Bull Frog Management Plan

Humboldt County, California

APN#'s 210-054-008, 210-071-001, 210-062-007

Introduction:

American bullfrogs, native to the eastern United States, are hopping around Northern California ponds, gobbling up lizards, snakes, bats and birds – anything that fits in their mouths. Among their prey are the adults and tadpoles of endangered native amphibians, foothill yellow-legged frogs. They are also consuming the tadpoles that dragon flies feed on and negatively affecting a wide range of species. Along with its voracious appetite, this species is a known carrier of chytrid fungus, which causes a potentially fatal skin disease in frogs. Scientists believe the fungus is a leading cause of the decline of native amphibian populations all over the world and responsible for the extinction of over 100 species since the 1970s.

Scientists consider the American bullfrog one of the world's top 100 invasive species. While amphibians are declining globally, the bullfrog continues to expand its range. A single female bullfrog can produce 20,000 to 40,000 eggs a year. Management of bullfrog populations is difficult, in part because bullfrogs are interspersed with sensitive native species in aquatic habitats. The bullfrog is one of the worst invaders in the world that outcompetes and is a predator of many native species. There are few efficient and effective control methods. So it is important to understand the current control methods being used in the field for future directions. Since it has also has invaded places like California, it is important we look at control, methods being used and the research and results that are found to see if they would be viable to implement.

Bullfrog plan:

Adult frogs are removed by trapping, shooting (Pellet Gun), hand capture and pond draw down. We will try to minimize or reduce habitat conditions which favor bullfrog persistence and eliminate bullfrogs. Any excessive debris or lily pads will be removed. Life stages that strongly influence population growth rates were identified. Targeting these is considered the most effective way to control populations. Model suggests culling of metamorphosis in fall is most effective method of decreasing bullfrog population growth rate. Culling at metamorphosis and adult stages has seem to found success. Habitat modification in places like California has been shown to be able to promote indigenous species abundance. Pond draining can help with removing tadpoles.

Current Onsite Bullfrog Information:

No bullfrogs have yet to be seen. Other native species frogs are few and far between. The elevation, and freezing winter temperatures might keep them at bay. There are currently three lined ponds that don't produce a good habitat for these frogs. The three natural ponds would are a suitable habitat for native frogs, turtles but no bullfrogs have been identified in these ponds either. The lined ponds are used for cannabis irrigation as rain catchment ponds, so they get drawn down significantly in the summer. The natural ponds also draw down but because of natural reasons, they just don't hold water year round, and loose about 60% of they're water.

Findings:

Every two months in spring, summer and fall, the Property owner or a designee will conduct a bullfrog findings below.

10/1/19: No findings

Bullfrog Information/Identification techniques:

Size

The largest native frog inhabiting North America.
Adults are 3.5 - 8 inches long from snout to vent (8.9 - 20.3 cm). (Stebbins, 2003)
Males grow up to 7.09 inches long (18 cm), females up to 8 inches long (20.3 cm).

Appearance

A large frog with long legs and large webbed toes.
Dorsolateral folds are not present.
A short fold extends from the eye over and past the tympanum (eardrum) to the forearm.
The tympanum is conspicuous.

Color and Pattern

Light green to dark olive green, sometimes brown or tan, with dark spots and blotches.
Sometimes there is light green only on the upper jaw.
Cream to yellow below with grey marbling on larger individuals.

Male/Female Differences

Males have tympanums larger than their eyes.
A female's tympanum is about the size of her eye.
Males also have a yellow throat.
The base of a male's thumb is swollen and dark.

Young

Juveniles have many small dark spots.

Larvae (Tadpoles)

Tadpoles are greenish yellow with small spots, growing up to 6 in. (15.3 cm).

Life History and Behavior

Activity

American Bullfrogs are highly aquatic - rarely found far from water.
Active day and night.
Prefers a relatively high body temperature and becomes active later in the spring in colder areas.
In areas with freezes in winter, bullfrogs hibernate under water, buried in mud or laying on a pond bottom.

Movement

Adults and juveniles are capable of hopping large distances.
Bullfrogs are very strong swimmers.

Defense

When disturbed, they will hop into water and dive down, usually making a loud squeaking sound as they jump.
When captured they will sometimes play "possum" then suddenly jump away.

Bullfrogs and tadpoles are unpalatable to many predators.

Territoriality

Males defend their territory from other males during the breeding season.
A territorial sound is often used.

Longevity

Longevity in the wild is thought to be 8-10 years, but captive specimens have lived nearly 16 years.

The **advertisement call** is a loud low-pitched two-part drone or bellow, popularly described as "jug-o'rum." This is one of the loudest frog calls heard in California
These calls are made during the day and at night.
Bullfrogs also produce an **alarm call**, a short fast squeak, which is usually made before the frog jumps into the water to escape from danger.
A short sharp "bonk" **encounter call** is also made.
A loud open-mouthed **screaming sound** is made when a frog is under extreme

stress, such as when it is being attacked or eaten by a snake.

An older female will sometimes vocalize along with males to let her better choose the most dominant male.

Diet and Feeding

Eats anything it can swallow, including invertebrates, mammals, birds, fish, reptiles, and amphibians including other bullfrogs.

Bullfrogs typically sit and wait for food to come near them, then they lunge after it. It is likely that bullfrogs also actively hunt other frogs after hearing their breeding or distress calls.

Breeding

Reproduction is aquatic.
Fertilization is external, with the male grasping the back of the female and releasing sperm as the female lays her eggs.

The reproductive cycle is similar to that of most North American Frogs and Toads. Mature adults come into breeding condition and the males call to advertise their fitness to competing males and to females. Males and females pair up in amplexus in the water where the female lays her eggs as the male fertilizes them externally. The eggs hatch into tadpoles which feed in the water and eventually grow four legs, lose their tails and emerge onto land where they disperse into the surrounding territory.

Mating and egg laying occurs mostly from May to late August (but in some areas it occurs as early as March and as late as October.) Reproduction begins when the air temperature reaches a certain level (measured at one location in Kansas at 21 degrees C., or about 70 degrees F.)

Males are reproductively mature in 1-2 years, females in 2-3 years. (Lanoo, 2005)

Males set up a territory and make an advertisement call at night, but the call is also heard sometimes during the day.
Males defend their territory from other males.

Females choose a mate by entering a male's territory. An older female will also sometimes vocalize along with males, which creates more competition among the males, allowing the female to better choose the most dominant male.

Eggs

Older females are capable of laying two clutches of eggs in a year.
A female may lay as many as 20,000 eggs and lose up to 27 percent of her body

weight.
Eggs are laid in a sheet of jelly about 2 feet in diameter. The egg mass floats at first, then sinks to underwater vegetation just before hatching. Eggs hatch in 3 - 5 days.

Tadpoles and Young

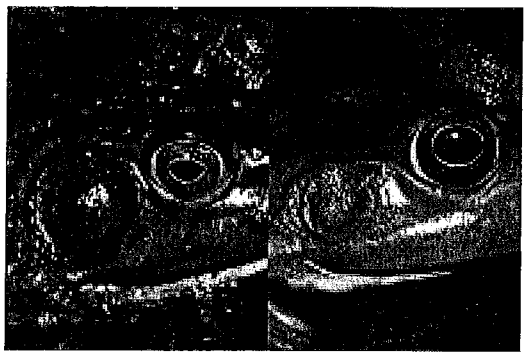
Tadpoles prefer areas of warm shallow water with dense aquatic vegetation. Transformed froglets are 2 in. (5 cm.) in length.

Bullfrog tadpoles are noxious to many species of fish who eat them only as a last resort, and they are probably noxious to some reptiles, birds and mammals.

Tadpoles enter metamorphosis anywhere from a few months after hatching in the warmer Southern parts of the United States to the end of their 2nd or 3rd summer in colder areas such as Michigan. In most of California, my guess (based on seeing many large old tadpoles in California) is that transformation probably occurs after the second summer, but I don't know that for sure. It's possible they transform their first year in hotter areas or if they were hatched in temporary ponds.

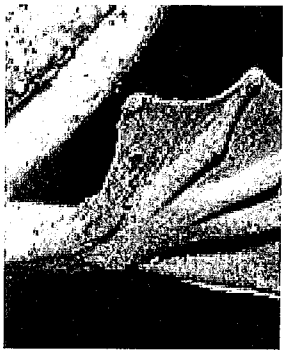
Habitat

Inhabits warm, sunny, open, permanent water - lakes, ponds, sloughs, reservoirs, marshes, slow river backwaters, irrigation canals, cattle tanks, and slow creeks. Found in grassland, farmland, prairies, woodland, chaparral, forests, foothills, and desert oases.



Comparison of adult American Bullfrog tympanums (the round eardrum behind the eye).

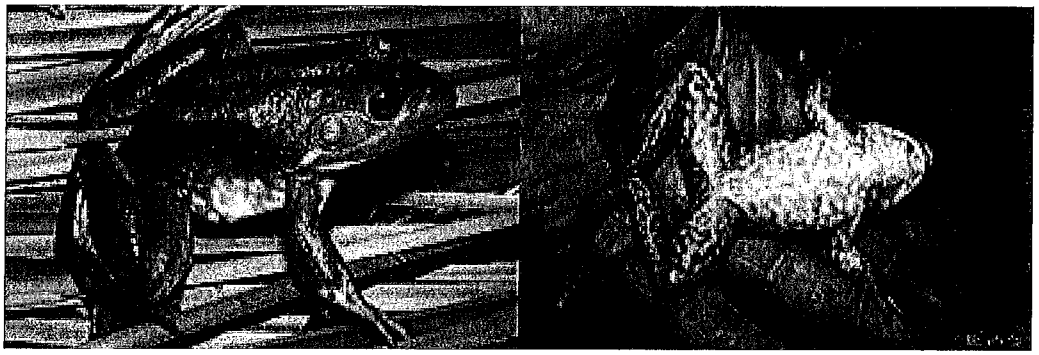
The diameter of an adult **male's** tympanum (left) is larger than the diameter of the eye.

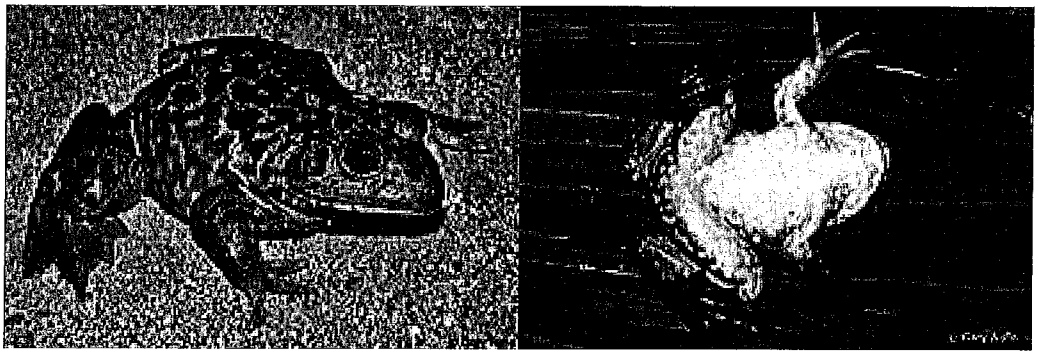


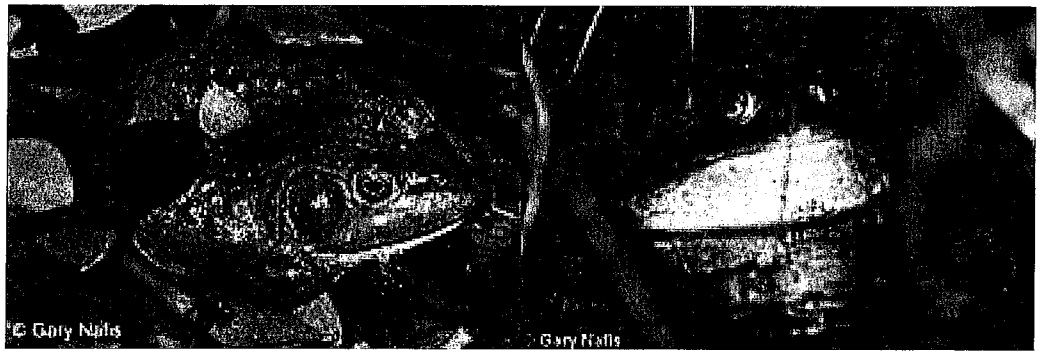
American Bullfrogs ha webbed hind feet.

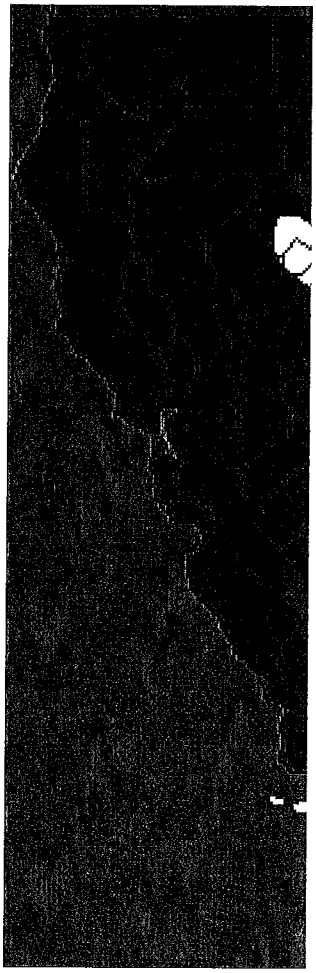
The diameter of an adult **female's** tympanum (right) is smaller than or equal to the diameter of the eye.

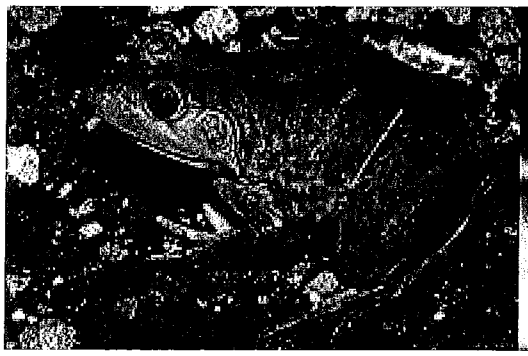
American Bullfrog - *Lithobates catesbeianus*





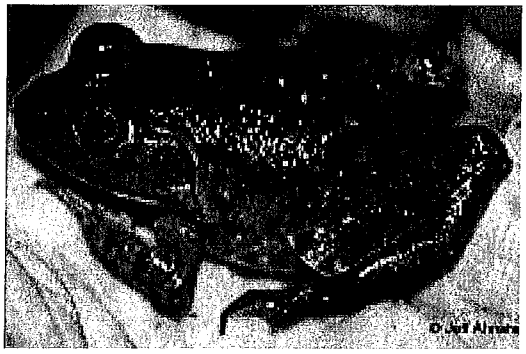




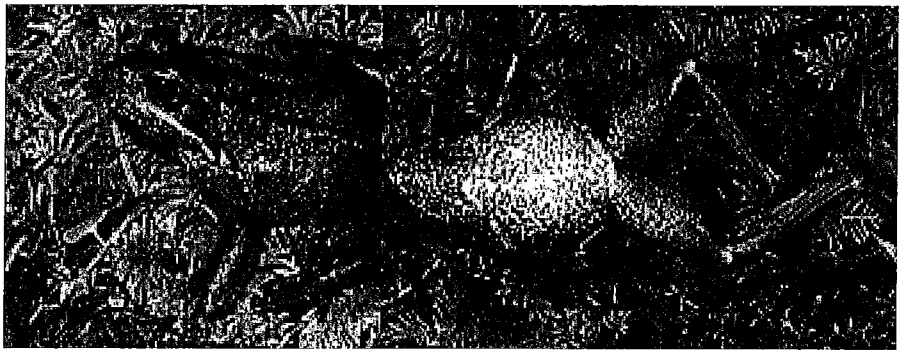


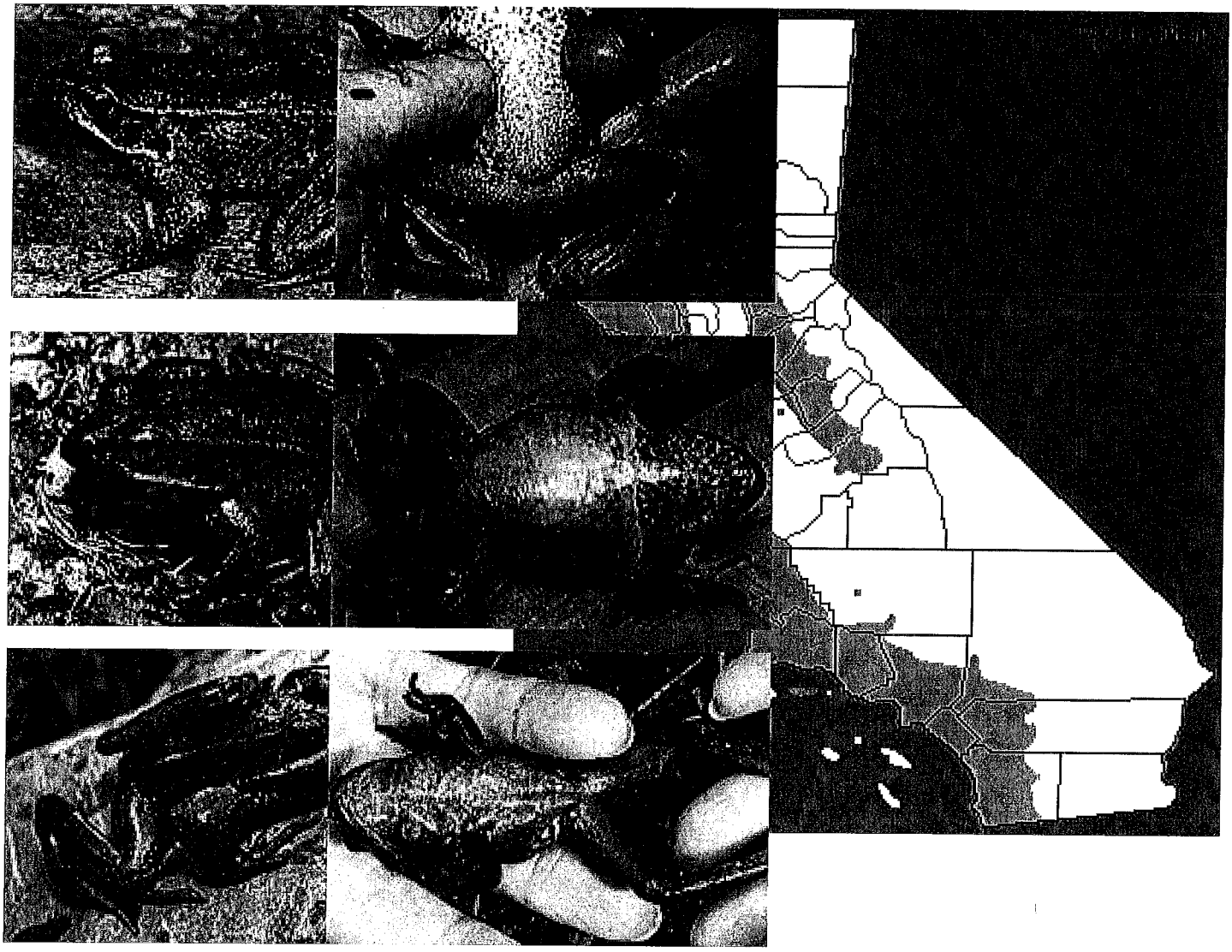
The underside is light in color with mottling. Some adults have yellow coloring underneath and calling males show a bright yellow throat sack.

Ran



Northern Red-legged Frog - *Rana aurora*

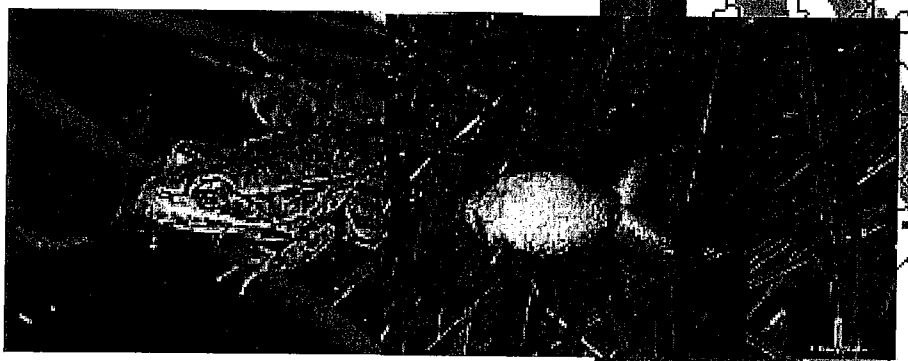


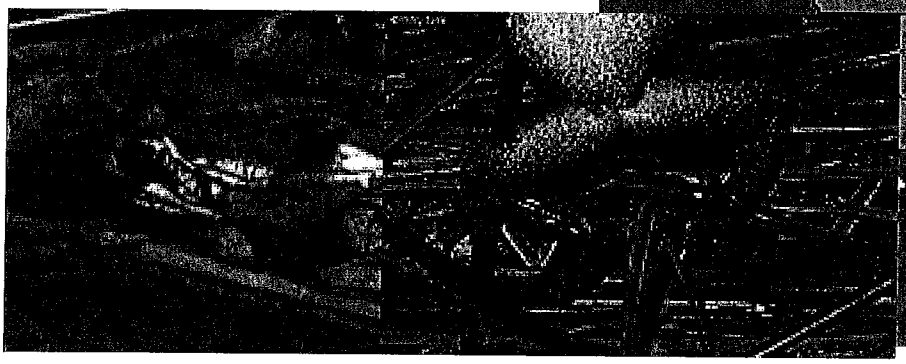


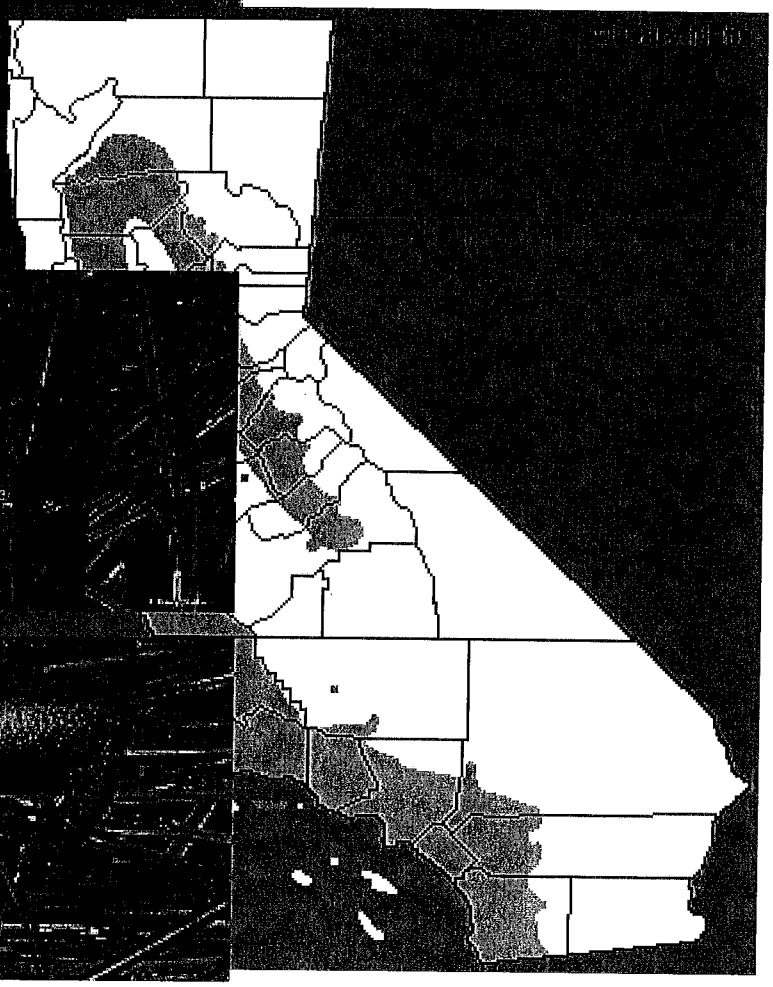
Underside of legs is reddish

Range: Red and Purple

California Red-legged Frog - *Rana draytonii*







The back is sometimes reddish

Underside of legs is reddish

Historic Range: Orange and Purple

EXHIBIT A.

BULLFROG MONITORING AND MANAGEMENT PLAN

GENERAL BULLFROG INFORMATION

The American bullfrog (*Lithobates catesbeianus* = *Rana catesbeiana*); hereafter bullfrog, is an invasive non-native species in California and poses a significant threat to California's native fish and wildlife resources. Bullfrogs were introduced in California over 100 years ago from eastern parts of the United States as a food supply, but have since caused substantial ecological consequences. Bullfrogs are considered highly invasive and are well documented to be prey upon a variety of fish and wildlife species, including some that are rare, threatened, and endangered. Human modifications to the environment provide favorable condition to bullfrogs such as artificially created agricultural ponds, canals and ditches where warm still water occurs. As a result bullfrogs have spread throughout California.

Efforts to control bullfrogs have been met with varying degrees of success because: 1) bullfrogs can be difficult to detect and go dormant from fall through winter, 2) bullfrogs often take cover in difficult areas to manage (e.g. dense vegetation), 3) they can travel long distances to colonize and re-colonize areas, 4) they have high reproductive output, 5) they are weary and readily flee perceived threats, and 6) they can survive physical trauma remarkably well. CDFW scientific staff recognizes there is an urgent and immediate need to develop improved bullfrog management strategies to protect California's diverse fish, wildlife, and plant resources, and the habitats upon which they depend, for their ecological values and for their use and enjoyment by the public. Public support and implementation of bullfrog control in California is an important conservation strategy that will help protect natural resources for future generations.

MONITORING

The Project reservoir(s) shall be monitored for bullfrog presence on an annual basis with a minimum of five total surveys, no less than two weeks apart, throughout the months of May-July

- All pond survey effort must be made by a person knowledgeable in bullfrog identification (see Appendix A for reference photos);
- Survey efforts shall include listening for bullfrog calls and slowly walking the complete perimeter of the pond at night* (dusk or later) while shining a flashlight to detect movement and eye-shine

If bullfrogs are not detected upon completion of five total surveys, or at any other time of the year incidentally, removal efforts are not required that year.

*Day time monitoring can also be conducted to aid detection but is not required under this plan.

SUCCESS CRITERIA

The level of effort needed to successfully manage bullfrog populations varies with infestation levels. This plan shall be considered successfully implemented if sufficient effort is provided to prevent adult bullfrogs from reproducing in the reservoir(s) each year, and no bullfrog life-stages can be detected. Bullfrogs are capable of traveling long distances over-land, and on-going

efforts will be required to ensure dispersing bullfrogs do not colonize the reservoir(s) at a future time.

OPTIONS FOR MANAGEMENT

Two removal methods may by employed for controlling bullfrogs under this plan and include:

- Manual direct removal
- Reservoir de-watering (Hydro-modification)

Implementing both reservoir de-watering and manual direct removal is currently believed to be the most effective method of managing bullfrog infestations. For reservoirs that are heavily infested with juvenile bullfrogs and/or tadpoles, reservoir dewatering may be necessary to break the bullfrog's life cycle and prevent on-going reproduction. Prior to conducting reservoir dewatering activities, please coordinate with CDFW Environmental Scientist David Manthorne by phone at (707) 441-5900 or via email at david.manthorne@wildlife.ca.gov.

Direct Removal

All direct removal efforts must be made by a person knowledgeable in bullfrog identification.

- Removal efforts must occur during, but are not be limited to the active/breeding season, occurring May – July;
- A minimum of ***five*** efforts throughout the season are considered necessary;
- Direct removal efforts are typically most effective when conducted at night with use of lights but can also be conducted during the day;
- Direct removal must include working the entire perimeter of the reservoir;
- A rubber raft or small boat may be necessary to successfully remove some individuals;
- A team of two individuals or more is often helpful, one person for shining lights and/or operating a boat and the other person to perform removal efforts;
- Bullfrog tadpoles must be removed and dispatched and must not be relocated or kept as pets.

Management Authorization

Take of bullfrogs is specifically allowed in the California Code of Regulations (CCR), Title 14 (T-14) section 5.05(a)(28), under the authority of a sport fishing license. There is no daily bag limit, possession limit or hour restriction, but bullfrogs can only be taken by hand, hand-held dip net, hook and line, lights, spears, gigs, grabs, paddles, bow and arrow or fish tackle.

Alternatively, FGC Section 5501 allows CDFW, as limited by the commission, to issue a permit to destroy fish that are harmful to other wildlife. The regulations have addressed this under Section CCR T-14 226.5 Issuance of Permits to Destroy Harmful Species of Fish in Private Waters for Management Purposes. This allows the CDFW to issue free permits to destroy harmful aquatic species by seining and draining.

Pond Dewatering

Pond dewatering may be appropriate if the reservoir can be successfully dewatered without adversely affecting stream resources. Careful planning and coordination with CDFW, is necessary to ensure potential impacts to stream resources can be addressed, prior to commencing with pond draining. Discharge of polluted water to waters of the state may require permitting from other agencies with permitting authority, such as the Regional Water Quality Control Board.

In general, bullfrog tadpoles require two years to develop into frogs, whereas native amphibians only require one year. Therefore, draining a reservoir every two years (or less) is intended to interrupt bullfrog tadpole development, dramatically decrease bullfrog populations and allow for reduced efforts as a measure of adaptive management. Typically in Northern California, reservoir draining should occur in September through October to avoid impacts to sensitive native amphibian and fishery resources. While draining occurs, direct removal efforts should be employed as described above if possible.

REPORTING

A written log shall be kept of monitoring and management efforts and shall be provided to CDFW **each year** by December 31. The written log shall include: 1) date and time of each monitoring and management effort, 2) approximate number of each bullfrog life stage detected and/or removed per effort, and 3) amount of time spent for each monitoring and management effort.

APPENDIX A. BULLFROG REFERENCE PHOTOS

This is a photo of a Bullfrog tadpole. (Photo taken by Mike van Hattem).

The photos shown in this Appendix demonstrate a medium sized adult bullfrog that was removed from Ten Mile Creek, Mendocino County. Note the bullfrog has a large tympanum, (circular ear drum shown with an arrow) and **does not** have distinct ridges along its back (dorsolateral folds). Photo taken by Wes Stokes.

The bullfrog has somewhat distinct mottling and **the underside of the bullfrogs hind legs are not shaded pink or red.**