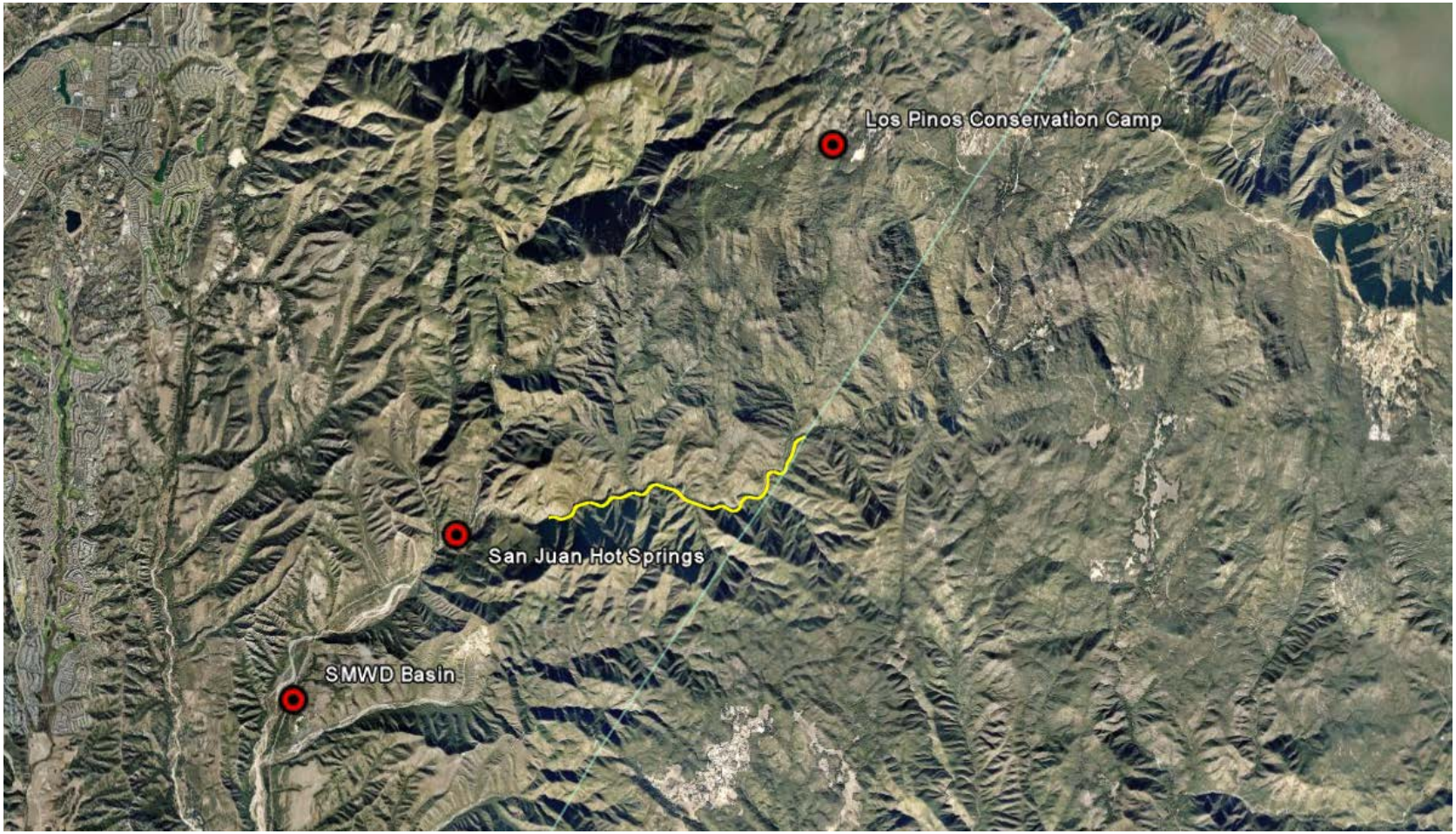

Invasive Species – Control Methodology

- Field equipment and skills.
  - Break barrel air pellet guns with scopes and lights.
  - Telescoping pole gigs.
  - Collapsible nylon funnel traps.
  - Harnesses and ropes to rappel in and climb out.

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Invasive Species – Control Methodology

- Surveyor familiarity with species (no take of natives).
- Repeated visits to areas of heavy infestation.

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Water Quality – Invertebrate Sampling

- Comparison of native pools with pools infested with all three invasive species.
- Kick netting to sample invertebrate diversity.
- Water quality testing (Dissolved oxygen, fecal coliform, & biological oxygen demand).

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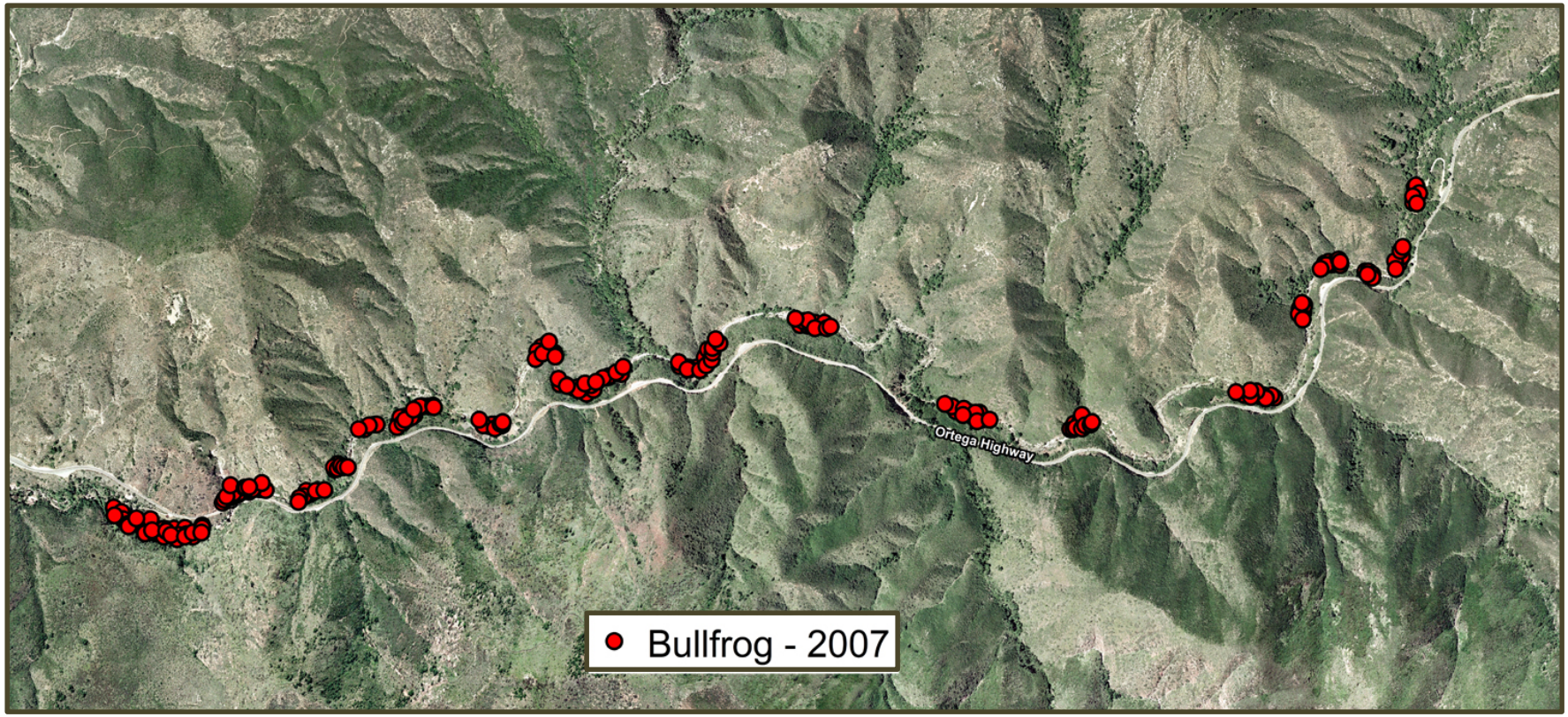
Invasive Species Control in 2007



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Invasive Species Control Results in 2007

- 219 reproductive bullfrogs removed from creek adjacent to project.
- 29 removed downstream in CNF.
- Maximum mass/svl: 1.57 lbs (710 g)/ 7.95 in (202 mm).
- Mean mass/svl: 0.44 lb (198 g)/5.08 in (129 mm).
- 1,393 crayfish/7 African clawed frogs.

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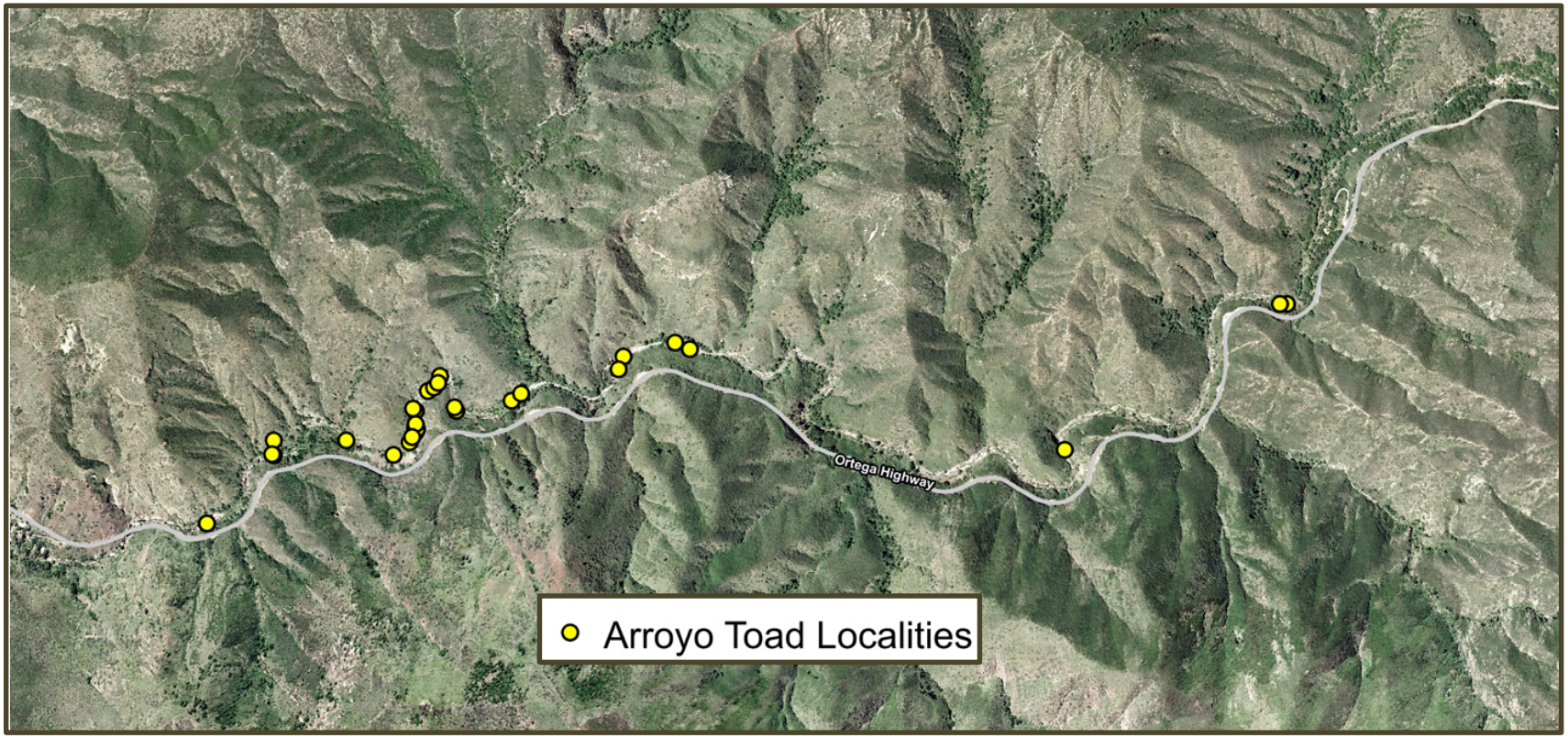
Arroyo Toad Survey Results in 2008



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Arroyo Toad Survey Results in 2008

- Based on data, 33 arroyo toad observations likely representing 26 individual toads.
- Larger toads detected in 2008.
- Maximum mass/SVL: 36 g/68 mm.
- Mean mass/SVL: 22.7 g/56.72 mm.
- Calling males observed.
- Sex ratio almost 2:1 female.

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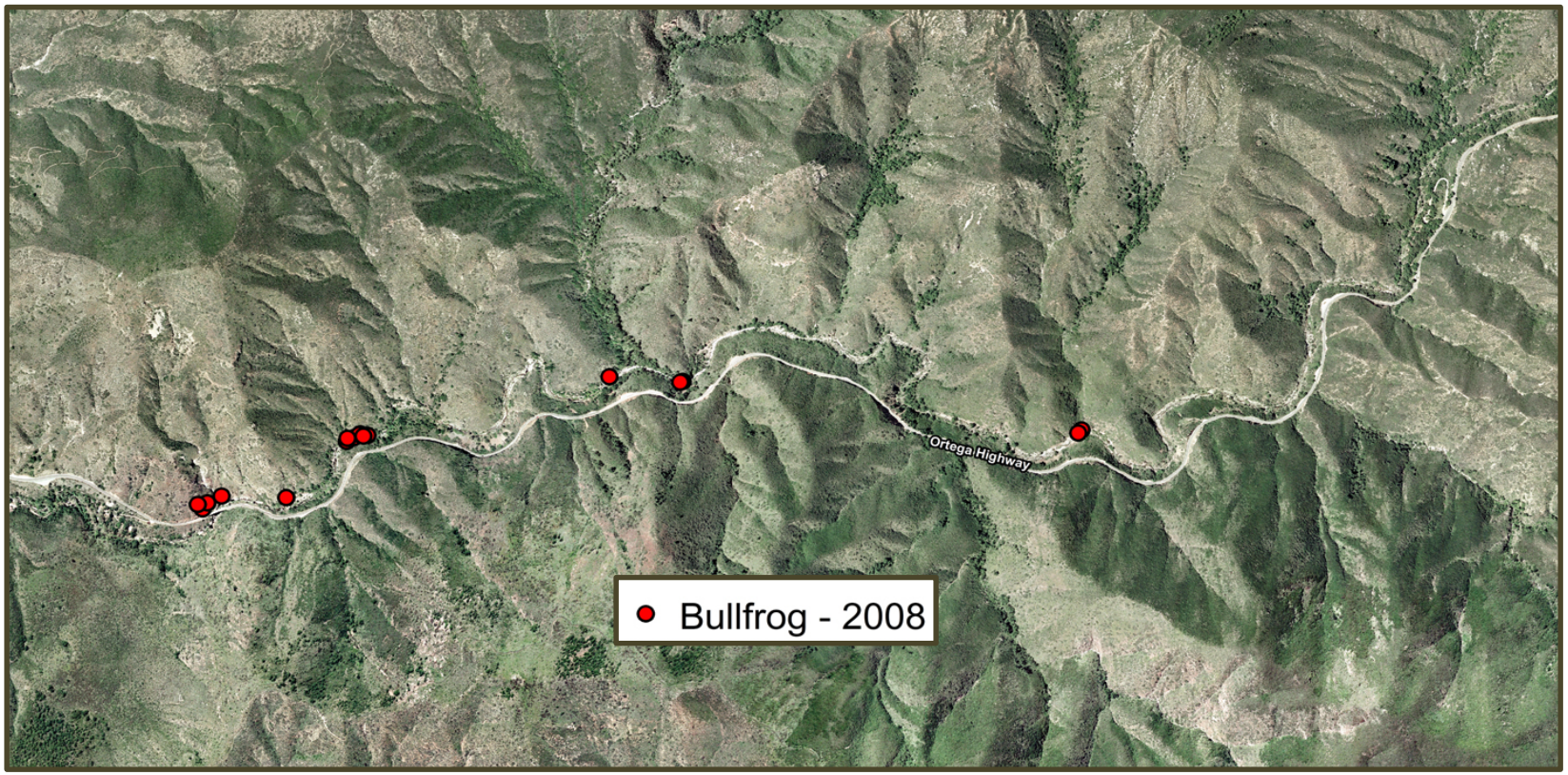
Invasive Species Control Results in 2008



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Eradication Results in 2008

- 26 reproductive bullfrogs removed from creek directly adjacent to the project alignment.
- 509 more removed from downstream areas within the CNF, Casper's Park, & SMWD basin.
- Max. mass/svl: 2.2 lbs (999 g)/8.27 in (210 mm)
- Mean of 0.77 lb (198 g) and 5.75 inches (129 mm) svl.
- 7,540 crayfish and 6 African clawed frogs.

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Stomach Content Analysis – Invertebrates

- earwigs (*Forficulidae*)
- hangingflies (*Bittacidae*)
- dragonflies (*Odonata*)
- damselflies (*Zygoptera*)
- crickets (*Grillus*)
- camel crickets (*Ceutophilus*)
- Jerusalem crickets (*Stenopelmatus*)
- giant water bugs (*Abedus*)
- backswimmers (*Notonectidae*)
- water boatmen (*Corixidae*)
- water striders (*Gerris*)
- ground beetles (*Carabidae*)
- June beetles (*Phyllophagae*)
- diving beetles (*Dysticus*)
- soldier beetles (*Cantharidae*)
- longhorn beetles (*Prionus*)
- darkling beetle (*Tenebrionidae*)
- click beetles (*Elateridae*)
- blister beetles (*Meloidae*)
- green lacewings (*Chrysopidae*)
- fishflies (*Chauliodes*)
- antlions (*Vella*)
- sphinx moths (*Hyles lineata*)
- owlet moths (*Noctuidae*)
- crane flies (*Tipulidae*)
- honey bees (*Apis mellifera*)

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Stomach Content Analysis – Invertebrates

Continued…

paper wasps (*Polistes*)
yellowjackets (*Vespula*)
carpenter ants (*Formicidae*)
diving beetles (*Dysticus*)
scorpions (*Anuroctonus*)
wolf spiders (*Lycosidae*)
green lynx spiders (*Peucetia*)
stone centipedes (*Scolopendra*)
millipedes (*Hiltonius*)
pillbugs (*Armadillim vulgare*)
sowbugs (*Porcellio*)
red swamp crayfish (*Procambarus clarkii*)

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Stomach Content Analysis – Amphibians

- Coast Range newt (*Taricha torosa torosa*)
- American bullfrog (*Rana catesbeiana*)
- Pacific chorus frog (*Pseudacris regilla*)
- California chorus frog (*Pseudacris cadaverina*)
- African clawed frog (*Xenopus laevis*)

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Stomach Content Analysis – Reptiles

- alligator lizard (*Elgaria multicarinatus*)
- California black-headed snake (*Tantilla planiceps*)

Stomach Content Analysis – Birds

- black-headed grosbeak (*Pheucticus melanocephalus*)
- song sparrow (*Melospiza melodia*)

Stomach Content Analysis – Mammals

- desert woodrat (*Neotoma lepida*)
- deermouse (*Peromyscus* sp.)

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Conclusions – Invasive Species Sources

- SMWD Basin considered primary source and bridge for downstream sources.

Conclusions - Water Quality

- Infested pool faunal diversity less than one-quarter that of native pools.
- Infested pools DO significantly lower than native pools.
- Infested pools found to have high fecal coliform bacteria concentrations.

Conclusions - Stomach Content Analysis

- No arroyo toads in bullfrog stomachs in the San Juan Creek.
- Arroyo toad sex ratio likely due to bullfrog predation of advertising males.
- Increased arroyo toad activity may or may not correlate to reduced invasive presence.
- In a canyon not too far away…

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Lessons

- Consider invasive wildlife species removal to offset impacts to native wildlife early in project planning and budget appropriately.
- Involve Project Management early with planning and funding issues.
- Invasive species removal regarded positively by resources agencies and implementation reflects well on Caltrans' image.

SR-74 Ortega Highway Safety Improvement Project

Achievements

- Roadway construction finished 1+ year ahead of schedule.
- Project awarded Western Council's Distinguished Project.
- Project nominated for Excellence in Engineering Award.
- Project nominated for Construction Management Project Achievement Award.