Brent Plater (CA Bar No. 209555)
WILD EQUITY INSTITUTE
PO Box 191695
San Francisco, CA 94119
Telephone: (415) 349-5787
bplater@wildequity.org

Eric R. Glitzenstein (D.C. Bar No. 358287)
Howard M. Crystal (D.C. Bar No. 446189)
Pro Hac Vice
MEYER GLITZENSTEIN & CRYSTAL
1601 Connecticut Ave., N.W., Suite 700
Washington, D.C., 20009
Telephone: (202) 588-5206
eric@meyerglitz.com
hcrystal@meyerglitz.com

Attorneys for Plaintiffs

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **PLAINTIFFS' NOTICE OF FILING OF EXHIBITS IN SUPPORT OF MOTION FOR A PRELIMINARY INJUNCTION** Date: November 18, 2011 Time: 9:00 a.m. Courtroom: 10, 19th Floor Judge: Hon. Susan Illston

Plaintiffs hereby file the attached Exhibits in support of their Motion for a Preliminary Injunction.

Dated: September 23, 2011

Respectfully submitted,

/s/ Brent Plater
Brent Plater (CA Bar No. 209555)
WILD EQUITY INSTITUTE
Attorney for Plaintiffs

Wild Equity Institute v. City and County of San Francisco,

No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 3

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **DECLARATION OF VANCE VREDENBURG, PH.D.**

I, Dr. Vance Vredenburg, declare as follows:

1. I am submitting this declaration in support of plaintiff's motion for preliminary injunction. For the past decade I have worked as a post-doctoral researcher and professor studying the ecology of amphibians, with a particular emphasis on the causes of amphibian declines. I received my B.A. in Biological Sciences from the University of California Santa Barbara in 1992, and my Ph.D. in Integrative Biology from the University of California Berkeley in 2002. I am currently an Assistant Professor at San Francisco State University, and a Research Associate at the California Academy of Sciences and the Museum of Vertebrate Zoology at UC Berkeley. More detailed information about my background can be found in my *curriculum vitae*, which is attached as Exhibit A.

2. My research focuses on the causes of amphibian declines. For example, I conducted several whole-lake studies in the Sierra Nevada Mountains that conclusively demonstrated amphibian population declines when non-native fish were stocked in mountain lakes. This groundbreaking study was published in 2004 in the *Proceedings of the National Academy of Sciences*, arguably the world's most prestigious academic journal. I have since published over 30 peer-reviewed articles including five more articles in the *Proceedings of the National*

Academy of Sciences and several other prestigious scientific journals, and eight book chapters on amphibian ecology.

3. Currently I am collaborating with colleagues from UC Berkeley, UC Santa Barbara, and the University of Idaho on a National Science Foundation-funded study that seeks to understand how some populations of frogs survive disease epidemics. A newly discovered fungal pathogen (the chytrid fungus, *Batrachochytrium dendrobatidis*) has caused hundreds of recent amphibian extinctions and represents the worse case of a single pathogen driving vertebrates to extinction in recorded history. Because this is so unusual in evolutionary history, my research on this issue has garnered substantial media attention, including feature articles on my field research in the Sierra Nevada in the *New York Times*, *National Geographic Magazine*, and documentary videos on Animal Planet (with Jeff Corwin), the National Science Foundation's *Science Nation* show and coverage of my studies on the California red-legged frog at Sharp Park on KQED's Quest, a weekly television show on the Bay Area's science and environment.

4. Living amphibians (Class Amphibia, Subclass Lissamphibia) include frogs (Order Anura), salamanders (Order Caudata), and caecilians (Order Gymnophiona). Of the three groups, frogs and toads exhibit the most varied reproductive modes and habitat associations and comprise the majority of recognized species (>6000 species). Salamanders and caecilians, also diverse, have fewer species and are more restricted but still have a widespread distribution (614 species and 188 species, respectively). Most of the world's amphibian diversity occurs in the tropics, especially in Central and South America, but other amphibian biodiversity hotspots include sub-Saharan Africa, Madagascar, Sri Lanka, Southeast Asia and Australia.

5. Amphibians are represented in diverse aquatic and terrestrial ecosystems and frequently are important components of communities and food webs. In some parts of the world they are the dominant predator, both in terms of numbers and total mass. They are diverse in behavior. Most salamanders have the structure of a generalized tetrapod with four legs, a relatively short

trunk, and a tail, but some are extremely elongated with very small limbs or only forelimbs, and some reach very large size -- in excess of 1.5 meters. Caecilians, restricted mainly to the tropics, are limbless and their eyes are covered by skin. They have larger numbers of trunk vertebrae and are very elongated, but they either lack or have an exceedingly short tail. Frogs have a characteristic form consisting of a large head, a very short trunk, and four legs, the hind limbs containing four major segments, being elongated associated with jumping and /or swimming, and being suspended from elongated and specialized pelvic girdles. However, despite the constraints of body form frogs are diverse in morphology, coloration and behavior.

6. Adult amphibians are effective predators and both salamanders and frogs have tongues specialized for rapid, long distance prey capture. Caecilians generally feed on subterranean prey such as earthworms. The amphibians are long-term survivors (existing on earth for more than 350 million years) that endured four previous mass extinctions (e.g., 95 percent of all living species were lost in the Permian-Triassic extinction). Through these extinctions, all three orders of amphibians escaped extinction, and even most families and genera survived. This was not the case for most other groups of organisms (e.g. dinosaurs, etc). Yet today the amphibians, presently including more than 6,800 species, are the most threatened group of vertebrates on Earth with over 40 percent of species in decline and over 30 percent threatened with extinction.

The geographic extent of the declines is worldwide. The areas most affected are located in Central and South America, the Caribbean, the wet tropics of eastern Australia (Figure 2), and western North America (Stuart et al. 2004). Less is known about the status of species in Africa and Asia due to a lack of long term studies. The first reports of massive collapse of amphibian faunas came from montane areas in Central America and Australia. The loss of more than 50% of the species in a large tropical montane fauna (Monteverde Cloud Forest Reserve) in Costa Rica in the course of a single year (1987) was a profound shock, and included the first prominent extinction (the Golden Toad, *Bufo periglenes*). Collapse of amphibian fauna in montane and lower montane Central America and South America is on-going. Several species of frogs declined dramatically, some to apparent extinction, in eastern Queensland, Australia, starting at about the same time (1980's).

7. Concern has been expressed over declines of frogs in California for many years, and in the 1980's and early 1990's the phenomenon accelerated. Now there have been reports of mainly geographically limited declines from many parts of the world. California, along with Central America and Australia, has been a focal area for the study of amphibian population declines, because of the severe declines of many of its species. The region is recognized as one of the world's biodiversity hotspots (the "California Floristic Province") and contains a heterogeneous landscape that sustains a wide variety of ecosystems, such as Sonoran deserts, marshes and wetlands, oak woodlands, high-elevation alpine systems, temperate rain forests, and many others. The amphibian fauna is diverse and includes 67 recognized native species, including 41 species of salamanders from five families and nine genera, and 26 species of frogs and toads from five families and six genera (plus two introduced species). Amphibians in California can be found in nearly all habitat types ranging from near Mount Whitney (at 3,657 m, the highest peak in the contiguous United States) to Death Valley (85 m below sea level). Despite the fact that California contains some of the largest contiguous protected habitats in the continental United States, nearly one-quarter of amphibians in California are threatened.
Many potential causes for the widespread declines of amphibians have been proposed. In general these can be grouped into two major categories: 1) factors general to the overall biodiversity crisis, including habitat destruction, alteration and fragmentation, introduced species and over-exploitation, and 2) factors associated with amphibians that might account for declines in relatively undisturbed habitats. The first category includes relatively well understood and reversible direct ecological phenomena, whereas the second includes complex and elusive mechanisms, such as climate change, increased ultraviolet (UV-B) radiation, chemical

contaminants, infectious diseases, and the causes of deformities (or malformations). Habitat alteration and outright destruction are the single most important cause of declines in California and worldwide. The underlying mechanisms behind all of the factors stated above are sometimes complex and may be working synergistically with more evident factors, such as habitat destruction and introduced species, to exacerbate declines.

In California, amphibian declines are associated with many of the various hypotheses. Habitat destruction, alteration, and fragmentation have affected a large number of species including the California red-legged frog (CRLF), the Foothill Yellow-legged Frog, the Arroyo Toad, and the California Tiger Salamander, to name a few. Some amphibians began suffering declines long ago. In the 19th century, the California Gold Rush brought waves of new settlers who quickly over-exploited some frog species for food, including the CRFL. They also altered the environment in ways that have had much more substantial effects on amphibians. Cities were built, rivers dammed and diverted, forests were cleared, and the waterways of Great Central Valley were completely altered for agriculture and to provide water for cities and industrial growth. The effect on California's ecosystems has been profound. As elsewhere, habitat conservation has become a central theme in efforts to preserve the region's biodiversity.

8. Throughout my career I have retained a particular interest in the California red-legged frog, *Rana draytonii.* This frog ranges in size from 1.5 to 5 inches in length, making it the largest native frog in the Western United States. Adult females are significantly larger than males, with an average length of 138 mm versus 116 mm for adult males. The hind legs and lower abdomen of adult frogs are often characterized by a reddish or salmon pink color, and the back is brown, gray, olive, or reddish brown, marked with small black flecks and larger irregular dark blotches. Dorsal spots often have light centers, and in some individuals form a network of black lines. Dorsolateral folds, raised fleshy stripes that run parallel to the length of the frog, are prominent in this species of frog. Tadpoles range in length from 14 to 80 mm, and are a dark brown or

olive, marked with darker spots. *R. draytonii* breeds when the rains begin in earnest, usually in November and , an breeding may continue through April, depending on local conditions. Egg masses consist of between 300 and 5,000 eggs. Egg masses are nearly always attached to submerged vegetation that has some standing plant matter above water. Eggs hatch after 6 to 14 days depending on water temperature. Larvae typically metamorphose in 3.5 to 7 months, usually between July and September, but some overwinter and transform after more than 12 months in the larval stage. Males may attain sexual maturity at 2 years, females at 3 years, and adult frogs may live 8 to 10 years. Like tadpoles of many frog species, larvae are thought to be algal grazers, and the adult diet consists mostly of invertebrates. Pacific Tree Fogs (*Pseudacris regilla*) and California mice (*Peromyscus californicus*) are occasionally consumed by adult frogs but the importance of them in the diet is unknown. Juvenile frogs may be active both nocturnally and diurnally, whereas adult frogs are primarily active nocturnally. The primary predators on *R. draytonii* include garter snakes (*Thamnophis spp.*), raccoons (*Procyon lotor*), and great blue herons (*Ardea herodias*). Less frequently, red-legged frogs are eaten by American bitterns (*Botaurus lentiginosus*), black-crowned night herons (*Nycticorax nycticorax*), and rarely by red-shouldered hawks (*Buteo lineatus*). Introduced species such as the bullfrog (*Rana catesbeiana*) and non-native fish also prey on the frog.

9. The California red-legged frog is often referred to as "Twain's frog" because the Mark Twain included them in his colorful stories of California's Gold Rush days. The species faces several threats, and there is a high probability that the species will one day go extinct if these threats are not addressed. The species is already gone from 70% of its historic range, and has suffered a 90% population decline. Destruction and adverse modification of terrestrial and aquatic habitat is the primary reason for these declines, along with disease, pollutions in the form of pesticides and fertilizers, exploitation of the species for food, and predation from nonnative, invasive species.

10. I have often shared my interest in the California red-legged frog with my graduate students and research assistants. Recently one of my master's graduate students completed her degree in a study on the California red-legged frog, including the California red-legged frog populations at Sharp Park, to determine precisely what comprises the frog's diet. We analyzed stable isotopes of carbon and nitrogen to trace energy flow through food webs. The basis of this technique is simply that carbon's isotopic signatures in aquatic and terrestrial plants are consistently different from each other (aquatic plants contain consistently more heavy isotopes than terrestrial plants). Because the isotopic signature of carbon does not vary once it is in the food chain (as you move up the food chain from plants to higher consumers), you can use it to trace where energy in food webs was first captured by plants. You can trace energy flow through food chains by comparing isotopic signatures in an organisms' tissues. We used this technique with California red-legged frogs and showed that the carbon in frog tissues could be traced back to terrestrial, and not aquatic sources. This ground-breaking study discovered that over 99% of the frog's diet is composed of terrestrial insects—*indicating that the frog's upland and terrestrial habitats are much more important to the species' long-term survival than previously imagined*.

11. My PhD training at UC Berkeley in the Museum of Vertebrate Zoology has provided me a deep understanding of amphibian morphology, phylogenetics, evolution and taxonomy. In 2007, I published a detailed peer-reviewed paper in the *Journal of Zoology* on California's mountain yellow-legged frogs showing that there are two distinct species, while previously only one was recognized. I used morphology, frog vocalizations and molecular data to distinguish the two species. This work built on previous molecular and phylogenetic work I conducted on the relationship between western North American frog lineages, including the California red-legged frog, and published in the journal *Molecular Phylogenetics and Evolution.* I have studied thousands of laboratory specimens including hundreds of the California red-legged frog at the

permanent collections at the California Academy of Sciences, the Museum of Vertebrate Zoology, and other biological science collections. These specimens have given me insight on the basic ecology, evolution and conservation of the species. As many others before me, I have been especially struck by how the species' population has been impacted over time. For example, museum records and specimens, perhaps more than any other line of evidence, illustrate the loss of populations because many specimens were collected in areas where the frog no longer exists today.

12. Because of my study of frogs in the field and in the laboratory, I am an expert in identifying frog species. I can identify all life phases of the California red-legged frog in particular.

13. I am also familiar with Sharp Park and its aquatic features that provide habitat for California red-legged frogs. As mentioned above, I have mentored a graduate student who has conducted field research at this site; I have visited the site to test the frogs for disease; and I regularly take my undergraduate and graduate students there on field trips to gain experience observing and identifying amphibians in the wild. I have also reviewed several reports about Sharp Park prepared by biological contractors for the City and County of San Francisco, and publications prepared by the U.S. Fish and Wildlife Service.

14. It is my professional opinion that Sharp Park is an extremely important area for the California red-legged frog. Sharp Park must have successful recovery actions implemented, or it will one day lose its CRLF population, and potentially jeopardize populations at nearby properties as well. Because Sharp Park is relatively free from American bullfrogs (*Rana catesbeiana*, also called *Lithobates catesbeiana* in the scientific literature)—a non-native predator and competitor of the California red-legged frog—and relatively free from disease, it is one of the last best restoration opportunities to help recover the species along the Coast. Moreover, Sharp Park is adjacent to several protected lands with California red-legged frog

populations of their own, and therefore it serves as a central location for populations of the species on adjacent PUC watershed lands and neighboring Mori Point National Park.

15. California red-legged frogs have been documented at Sharp Park for decades. Wade Fox, one of the first biologists to survey the area, noted that California red-legged frogs were found in the bellies of snake specimens he had collected from Sharp Park in the 1940s. The frog has persisted on the land since: although survey's in the 1980s did not find any California red-legged frogs on the property, surveys in the 1990's found significant evidence of the species, and several recent publications and reports produced by the City and County of San Francisco have confirmed the presence of the species on the property. I have personally observed the species at Sharp Park on numerous occasions. Sharp Park and the adjoining Mori Point are excellent teaching examples for the students in my courses at San Francisco State University, located not more than a 10 minute drive away. I use the contrast between land management in Sharp Park vs. Mori Point as an example how the effects of human development and ongoing activities on threatened amphibians can be reversed. At Mori Point, the National Park Service has restored several breeding ponds and the California red-legged frog population has responded very positively whereas at Sharp Park, human activities have obvious negative effects on the threatened frog. It is not hard to see the difference when you are standing right there at the border between the two properties. It is remarkable that you can park your car on Fairway Drive, walk 15 paces and view California red-legged frogs in the creek below. In the rainy months of the year the frogs lay hundreds of egg masses that are easily visible from shore. Even during the day adults can be seen at these sites and this is not always the case for California red-legged frogs. In many other areas where they still occur, you usually have to visit sites at night to see adult frogs. I believe they are visible at Sharp Park and especially Mori Point because there are few introduced bullfrogs and the habitat, especially the restored areas, is prime habitat for the species that can support robust populations. This has been the case dating back to the 1940s. At Sharp

Park and Mori Point all stages of California red-legged frog are visible, eggs, tadpoles, juveniles and adults. This is not only great for educational purposes, but also signals that the habitats can support robust populations. If it can be fully restored, this habitat is some of the best I've seen for the species. Unfortunately, it is well documented that Sharp Park Golf Course has been killing California red-legged frogs through operations and management of a pump house for many years. San Francisco's Conceptual Restoration Alternatives Report explains that the take of the CRLF, documented as early as 1992, is ongoing at Sharp Park.

16. After 2008, the City released a Final Draft Endangered Species Compliance Plan for Sharp Park. I have reviewed this plan, and I am also familiar with the City's effort to move egg masses in the Park. Even with these efforts, it is my professional opinion that there is a high degree of scientific certainty that take of California red-legged frog egg masses through desiccation will continue to occur in Sharp Park. Moreover, based on records of golf course management and operations I have reviewed, my own observations of Sharp Park, and my professional expertise, I believe that the City is not, and cannot, actually implement the Compliance Plan – which contemplates managing water levels to avoid desiccation of CRLF egg masses – making it virtually certain that California red-legged frogs will be taken unless the relief requested by plaintiffs here is granted.

17. The California red-legged frog requires aquatic habitats to breed successfully. If the aquatic features are not of sufficient depth and duration, the eggs may not survive.

18. At Sharp Park, the opportunity for frogs to complete this cycle is being undermined by the management of the golf course, whereby two pumps drain Sharp Park wetlands (upon which the golf course was built) during flooding that occurs as a natural function of winter rains. This unnatural draining of what would otherwise be a naturally functioning wetlands complex is causing the take of many California red-legged frog egg masses.

19. The Compliance Plan does not prevent egg mass strandings. This past winter, for example, the golf course operated the pumps with the Compliance Plan in place. Yet beginning in January, 2011, Recreation and Park Department staff had to move over one hundred egg masses that they concluded would not survive in the location where they were laid. It is my professional opinion that these egg masses would not have been stranded if the pumps were not draining Sharp Park's wetlands.

20. These frogs have evolved over millions of years towards a strategy of egg-laying that balances water depth, water temperature, predator avoidance, and pond desiccation. The most successful frogs maximize the contrasting pressures of pond desiccation and water temperature. For example female frogs that choose to lay their eggs in deeper water are minimizing risk to desiccation but also exposing eggs to cooler water temperatures, which translate into slower growth and development. Deeper, more permanent water also harbors a more diverse food web which is more likely to contain aquatic egg and tadpole predators. Females that lay eggs in the shallowest water on the margin of ponds are maximizing growth potential (warmer temperatures) and minimizing exposure to aquatic predators, but are also exposing egg masses to higher probability of desiccation. If the rains continue and the pond does not dry too quickly the strategy pays off and eggs in shallow waster hatch faster, tadpoles grow faster and outcompete other eggs and tadpoles from other frogs laid in deeper water.

21. Ponds fill and dry seasonally and although it can seem rather dramatic from wet to dry years, the change over the course of days is not rapid because water levels decrease mostly due to evaporation from heat and use by terrestrial and emergent plants during photosynthesis. The pumping of water to dry up fairways at Sharp Park, however, is well outside the natural rate of pond drying and the frogs are not adapted to this type of rapid change in pond depth. Therefore, because these frogs have evolved a breeding strategy over millions of years that is cued in on natural rates of desiccation, the pumping of the ponds by the golf course will inevitable lead to a

much higher mortality rate for the eggs that the females lay at the margins of the pond, in the shallowest water. This elevated mortality is completely man made and can be reduced if pumping is not allowed. Although RPD has for years been moving egg masses it determines are at some risk, egg mass movement is not part of the Compliance Plan.

22. Moving egg masses does not ensure their survival. Frog egg masses are encased in a protective jelly coating. California red-legged frogs females attach the egg masses to emergent vegetation usually suspended near the surface of the water to balance impacts from solar radiation from above while avoiding predators from below. Movement of egg masses can damage the embryos in a number of ways. For example, jarring movements can damage eggs directly and even when the embryos are at later stages and are less sensitive to movement, egg survival can plummet if egg masses are moved. Amphibian eggs are sensitive to changes in gas exchange rates across the jelly boundary and the egg membrane. If eggs masses are taken out of the water for more than a few minutes and exposed to air, then oxygen and carbon dioxide exchange rates can decrease rapidly because the jelly does not function well as a gas exchange membrane when exposed to air. The jelly can quickly begin to dry along the outer edge, this edge, like a thicker skin, impedes natural gas exchange rates. Additionally, once egg masses are placed in a new location, it is very difficult, to suspend them in the water column off the bottom yet also near the surface. If eggs become dislodged they can float away and end up in less than perfect microhabitats, for example they can be washed ashore by wind or even small wave action. Therefore, it is my professional opinion that at least some eggs and even entire egg masses that are relocated by the City in 2011 did not survive the relocation effort.

23. I am also concerned by the artificially high concentration of egg masses placed in Horse Stable Pond. Horse Stable Pond is the aquatic feature closest to Sharp Park's pump house, and therefore it is the area most impacted by the suction of the pumps. When a very large portion of Sharp Park's California red-legged frogs are placed in Horse Stable Pond, nearly the

entire population is at greater risk of entrainment, impingement, or desiccation. If the eggs did in fact survive, then the pond may be at risk of exceeding its ecological carrying capacity. Many species, and in particular amphibians, have been shown to display density dependent growth. The idea is a simple one: while each species or population has the potential to grow exponentially this does not happen because of interspecific and intraspecific factors. At some point a population's size is either limited by resources (food, space, breeding sites, etc) or other individuals (competitors, predators, parasites, etc.). If thousands of eggs are being artificially added to a pond that wouldn't naturally have that high a number, then this could have very negative effects on the population. It could make food acquisition more difficult, it could make the population a target to predators that may be attracted to the large number or prey items, or abiotic conditions in the environment (oxygen concentration in the water may be lowered, or excreted compounds could overwhelm natural decomposers leading to toxic levels of nitrogenous waste). Of course, not all egg masses can be moved. On February 21, 2011 a partially submerged egg mass was found on the edge of Horse Stable Pond. The water level of Horse Stable Pond, as measured by the gauge at the pump house, at 2.9 meters (relative scale), but massive amounts of water were being pumped through the system. On February 23, 2011, I visited this egg mass, and discovered that the water levels were at 2.6 meters (relative scale): and the egg mass was completely exposed to the air due to the ongoing pumping. I identified the egg mass as a California red-legged frog egg mass, and concluded that it was not likely to survive. A photograph of the egg mass I viewed on that date is attached as Exhibit B. On March 1, 2011 a follow-up visit to the egg mass found that it was completely desiccated and partially frozen. All of these egg mass strandings occurred despite the Compliance Plan, which cannot reduce egg mass strandings to zero or anything close to it. Because, even with the pumps on full throttle, it can take days for the water to draw down after significant rainfall, large numbers of California red-legged frog egg masses are often laid in areas that become exposed to the air due to the pumping operations, even though the Compliance Plan is functioning as designed. Finally, because the Compliance Plan provides for so much pumping the water that remains to secure egg and tadpole development is reduced. If a large rain event is followed by an extended drought, the buffer of rainwater provided by the initial storm event will have been eliminated, and the frog eggs and tadpoles also are at serious risk of desiccation and stranding. All of this is occurring despite implementation of the Compliance Plan.

24. It is my professional opinion that in order to reduce take of California red-legged frogs in the future, the relief requested by Plaintiffs in this motion must be granted. Specifically, San Francisco must be ordered to cease all pumping at Sharp Park. The best way to safeguard the frog is to reduce unnatural variation in pond levels which is known to increase egg mortality. These frogs evolved with naturally fluctuating water levels in ponds, the best thing we can do to insure their survival and recovery is to let the water levels at Sharp Park vary naturally.

25. Based on the stable isotope food web research done by my lab, as well as my understanding of CRLF biology and habitat requirements, it is also my professional opinion that mowing Sharp Park lands, particularly lands along the edge of aquatic features, is taking California red-legged frogs by significantly modifying the frog's habitats to the point where individual animals are killed or injured by impeding significant behavior functions, particularly feeding. As noted, our recent research demonstrated that for postmetamorphic individuals, the CRLF's diet consists mostly of terrestrial insects, which are produced and in many cases also obtained in terrestrial habitat. Mowing in these areas, therefore, is interfering with these essential life functions. Moreover, it is also my professional opinion that mowing in these areas is reasonably certain to take SFGS in Sharp Park, since the CRLF is a significant prey species for the SFGS. The City's Compliance Plan, which provides an inadequate monitoring protocol prior to certain mowing, would not avoid the significant risks of take even were it being implemented,

particularly given the massive scale of mowing in the vicinity of water features and the large scale habitat modification mowing causes.

26. This is why the plaintiffs requested relief is essential to protect the California red-legged frog and San Francisco gartersnake. The plaintiffs request to cease all mowing within roughly 200 meters of the delineated wetland boundary area will provide a large swath of buffer and edge habitat that will be free from mowing and wheels that could compress and take endangered frogs and snakes. Although I certainly believe a much larger buffer area would provide even further protection for the species, this will significantly diminish the risks as compared to current golf course operations.

27. If this relief is provided, it is my professional opinion that the probability of ongoing take as a result of golf course operations, while not eliminated, will be substantially reduced.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on this _____ day of September, 2011. ______________________________

Vance Vredenburg

I, Brent Plater, hereby attest that Vance Vredenburg's concurrence in the e-filing of this document has been obtained.

Executed on: September 23, 2011 ______________________________

Brent Plater

EXHIBIT A

Vance Thomas Vredenburg

Assistant Professor
Department of Biology
San Francisco State University

Research Area:

Amphibian ecology, evolution and conservation, disease ecology, food webs

University Address:

Department of Biology; 1600 Holloway Avenue, HH 754; San Francisco, CA 94132, USA; Email: vancev@sfsuedu; Telephone: 415-338-7296
Web pages: http://biologysfsuedu/people/vance-vredenburg
http://web.me.com/vancevredenburg/Vances_site/Home.html

Education

- PhD, University of California, Berkeley (Integrative Biology), Dec 2002 "The effects of introduced trout and ultraviolet radiation on anurans in the Sierra Nevada" Co-advisors: Dr Mary E Power and Dr David B Wake
- BA, University of California, Santa Barbara (Biology), 1992

Professional background

- 2007- to present *Assistant Professor* Department of Biology, San Francisco State University
- 2007- to present *Research Associate* Museum of Vertebrate Zoology, University of California Berkeley
- 2008- to present *Research Associate* California Academy of Sciences, San Francisco, California, USA
- 2003-2007 *Postdoctoral Scholar* Department of Integrative Biology and Museum of Vertebrate Zoology, University of California Berkeley
- 1998-to present *Co-Founder and Associate Director* of AmphibiaWeb.org an online bioinformatics project promoting science and conservation of the world's amphibians

Research Grants (currently funded)

2011-2013 National Science Foundation, (DEB) *The effects of climate change and fungal disease on Andean montane frogs*, V Vredenburg (PI)

2011-2012 The Rufford Small Grants Foundation, Grants for Nature Conservation, *Conservation of montane forest anurans in Southeastern Peru*, V Vredenburg (co-PI)

2007-2012 National Science Foundation, (DEB) *After the crash: factors allowing host persistence following outbreaks of a highly virulent disease, C* Briggs (PI), C Moritz (co-PI), R Knapp (co-PI), V Vredenburg (co-PI)

2008-2010 CalFed-Bay Delta Program *Climate change impacts to San Francisco Bay-Delta wetlands: Links to pelagic food webs and predictive responses based on landscape modeling* T Parker (PI), J Callaway (co-PI), M Kelli (co-PI), V Vredenburg (co-PI)

Publications (*SFSU Master's student; #SFSU Undergraduate student)

<u>*In Review*</u>

1. Catenazzi, A, E Lehr, and VT Vredenburg *Thermal physiology fails to link climate warming to enigmatic amphibian declines in neotropical mountains* (PNAS)
2. Reeder*, NMM, AP Pessier, and VT Vredenburg *Pathogen resistance identifies reservoir species and its role in infectious disease outbreaks in amphibians* (PNAS)
3. Woodhams, DC, Rollins-Smith, LA, Reinert, LK, Lam, BA, Harris, RN, Briggs, CJ, Vredenburg, VT; Caprioli, RM Chaurand, P *Microbial biotherapy causes immunomodulation of brevinin-1Ma, a novel antifungal peptide from the skin of mountain yellow-legged frogs, Rana muscosa* (Peptides)
4. Woodhams, DC, Geiger, CC, Reinert, LK, Rollins-Smith, LA, Lam, BA, Harris, RN, Briggs, CJ, Vredenburg, VT; Voyles, J *Treatment of amphibians with chytrid fungus: learning from failed trials with itraconizole, antimicrobial peptides, bacteria, and heat therapy* (Diseases of Aquatic Organisms)
5. Bishop*, MR, RC Drewes, and VT Vredenburg *Stable isotope approach illustrates the importance of terrestrial prey to the California red-legged frog* (Ecology)

<u>*In Press*</u>

1. Vásquez Almazán, CR, and VT Vredenburg (*2011*) Discovery of the lethal amphibian fungal pathogen, *Batrachochytrium dendrobatidis*, in a direct-developing salamander in Guatemala *Herpetological Review*

<u>*Published*</u>

1. Swei, A, JJL Rowley, D Rödder, MLL Diesmos, AC Diesmos, CJ Briggs, R Brown, TT Cao, TL Cheng*, B Han, J Hero, DH Hoang, MD Kusrini, TTD Le, M Meegaskumbura, T Neang, SPhimmack, D Rao, NMM Reeder*, SD Schoville, N Sivongxay, N Srei, M Stöck, B Stuart, L Torres#, TAD Tran, TS Tunstall, D Vieites, and VT Vredenburg (2011) Is Chytridiomycosis an Emerging Infectious Disease in Asia? *PLoS ONE* 6(8): e23179 doi:101371/journalpone0023179
2. Cheng*, TL, S Rovito, DB Wake and VT Vredenburg Coincident mass extinction of neotropical amphibians with the emergence of the fungal pathogen *Batrachochytrium dendrobatidis* 2011 *Proceedings of the National Academy of Sciences*108(23):9502-9507
   a) <u>Review of Cheng et al 2011</u>: Lips KR 2011 Museum collections: Mining the past to manage the future *Proceedings of the National Academy of Sciences USA* 108(23):9323-9324
   b) Cheng, et al. 2011 won the *Best Student Paper Award* at the Ecological Society of America general meeting 2011
3. Schoville, SD, TS Tustall, VT Vredenburg, AR Backlin, DA Wood, RN Fisher 2011 Conservation of evolutionary lineages of the endangered mountain yellow-

legged frog, *Rana muscosa* (Amphibia: Ranidae), in southern California *Biological Conservation* 144:2031-2040

4. Reeder*, NMM, TL Cheng*, VT Vredenburg, and DC Blackburn 2011 Survey of the chytrid fungus *Batrachochytrium dendrobatidis* from montane and lowland frogs in eastern Nigeria *Herpetology Notes* 4:83-86
5. Catenazzi A, E Lehr, LO Rodriguez, and VT Vredenburg 2011 *Batrachochytrium dendrobatidis* and the collapse of anuran species richness and abundance in the upper Manu National Park, southeastern Peru *Conservation Biology* 25: 382-391
6. Catenazzi, A, VT Vredenburg, and E Lehr 2010 *Batrachochytrium dendrobatidis* in the live frog trade of Telmatobius (Anura: Ceratophryidae) in the Tropical Andes *Diseases of Aquatic Organisms 92:187-191*
7. Blackburn, DC, B J Evans, AP Pessier, VT Vredenburg 2010 An enigmatic mass mortality event in the only population of the Critically Endangered Cameroonian frog *Xenopus longipes* (Anura: Pipidae) *African Journal of Herpetology 59:1-12*
8. Vredenburg, VT, LM Chan, T Tunstall, and JM Romansic 2010 Does UV-B radiation affet embryos of three high-elevation amphibian species in California? *Copeia* 2010:502–512
9. Lam, BA, J B Walke, VT Vredenburg, and RN Harris 2010 Proportion of individuals with anti-*Batrachochytrium dendrobatidis* skin bacteria is associated with population persistence in the frog *Rana muscosa Biological Conservation* 143 (2010):529-531
10. Vredenburg, VT, RA Knapp, T Tunstall, and CJ Briggs 2010 Dynamics of an emerging disease drive large-scale amphibian population extinctions *Proceedings of the National Academy of Sciences* 107:9689-9694

    <u>Reviews and other significant citations of Vredenburg et al 2010:</u>

    a) Blaustein, AR and PTJ Johnson 2010 When an infection turns lethal *Nature* 465:881-882
    b) Jeremy, A 2010 Epidemiology: It's not easy being green *Nature Reviews Microbiology 8:467*
    c) Kinney, V C, J L Heemeyer, A P Pessier, and M J Lannoo 2011 Seasonal pattern of B*atrachochytrium dendrobatidis* infection and mortality in *lithobates areolatus*: <u>Affirmation of Vredenburg's "10,000 zoospore rule"</u> *PLoS ONE* 6(3):e16708
11. Briggs, CJ, RA Knapp, and VT Vredenburg 2010 Enzootic and Epizootic Dynamics of the Chytrid Fungal Pathogen of Amphibians *Proceedings of the National Academy of Sciences* 107:9695-9700
12. Harris, RN, RM Brucker, JB Walke, MH Becker, CR Schwantes, DC Flaherty, BA Lam, DC Woodhams, CJ Briggs, VT Vredenburg, KPC Minbiole 2009 Skin microbes on frogs prevent morbidity and mortality caused by a lethal skin fungus *The ISME Journal* 3:818-824
13. Wake, DB, and VT Vredenburg 2008 Are we in the midst of the sixth mass extinction? A view from the world's amphibians *Proceedings of the National Academy of Sciences 105:11466-11473*
14. FrÍas-Álvarez P, V T Vredenburg, M Familiar-Lopez, JE Longcore , E Gonzalez-Bernal, G Santos-Berrera, L Zambrano, and G Parra-Olea 2008 Chytridiomycosis survey in wild and captive Mexican amphibians *EcoHealth* 5: 18-26

15. Morgan, JAT, VT Vredenburg, LJ Rachowicz, RA Knapp, MJ Stice, T Tunstall, RE Bingham, JM Parker, JE Longcore, C Moritz, CJ Briggs, JW Taylor 2007 Population genetics of the frog killing fungus *Batrachochytrium dendrobatidis Proceedings of the National Academy of Sciences* 104(34): 13845-13850
16. Woodhams, DC, VT Vredenburg, M Simon, D Billheimer, B Shakhtour, Y Shyr, CJ Briggs, LA Rollins-Smith, RN Harris 2007 Symbiotic bacteria contribute to innate immune defenses of the threatened mountain yellow-legged frog, *Rana muscosa Biological Conservation* 138: 390-398
17. Finlay, JC and VT Vredenburg 2007 Introduced trout sever trophic connections in watersheds: consequences for a declining amphibian *Ecology* 88(9): 2187-2198
18. Vredenburg, VT, R Bingham, R Knapp, JAT Morgan, C Moritz, and D Wake 2007 Concordant molecular and phenotypic data delineate new taxonomy and conservation priorities for the endangered mountain yellow-legged frog (Ranidae: *Rana muscosa*) *Journal of Zoology* 271(4): 361-374
19. Knapp, RA, DM Boiano, and VT Vredenburg 2007 Recovery of a declining amphibian (mountain yellow-legged frog, *Rana muscosa*) following removal of nonnative fish *Biological Conservation* 135: 11-20
20. Rollins-Smith, LA, DC Woodhams, LK Reinert, VT Vredenburg, CJ Briggs, PF Nielsen, and JM Conlon 2006 Antimicrobial Peptide Defenses of the Mountain Yellow-Legged Frog (*Rana muscosa*) *Developmental & Comparative Immunology* 30(9): 831-842
21. Rachowicz, LJ, RA Knapp, JAT Morgan, MJ Stice, VT Vredenburg, JM Parker and CJ Briggs 2006 Emerging infectious disease as a proximate cause of amphibian mass mortality *Ecology* 87(7): 1671-1683
22. Briggs, C, VT Vredenburg, RA Knapp, and LJ Rachowicz 2005 Investigating the population-level effects of chytridiomycosis, a fungal disease of amphibians *Ecology* 86(12):3149-3159
23. Rachowicz, LJ, JM Hero, JAT Morgan, VT Vredenburg, J Taylor, CJ Briggs 2005 The novel and endemic pathogen hypothesis: explanations for the origin of an emerging infectious disease of wildlife *Conservation Biology* 19(5):1441-1448
24. Vredenburg, VT 2004 Reversing introduced species effects: Experimental removal of introduced fish leads to rapid recovery of declining frog *Proceedings of the National Academy of Sciences* 101(20):7646-7650
25. Rachowicz, LJ and VT Vredenburg 2004 Transmission of *Batrachochytrium dendrobatidis* within and between amphibian life stages *Diseases of Aquatic Organisms* 61:75-83
26. Macey, JR J Stasburg, J Brisson, VT Vredenburg, M Jennings, and A Larson 2001 Molecular phylogenetics of western North American frogs of the *Rana boylii* species group *Molecular Phylogenetics and Evolution* 19(1):131-143
27. Vredenburg, VT, T Tunstall, H Nguyen, J Romansic and S Schoville 2001 *Hydromantes platycephalus* (Mt Lyell salamander) *Herpetological Review* 32:178
28. Vredenburg, VT, and AP Summers 2001 Field Identification of chytridiomycosis in *Rana muscosa Herpetological Review* 32:151-152

29. Vredenburg, VT 2000 Natural History Notes: *Rana muscosa* (mountain yellow-legged frog), conspecific egg predation *Herpetological Review* 31:170-171
30. Vredenburg, V T, Y Wang, and G Fellers 2000 Scientific meeting raises awareness of amphibian decline in Asia *FrogLog* 42: 2-3
31. Knapp, R A, V T Vredenburg, and K M Matthews 1998 Effects of stream channel morphology on golden trout spawning habitat and recruitment *Ecological Applications* 8(4):1104-1117
32. Knapp, RA, and VT Vredenburg 1996 A field comparison of the substrate composition of golden trout redds using two sampling techniques *North American Journal of Fisheries Management* 16:674-681
33. Knapp, RA, and VT Vredenburg 1996 Spawning by California golden trout: characteristics of spawning fish, seasonal and daily timing, redd characteristics, and microhabitat preferences *Transactions of the North American Fisheries Society* 125(4):519-531
34. Knapp, RA, PC Sikkel, and VT Vredenburg 1995 Age of clutches in nests and the with-in nest spawning-site preferences of three damselfish species (Pomacentridae) *Copeia*(1995):78-88

<u>*Book Chapters and other publications In Press 2011*</u>

1. Catenazzi, A, E Lehr, LO Rodriguez, and VT Vredenburg Amphibian Disease in the Peruvian Andes 2011 *Smithsonian Institution Scholarly Press*
2. Vredenburg, VT, M Koo, K Whittaker, and DB Wake 2011 Global Declines of Amphibians *In Encyclopedia of Biodiversity* Elsevier Press
3. Cheng*, TL, S Rovito, DB Wake and VT Vredenburg (*In Press*) Museum specimens reveal spread of pathogen and collapse of amphibians in Central America *Froglog*
4. A Swei, JJL Rowley, D Rödder, MLL Diesmos, AC Diesmos, CJ Briggs, R Brown, TT Cao, TL Cheng*, B Han, J Hero, DH Hoang, MD Kusrini, TTD Le, M Meegaskumbura, T Neang, SPhimmack, D Rao, NMM Reeder*, SD Schoville, N Sivongxay, N Srei, M Stöck, B Stuart, L Torres#, TAD Tran, TS Tunstall, D Vieites, and VT Vredenburg (*In Press*) Prevalence and distribution of chytridiomycosis throughout Asia *FroLog* 98

<u>*Book Chapters and other publications*</u>

1. Vredenburg, V. T., C. J. Briggs, and R. N. Harris. 2011. Host-pathogen dynamics of amphibian chytridiomycosis: The role the skin microbiome in health and disease In *Fungal diseases: An emerging threat to human, animal and plant health*, edited by L. Olsen, E. R. Choffnes, D. A. Relman and L. Pray. Washington, D.C.: The National Academies Press IOM (Institute of Medicine). Pp. 342-355.
2. Vredenburg, VT, MS Koo, and DB Wake 2008 Declines of amphibians in California *In* Hoffman, M (Ed), *Threatened Amphibians of the World* Lynx Ediciones, Barcelona, Spain, pp 126
3. Vredenburg, VT, G Fellers, and C Davidson 2005 The mountain yellow-legged frog (*Rana muscosa*) *In* Lannoo, MJ (Ed), Status and Conservation of US Amphibians University of California Press, Berkeley, California, USA, pp 563-566
4. Vredenburg*, VT, M McDonald, & T Sayre (2010) *Amphibians and Climate Change* Natural Selections 6(1):10-12

Teaching Experience at SFSU

Ecology (BIOL 482) 40-60 undergraduates
Ecology and Evolution Seminar (BIOL 862) 12-18 graduate students
Vertebrate Evolution and Natural History (BIOL 470) 20 undergraduates

Student Mentoring

Master's Students-Chair

Completed

1. Natalie Reeder; *Potential role of the pacific chorus frog in the spread of chytridiomycosis disease* (6-25-2010) [This thesis was San Francisco State University's nomination for the 2010 Western Association of Graduate Studies Distinguished Master's Thesis Award 2010]
2. Tina Cheng; Title: *The effects of chytridiomycosis disease on Central American salamanders* (please see publication #2, published in PNAS; winner Ecological Society of America *BEST STUDENT PAPER 2011*)
3. Meghan Bishop*; Title: *Habitat use and conservation of red-legged frogs in coastal California* (*Official Chair was Dr R Drewes at the California Academy of Sciences)

In progress

1. Sam McNally; *Tracking the spread of Batrachochytrium dendrobatidis through amphibians in California's Sierra Nevada*
2. Stephanie Hyland; *Development of a rapid PCR Assay for* Janthinobacterium lividum*, a bacterium that occurs symbiotically on amphibian skin*
3. Raul Figeroa; *Was the fungal pathogen,* Batrachochytrium dendrobatidis*, spread throughout Asia by the amphibian food and pet trade*?
4. Celeste Dodge; *Effects of a fungal pathogen on the Yosemite Toad (*Bufo canorus*)?*
5. Danquing Shao; *Investigating the role of introduced American Bullfrogs in the spread chytridiomycosis disease in Chinese amphibians?*
6. Gabriela Rios-Sotelo; *Did the fungal pathogen* Batrachochytrium dendrobatidis *originate from Japan?*
7. *Angel Jacobo Pereira; The amphibian chytrid pathogen* Batrachochytrium dendrobatidis *in Guatemala*

Master's Students-Committee Member

Completed

1. Kim Vincent (Chair E Routman), *The effects of pesticides on tadpoles*
2. Anthony Chazar (Chair Dr R Sehgal), *Effects of deforestation on the prevalence and diversity of blood parasites in two African rainforest birds*
3. Maria Tonione (Chair E Routman), *Microsatellite variation in the hellbender,* Cryptobranchus alleganiensis
4. Jenny Carlson (Chair R Seghal), *Evolution of blood pathogens*
5. Hazel Thwin (Chair J Dumbaucher), *Ornithology of Myanmar*
6. Molly Dodge (Chair R Sehgal), Transmission of haemosporidian pathogens in resident and migrating birds
7. Holly Archer (Chair R Seghal), *Emerging infectious disease and blood parasite prevalence in countryside birds*

8. Stephen Micheletti (Chair E Routman), *Population structure of Side-blotched Lizards (*Uda stansburiana*): Displaying adaptive dorsal coloration*

In progress

1. Alexandra Vasquez Ochoa; El ensambleaje de anfibios en 13 localidades de la region Andina central oriental, Orinoquia y Amazonia de Colombia; Pontificia Universidad la Javeriana, Bogota, Colombia

PhD Students-Committee Member

In progress

1. Brooke Talley (Chair K Lips, Southern Illinois University), *Distribution of* Batrachochytrium dendrobatidis *in amphibians of Illinois*

Service

University Level

1. San Francisco State University Academic Senator (elected Fall 2011)
2. Curriculum Review and Approval Committee

Departmental Level

1. Undergraduate General Biology Major advisor

Graduate Student advising

1. Weekly lab meetings in Vredenburg Lab, students participate in reading and evaluating recent scientific publications, present updates on student and lab projects and report on animal status in the SFSU animal care facility
2. Weekly individual meetings with graduate students

New Course Development

1. Biol 470 Evolution and Natural History of Vertebrates - course includes lectures, weekly laboratories and field trips (This course uses preserved museum specimens maintained at SFSU by Vredenburg)

Committee work

1. CRAC -Curriculum Review and Approval Committee
2. Biology Undergraduate and Graduate Scholarship Committee (2009-2010)
3. CSU System-wide Student Research Competition (2009-2010)
4. Undergraduate Curriculum Committee (2008-2010)
5. Judge for the College of Science and Engineering Project Showcase (2009-2010)
6. Biology Chair Evaluation Committee (2011)

Synergistic Activities

1. Co-Founder and Associate Director: wwwAmphibiaWeb.org an online research and conservation resource for the world's amphibians This site has an average of 20,000+ successful queries per day by students, conservation scientists, and the general public
2. Faculty Sponsor at SFSU for 7 graduate students (see below) and 9 undergraduate students (4 undergraduates are underrepresented minority students receiving funding from NSF and NIH)
3. Provided training in the form of lectures, field trips and lab methodology *in Spanish* to students and faculty in Latin America (Training Course on Quantitative PCR Detection of Chytridiomycosis, Mexico City, Mexico, at

UNAM, for the Red de Análisis para los Anfibios Neotropicales Amenazados; and in Guatemala City, Guatemala for the Museo de Historia Natural, Univ de San Carlos de Guatemala; and to professors and students at Pontificia Universidad la Javeriana, Bogota, Colombia)

Public Outreach/Education/News coverage of the Vredenburg Lab

Television

1. Animal Planet: *The Vanishing Frog* with Jeff Corwin; 11-20-09
2. ABC-News; CNN; CBS Evening News (various appearances)

Radio

1. NPR-Science Friday-*Modern Extinctions* (KQED; 5-14-10)
2. WALO 1240 AM Radio Puerto Rico (6-22-10)- in Spanish

Movie Documentaries

1. NSF Science Nation (*Disappearing Frogs: Trying to save the world's amphibians*, by Miles O'Brien and Marsha Walton; 11-2-09)
2. NPR KQED QUEST (*Disappearing Frogs*; 5-15-08)

Print/News media

1. National Geographic Magazine (4-1-09); *The Vanishing* by Jenny Holland
2. New York Times (05-10-10); *Toiling against a deadly disease to save a threatened frog* by Erica Rex
3. Popular Science (in press); *Can skin microbes save our frogs?* By Susannah Locke
4. GEO Magazine (Germany; 07/01/10); *Amphibians in Crisis* by Markus Wolff
5. National Parks Magazine (2011)
6. Audubon Magazine (*in press*)
7. Deep-Sea News (volume5: 9-12-2011)

Biology Textbook featuring Vredenburg research

1. Campbell, NA, & Reece, J B (*In Press*) *Biology*, Benjamin Cummings, 8th edition pp650-651 *(This is the most commonly used Biology textbook in Introductory Biology Courses in the USA)*

Collaborators & Other Affiliations

1. Collaborators and Co-Editors J Taylor, C Moritz (UC Berkeley); R Knapp, C Briggs (UC Santa Barbara), E Rosenblum (U Idaho)
2. Graduate and Postdoctoral Advisors PhD co-advisors Mary Power and David Wake (UC Berkeley); postdoc advisor Cheryl Briggs (UC Santa Barbara)
3. Thesis Advisor and Postgraduate-Scholar Sponsor Master's students: *completed* (3) Natalie Reeder (6-25-10); Tina Cheng (6-25-11), Meghan Bishop (5-22-11) *current* (7) Celeste Dodge, Raul Figeroa*, Stephanie Hyland*, Danquing Shao, Gabriela-Rios-Sotelo*, Sam McNally, and Angel J. Pereira* (*underrepresented minority)

Reviewer

1. National Science Foundation (two Panels)
2. National Geographic (research grants)
3. Scientific Journals
    a) *Proceedings of the National Academy of Sciences*
    b) *Nature*

c) *Public Library of Science Biology*
d) *Public Library of Science Pathogens*
e) *Journal of Animal Ecology*
f) *Conservation Biology*
g) *Herpetologica*
h) *Journal of Herpetology*
i) *Diseases of Aquatic Organisms*
j) *The Herpetological Journal*

Invited presentations/lectures

1. Special Forums
    a) National Academy of Sciences/Institute of Medicine, Dec 2010 F*orum on Microbial threats: Fungal Diseases; Washington, DC*
2. *Departmental Seminars*
    a) 2011 Universidad de los Andes, Bogota, Colombia
    b) 2011 La Javeriana University, Bogota, Colombia
    c) 2011 California Academy of Sciences
    d) 2010 University of Nevada Reno, Dept of Biology
    e) 2009 University of San Francisco, Dept of Biology
    f) 2008 Department of Zoology; Southern Illinois University
    g) 2008 Department of Biology; Museo de Historia Natural, Guatemala City, Guatemala
    h) 2007 Department of Biology; University of Puerto Rico, PR USA
    i) 2005 Department of Ecology and Evolution; University of California Santa Cruz
    j) 2002 Department of Ecology and Evolutionary Biology; University of Connecticut
1. *Scientific Meetings*
    a) 2012 World Congress of Herpetology - symposium presentation
    b) 2011 Ecological Society of America- symposium presentation
    c) *2009, 2011, 2012 Integrative Research Challenges in Environmental Biology*; Amphibian declines and chytridiomycosis; Arizona State University, Tempe, Arizona
    d) *2007* Partners in Amphibian and Reptile Conservation; Amphibian declines and chytridiomycosis; Tempe, Arizona

Symposium Organizer

1. 2012 World Congress of Herpetology: Reversing the effects of introduced species on amphibians
2. 2007 Ecological Society of America: Disease emergence and amphibian decline: using ecology to understand patterns and promote restoration; San Jose, California
3. 2005 Declining Amphibian Population Task Force; Berkeley, California
4. 2000 Amphibian Conservation; 4th Asian Herpetological Conference; Chengdu, China

Provided qPCR Prep and Analysis Training

1. NSF Collaborative Network

a) The Research and Analysis Network for Neotropical Amphibians (Red de Análisis para los Anfibios Neotropicales Amenazados); Training Course on Quantitative PCR (Q-PCR) Detection of Chytridiomycosis; invited by Dr Gabriela Parra (Univ Nacional Autonoma de Mexico) Course co-funded by NSF and the IUCN Amphibian Specialist Group

2. Faculty - Pontificia Universidad la Javeriana, Bogota, Colombia
3. Postdocs - UC Berkeley; Gonzaga University; Smithsonian Institution
4. Graduate students - Universidad Nacional Autonoma de Mexico (UNAM), Mexico City, Mexico; Southern Illinois University; Museo de Historia Natural, Guatemala City, Guatemala; Pontificia Universidad la Javeriana, Bogota, Colombia

EXHIBIT B

EXHIBIT B, p. 1
Declaration of Vance Vredenburg
February 23, 2011, 11:01am
Southeastern Shore of Horse Stable Pond, Sharp Park Golf Course

EXHIBIT B, p. 2
Declaration of Vance Vredenburg
February 23, 2011, 11:01am
Southeastern Shore of Horse Stable Pond, Sharp Park Golf Course

Wild Equity Institute v. City and County of San Francisco,

No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 4

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **DECLARATION OF JEWEL SNAVELY**

I, Jewel Snavely, declare as follows:

1. I am a former resident of Pacifica, California, residing within a few miles of Sharp Park. I am a member of the Wild Equity Institute. While residing in Pacifica in 2010-2011, I visited Sharp Park to monitor golf course compliance plan activities. While observing activities in the Park I kept contemporaneous records of what I observed. I have relied on these records in preparing this declaration.

2. On February 9, 2011, from 5:00am until 8:00am, I monitored Compliance Plan activities at Sharp Park Golf Course. At 6:45am, I observed a lawn mower operating on hole 9. Although I was present since 5:00am, I did not see a biological monitor survey the area before the mowing occurred.

3. On February 21, 2011, I monitored Compliance Plan activities at Sharp Park Golf Course. The water level was extremely high this day. The pumps at Sharp Park Golf Course were pumping out large amounts of water. The force of the water had caused severe erosion of Sharp Park Beach near the outfall pipe. On this day I discovered a California red-legged frog egg mass that near the surface of the water at Horse Stable Pond. I was concerned that this egg mass might become exposed to the air if the pumping continued. Attached as Exhibit A are

several photographs I took of the pumping operations, the beach erosion, the California red-legged frog egg mass, and the water level gauge at the Sharp Park Golf Course pump house.

4. On February 28, 2011, I monitored Compliance Plan activities at Sharp Park Golf Course. I observed a lawn mower near hole 17. I did not observe a biological monitor walking in front of the mower at any time. While I was there, the Pump House was turned on, and water was pumped from Horse Stable Pond. Attached as Exhibit B are photographs of the pumping operation and the lawn mower.

5. On March 1, 2011, from 5:30am until about 7:00am, I monitored Compliance Plan activities at Sharp Park Golf Course. At 6:05am, a lawn mower was operating on hole 14, and mowed towards hole 13 near the edge of the water of Laguna Salada. I did not observe a biological monitor surveying hole 14 or 13 before they were mowed. After sunrise, I went to view egg masses near from land near Horse Stable Pond. I relocated the egg mass I first discovered on February 21, 2011. The egg mass was completely exposed to the air, and it was partially frozen. Attached as Exhibit C are contemporaneously made photographs of the egg mass and the water gauge at the pump house.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on this 23rd day of September, 2011. s/Jewel Snavely

Jewel Snavely

I, Brent Plater, hereby attest that Jewel Snavely's concurrence in the e-filing of this document has been obtained.

Executed on: September, 23 2011 Brent Plater

Brent Plater

EXHIBIT A, p. 1
Declaration of Jewel Snavely
February 21, 2011 2:58pm
Sharp Park Golf Course Pump House Outfall Pipe

EXHIBIT A, p. 2
Declaration of Jewel Snavely
February 21, 2011 2:28pm
Sharp Park Golf Course Pump House Outfall Pipe Erosion

EXHIBIT A, p. 3
Declaration of Jewel Snavely
February 21, 2011 2:29pm
Sharp Park Golf Course Pump House Outfall Pipe

EXHIBIT A, p. 3
Declaration of Jewel Snavely
February 21, 2011 12:58pm
Sharp Park Golf Course Pump House Outfall Gauge

EXHIBIT A, p. 4
Declaration of Jewel Snavely
February 21, 2011 12:58pm
California Red-legged Frog Egg Mass at Southeastern Horse Stable Pond

EXHIBIT B, p. 1
Declaration of Jewel Snavely
February 28, 2011 11:33am
Lawn Mower, Hole 17, Sharp Park Golf Course

EXHIBIT B, p. 2
Declaration of Jewel Snavely
February 28, 2011 11:45am
Pump House Outfall Pipe, Sharp Park Golf Course

EXHIBIT B, p. 3
Declaration of Jewel Snavely
February 28, 2011 11:46am
Pump House Outfall Pipe, Sharp Park Golf Course

EXHIBIT C, p. 1
Declaration of Jewel Snavely
March 1, 2011, 6:59am
Sharp Park Golf Course Pump House Gauge

EXHIBIT C, p. 2
Declaration of Jewel Snavely
March 1, 2011, 7:00am
California Red-legged Frog Egg Mass at Southeastern Horse Stable Pond

Wild Equity Institute v. City and County of San Francisco,

No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 7

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **DECLARATION OF WENDY DEXTER**

I, Wendy Dexter, declare as follows:

1. I am submitting this declaration in support of plaintiff's motion for preliminary injunction. I am the President and Principal Biologist at Condor Country Consulting, Inc., a biological consulting firm I founded ten years ago. For the past twenty years I have worked professionally as a wildlife biologist, with an emphasis on herpetology, i.e., the study of amphibians and reptiles. Through my work I have conducted special-status species surveys and prepared biological reports for projects requiring permits from federal and state agencies, including Endangered Species Act permits from the United States Fish and Wildlife Service. In this capacity, I have provided my expertise to many public entities, including the San Francisco Public Utilities Commission, Caltrans, San Mateo County Public Works, and many other public agencies.

2. I received a B.S. in Environmental Planning and Management from U.C. Davis in 1990, and completed my graduate coursework in Biology at California State University at Hayward in 1998. Sam McGinnis, PhD. was my major professor and under his tutelage I worked on several research projects collecting data on the San Francisco gartersnake (*Thamnophis sirtalis tetrataenia*, SFGS) and the California red-legged frog (*Rana draytonii*, CRLF). I am a member of several professional organizations, including the Wildlife Society, the Society for

Conservation Biology, and the Society for the Study of Amphibians and Reptiles. More detailed information about my work with the species at issue can be found in my resume, which is attached as Exhibit A.

3. I am one of a small number of professional biologists permitted by both the United States Fish and Wildlife Service and the California Department of Fish and Game to carry out recovery actions on the San Francisco gartersnake. I am therefore one of a few individuals authorized to study and implement recovery actions for this subspecies. I am also permitted to work with the California red-legged frog and other federal and state-listed threatened and endangered herpetofauna (reptiles and amphibians) by these agencies.

4. I have conducted several projects on lands where the San Francisco gartersnake and the California red-legged frog have been found, logging hundreds of hours searching for, identifying, and monitoring these species during all life stages. For example, I have performed population studies of SFGS at Pescadero Marsh State Park, Crystal Springs Reservoir, and West of Bayshore. I have participated in habitat enhancement efforts including pond construction, dredging of aquatic habitat, and vegetation management and enhancement at several other sites throughout San Mateo County. In addition, I have trapped or performed visual surveys for SFGS at seven other locations. All but two of these projects also included either studying, protecting, or enhancing habitat for California red-legged frog as well. I have spent hundreds of hours observing, trapping, netting, capturing, relocating, and surveying for this frog in counties throughout its range. In the process of performing these projects I have discovered new populations of CRLF. I have also assisted in the discovery that CRLF tadpoles can overwinter, and that female CRLF can vocalize when frightened or when desiring release during amplexus (an egg-laying position where the male frog holds the female from behind in order to fertilize eggs as they are layed). Both of these life history characteristics were undocumented prior to

work on a project in Contra Costa County where I and my colleague Jeff Alvarez first observed these phenomena.

5. In addition to field research, I have studied historic species accounts and almost all peer-reviewed journal articles and books that address life history aspects of SFGS and CRLF, in addition to various master's theses, Environmental Impact Reports, habitat assessments, Biological Opinions, and Biological Assessments that contained information or opinions on these species. I have reviewed historic accounts of SFGS in Wade Fox's papers, and of CRLF in Storer's 1925 A Synopsis of the Amphibia of California.[1]

6. I am an expert in identifying the herpetofauna of the greater Bay Area, particularly closely related species, in all life stages. I am also an expert in the habitat and ecological needs of Bay Area herpetofauna.

7. Part of my profession is to determine project impacts on threatened and endangered species. In the course of my career this work has prompted literature review and synthesis on a variety of threats that could affect the California red-legged frog and the San Francisco gartersnake. This research has focused on topics such as wildlife mortality associated with vehicle collisions on roads (specifically focusing on frogs, salamanders and snakes), noise and nighttime lighting impacts on sensitive bird and bat species, vegetation management impacts to herpetofauna and avian species, ground disturbance impacts to a host of species that live underground for some portion of the year (including CRLF and SFGS), impacts associated with the introduction of invasive non-native fauna, as well as large scale impacts associated with converting habitat to development. I have studied and observed threats to individual animals, such as activities that directly "take" or injure and kill these animals, and activities that impair

[1] At one time California red-legged frogs were considered a subspecies. However, because these two species do not overlap at Sharp Park, observations from areas where only one of the two species are found that predate our current understanding of taxonomic classifications can be useful in understanding the California red-legged frog.

important aspects of their life history through habitat conversion and modification associated with flood control, water management, land clearing, construction, and vegetation management.

8. Another part of my profession is to ensure that endangered species permits under state and federal law are properly applied for, obtained, and complied with. I have worked on many projects that have required incidental take approval from the U.S. Fish and Wildlife Service under the Endangered Species Act, and I am very familiar with these permitting processes. I have worked on projects that have had a federal nexus and therefore may be permitted through the Section 7 Consultation process, under the ESA, and on projects like Sharp Park that do not have an obvious federal nexus and require a Section 10 habitat conservation plan in order to obtain incidental take authorization. For example, I worked on a small project that had both frog and snake impacts, but had no federal nexus because the applicant was claiming no impact to Army Corps of Engineers jurisdictional waters. A majority of my work consists of assisting clients with permitting projects under existing HCPs, through Section 7 Consultation, or in the odd case where both Section 10 and Section 7 Consultation are required. This experience includes permitting dozens of projects that had the potential to impact CRLF or SFGS.

9. Based on my professional experience and expertise with CRLF and SFGS, in 2009, I was invited by the City and County of San Francisco to participate in a “peer-review panel” to discuss the City’s Conceptual Restoration Alternative Plan for Sharp Park. I was surprised by the unequivocal opinions given by the City and its consulting biologist, because they were not consistent with my understanding of the basic habitat and ecology needs of SFGS and CRLF. The opinions expressed also differed from my understanding of potential impacts associated with activities such as pumping water, mowing, and vehicle operation. My experience and understanding of San Francisco’s current and proposed land management activities at Sharp Park, in addition to my professional experience described above and my specific field and

research experience and study at Sharp Park described below, form the basis of my opinions in this declaration.

10. My experience regarding the land management activities employed at Sharp Park is as follows:

- I have witnessed SFGS basking early in the morning on a gravel road on a cold, but sunny day in mid-October.
- I reported and examined an SFGS that was killed by a vehicle traveling on a construction site as slow speeds. The driver had received species awareness training and direction on procedures necessary to keep from hitting snakes.
- I spent dozens of hours monitoring vegetation removal in and around SFGS aquatic habitat and I have a keen awareness of how difficult the snake is to detect, how quickly they can move in or out of an area, and how difficult it is to remain alert and vigilant to the task at hand when an animal has not been seen for hours or days.
- I had a project where a client was considering installing a golf course on their property, which also contained SFGS. I spend a considerable amount of time researching and considering how this might be accomplished for a subpecies listed as "fully protected" under the California Fish and Game Code, but could not conceive of a golf course where no take would occur.
- I have worked on many projects where CRLF were present, often in more than one life stage (e.g. adults and tadpoles), where pumping was required. My experience with these projects included assisting with the pump cage design and monitoring the cage to be sure that no animals were trapped on the mesh. Through these experiences I have found that unless there is a vigilant monitor clearing the fine mesh screen and very low water velocities, tadpoles become entrained and either are sucked through the pump and killed or they are sucked against the mesh and die because they cannot

free themselves. All of these projects had take permits, but none of them attempted to draw down the water in the pond during the timeframe when eggs or very small tadpoles would be in the water.

11. The San Francisco gartersnake, a subspecies of the common gartersnake (*Thamnophis sirtalis*), is a non-venomous snake that ranges throughout suitable habitat in San Mateo and extreme northern Santa Cruz Counties. Historically it occupied sag ponds along the San Andreas Fault and other quiet freshwater habitats and adjacent uplands within its range. Because of its limited range and the destruction of much of its aquatic habitat along the San Andreas Fault, SFGS has long been listed under both the federal and state endangered species acts, receiving protection as early as 1967 under the precursor to the federal endangered species act. SFGS is listed as endangered under both acts and is also classified as "fully protected" under the California Fish and Game Code. This status allows for no take or permits for take except for the purpose of scientific research and recovery.

12. SFGS is a slender snake with colorful stripes running the length of its body. The dorsal stripe is a very pale blue-green bordered by black stripes then red and black again. The head is red and the ventral surface (belly) is turquoise. SFGS can grow to be over four feet in length. These snakes are generally active during the daytime when not in hibernation (during cold winter weather) though they are known to emerge from burrows opportunistically on unseasonably warm days. They are often found around ponds and marshes, where they will readily retreat into the water and hide among emergent vegetation (e.g. cattails, tules, and sedges) when disturbed. However, this subspecies also spends considerable time in nearby upland areas such as grasslands and in rodent burrows, where they likely overwinter. This snake typically eats frogs,

especially Sierran treefrog[2] (*Pseudacris sierra*) and California red-legged frogs and other amphibians, as well as small fish. SFGS are live-bearing, typically giving birth to an average of between 12 and 18 young June through September. Young have the same coloration and patterning as adults, and are typically observed first when about the size of a pencil. Telemetry studies performed by Larsen (1994) and McGinnis (2002) reported upland use by SFGS that ranged on average from one to two hundred meters from aquatic habitat and preferred winter burrows. Upland areas provide habitat for basking, breeding, and retreat from predators. Low, dense vegetation and burrows are essential to the snake's ability to escape predation in uplands. Burrows also provide suitable locations for hibernation.

13. I am very familiar with Sharp Park. I have visited Sharp Park, and based on my experiences there and review of all available reports, it is my professional opinion that Mori Point and Sharp Park constitute *one* population of the SFGS and *one* population of the CRLF that function within a complex habitat mosaic. My experiences there have also helped me understand the proximity of the mowed areas to the aquatic habitat, and to understand how predators and scavengers, as well as prey availability, may impact SFGS and CRLF populations, as well as our ability to detect these species, at the site.

14. I have also reviewed documents regarding CRLF and SFGS at Sharp Park and the surrounding lands. I have reviewed these documents with a particular interest in the differences between management approaches at Sharp Park—which conducts several activities that create a population "sink"—or habitat where death rates exceed birth rates due to poor quality habitat or impacts associated with disturbance—and management approaches at the adjacent Mori Point National Park—where a robust recovery action is ongoing, creating a population "source" for

---

[2] The Sierran treefrog has also been known as the Pacific Treefrog (P*seudacris regilla*) and the Pacific Chorus Frog (*Hyla regilla*) in the past. For the purposes of the frogs found at Sharp Park, the terms may be used interchangeably to describe the same frog species.

both species, feeding snakes and frogs back into Sharp Park, regardless of the operations that make it a sink.

15. It is my professional judgment that the San Francisco gartersnake is present at Sharp Park based on the continued observations of SFGS on the property and at Mori Point; on the fact that biologically speaking the Mori Point and Sharp Park populations are one biological unit; and because suitable habitat exists at Sharp Park wherever the golf course operations and management have not removed or degraded required elements of suitable habitat. Many studies from diverse sources indicate that SFGS has persisted at Sharp Park for many decades, and continues to do so. Wade Fox, the first biologist to systematically survey and record amphibian and reptile species at Sharp Park, found relatively large numbers of San Francisco gartersnakes at Sharp Park in the 1940s, collecting 34 specimens there during ten visits to the site in 1946. In 1978, Sean Barry observed 37 San Francisco gartersnakes near Horse Stable Pond, and an additional 46 at Mori Point (which was all upland at that time) in ten visits: indicating a persistent population at least on the southern edge of the golf course at that time. Extensive trapping in the mid- to late-80s by Dr. Sam McGinnis captured only two San Francisco gartersnakes at Sharp Park, and while subsequent surveys in the 1990s did not observe the subspecies, the San Francisco gartersnake was found at Sharp Park by the California Department of Fish and Game in 2004, including one juvenile between Horse Stable Pond and Laguna Salada. In 2005 four San Francisco gartersnakes were observed at Horse Stable Pond; in 2008, two San Francisco gartersnakes were observed at Sharp Park; and this year to date two SFGS have been observed at Mori Point. Throughout this time period, several other San Francisco gartersnakes were also observed adjacent San Francisco Public Utility Commission watershed lands.

16. San Francisco gartersnakes are difficult to find, even under favorable conditions. The subspecies is relatively small, secretive, and cryptic. In addition, its preferred habitats make

visual observation difficult. Because of this, one cannot conclude that failure to visually observe the subspecies indicates that the subspecies is not present.

17. Telemetry studies of the snake determined that they conduct their daily routines within one to two hundred meters of aquatic foraging habitat. However, forays of up to 671 meters were also recorded (Larsen 1994). In addition, in 1978 Sean Barry recaptured a snake at Mori Point that he had originally captured and marked at Sharp Park two years prior, about a half mile away. This information supports the assertion that even if Laguna Salada is not currently supporting a population of San Francisco gartersnakes, snakes will continue to move from other areas of the Mori Point/Sharp Park population to Laguna Salada and Horse Stable Pond at Sharp Park because it is suitable foraging habitat. Movement in and around Laguna Salada, Horse Stable Pond, and the canal that joins them means that the snakes are likely to be killed by mowers or golf carts at a minimum.

18. Many different golf course activities are harming the San Francisco gartersnake, both directly and indirectly. These activities include golf cart use both on and off golf cart paths, which is reasonably certain to crush San Francisco gartersnakes, and mowing, which is reasonably certain to kill both snakes and frogs with mower blades or crush them with the mower's wheels.

19. It is my professional opinion that the San Francisco gartersnake's habitat at Sharp Park has not been secured, and that the subspecies has been taken, and will continue to be taken in the foreseeable future, by the continued operations and management of Sharp Park Golf Course. As will be explained below, it is my professional opinion that these take events have occurred more frequently than observed in the past, and will continue to occur in the future unless the relief requested in this case is provided.

20. Because the snake is an obligate basker, meaning that it needs to warm itself in the sun in order to function well, it seeks open uplands adjacent to suitable foraging habitat. The cart path

and the mowed areas of the course provide suitable basking habitat. Normal daily activity for the snake occurs within about one to two hundred meters of their aquatic foraging habitat. These activities include basking, feeding, breeding, resting, and escaping predation. While visiting Sharp Park on August 28, 2011, I observed large numbers of Sierran treefrogs, a preferred prey species of the snake, along the golf course-wetland margin of Laguna Salada. Given the proximity of this abundant prey to the course, it is my professional opinion that it is likely that snakes have been and will be killed in the future by normal operation of the golf course. Though the snakes numbers seems to have drastically diminished since a survey by Sean Barry in 1978 -- likely due to adverse impact of the golf course operations -- it is reasonable to expect that snakes are almost constantly moving between and among all aquatic habitat at Sharp Park and Mori Point and that some portion of the population will forage and disperse into the Laguna Salada area, a straight line distance of less than 350 meters from one Mori Point pond. As SFGS move from Mori Point to Laguna Salada, they will be exposed to activities that can harm or kill individual snakes, including lawn mowers and golf carts. It is likely that these SFGS will be killed by these activities so long as they occur within the normal activity range of the SFGS.

21. The United States Fish and Wildlife Service stated in its 2006 Five-year Status Review of the San Francisco Gartersnake that a dead SFGS found at Sharp Park in 2005 had been killed by a golf course lawn mower. I have reviewed the photographs of this snake, read the correspondence that accompanied the file, and reviewed photos of other snakes injured or killed by lawnmowers that I found and I concur that the snake was likely killed either by the wheels and blades of a lawn mower or by another mechanized vehicle, such as a golf cart. I identified two compression wounds on the snake that could have been made by either mower or golf cart wheels, one above the tail end of the snake and one anterior to the middle of the snake that would have crushed vital organs. In addition, there are a number of lacerations along the entire length of the snake's body that are characteristic of blade cuts. These include cuts where the flaps of

skin remain and locations where large chunks of flesh were removed (mid-body) and removal of a portion of the tail.

22. In light of this evidence, it is my professional opinion that many more San Francisco gartersnakes likely have been killed by mowing and golf cart operations in the past and that more will likely be killed in the foreseeable future. However, detecting dead San Francisco gartersnakes is very difficult to do, because snake carcasses are rapidly scavenged. While visiting the site in August, 2011, I observed a red fox hunting on the golf course for more than an hour. I also observed a group of at least five ravens perched on the dead cypress trees adjacent to Laguna Salada. Both species are likely to scavenge injured, dying, or dead snakes from the golf course during the day and the fox would also take them at night. Several studies documenting wildlife mortality on roads have also quantified the percentage of mortalities not detected due to scavenging. In a study by Antworth et. al. (2005), researchers planted dead snakes in the median and on the side of a busy road and then monitored the carcasses at two-hour intervals do determine the percentage of carcasses that are missed in roadkill surveys. They used dead snakes and chicks as carcasses and found that because scavengers are so effective, there was about an 85% chance of encountering a dead snake on the road within 2 hours of the carcass being placed there. At 4 hours the chance of encounter decreased to less than 50% and after 24 hours the chance of encounter was less than 10%. So on the golf course, where scavenging is safer than on a busy road, there is likely at least a 50% chance that a snake killed there will be scavenged within 4 hours. Given that potential for decreased detection and the fact that nobody is assigned to look for dead snakes at Sharp Park, I am certain that undocumented deaths of snakes occur annually if not more frequently.

23. It is my professional opinion that mowing around the edges of Laguna Salada is reasonably certain to be killing San Francisco garter snakes. Nearly all of the areas surrounding Laguna Salada and Horse Stable Pond are mowed regularly by the golf course, very near or

immediately adjacent to the wetland edge. This leaves a very narrow band of emergent wetland habitat between the open water areas of the lagoon and the golf course links and no protected upland in which to bask, breed, or seek refuge in a burrow. Beyond this narrow band, the San Francisco gartersnake would face a very high likelihood of being taken directly by golf or mowing operations. Moreover, these habitat modifying activities eliminate cover and shelter for the gartersnake, making them more susceptible to predation events. This habitat modification is therefore leading directly to injury and death of individual animals, taking the gartersnake.

24. Upon inspecting the golf course, it is clear to me that the City is mowing aquatic vegetation, i.e., it is mowing wetland habitats that are important for the San Francisco gartersnake. This alone creates a high degree of certainty that a San Francisco gartersnake will be taken by golf course mowing operations. These areas are important habitats for San Francisco gartersnakes, and there is a high probability that lawn mowing activities there will result in take of the snake. This is in part due to the fact that, from a snake's perspective, cover equals safety, so any snake basking near or foraging in or near this habitat edge will seek cover in the edge habitat if disturbed. If that disturbance is an approaching lawn mower, the snake will feel protected by the cover even though that cover is exactly what the mower is removing. While visiting the site, large numbers of Sierran treefrogs were observed along this habitat edge, prey for the snake in the very location that may get mowed at any time.

25. Golf cart operations, both on and off golf cart pathways, are also very dangerous for San Francisco gartersnakes. Gartersnakes need to bask in the sun to regulate bodily functions such as body temperature and digestion, and the paved golf cart paths absorb and store heat, providing snakes exceptional opportunities for quick warming on cold sunny mornings, throughout the day, and even after the sun has set. Golf carts are particularly well known to cause harm to snakes, even at slow speeds. One researcher, needing dead snakes to study the effects of scavenging on roadkill detection rates, and found that golf carts killed many snakes. Snakes killed in this

manner were used as a prey source in his study (DeGregorio 2011). Golf carts can also kill snakes when they go off the pathways.

26. Because CRLF and treefrogs, both pond/pool breeders, are an important component of the snake's diet, management of aquatic habitat that affects water depth during the egg laying and maturation season can significantly affect the size of the prey population. Golf course management activities that lower water levels once eggs have been laid will leave egg masses above the water level to desiccate and die. Reduced numbers of frogs means reduced foraging opportunities for the snake and an increased risk of death from starvation or predation due to spending more time actively foraging.

27. It is my professional opinion that unless the golf course operations that cause take of the San Francisco gartersnake are halted in areas where the snake is likely to be found, the Sharp Park/Mori Point population will continue to decline, increasing the potential for the population to become extirpated. Because there are less than ten wild populations of SFGS known to exist, each contributes significantly to the genetic diversity, distribution, and viability of the subspecies. The loss of even one population would result in the subspecies becoming more critically endangered, reduce genetic diversity, decrease its distribution, and ultimately make it more vulnerable to extinction through stochastic events.

28. In my professional opinion, SFGS are likely to be found within two hundred meters of the aquatic features at Sharp Park. Activities that occur within this area such as lawn mowing and golf cart operations therefore have a highly likely to result in take of SFGS.

29. It is my professional opinion that these activities should be covered by an incidental take permit, and in this case, where there is no obvious federal nexus, through a habitat conservation planning process. The impacts associated with golf course operations require a take permit because they are precisely the kind of actions that the Endangered Species Act permitting process is designed to address.

30. After 2008, the City released a Final Draft Endangered Species Compliance Plan for Sharp Park. Upon review of this plan it is my professional judgment that the plan is unworkable and cannot reduce take to levels that would obviate the need for Endangered Species Act permits.

31. The City's compliance plan cannot eliminate take from mowing and golf operations because mowing and golf cart use within two hundred meters of Laguna Salada will still occur, putting any snake that basks on a cart path or ventures beyond the "monitored area," about 200 feet wide around most of the lagoon, in harm's way. In addition, the methods for protecting SFGS and CRLF within the "monitored area" are insufficient to avoid take. Even five minutes is plenty of time for a snake or frog to move into an area after a monitor has passed by. Having spent hundreds of hours searching for SFGS along the edge of their aquatic habitat and in uplands I have personal experience that informs my opinion that these animals are too fast and difficult to detect effectively, especially where there is any change in vegetation or change in topography. It is simply unrealistic to expect even a trained eye to detect every SFGS that will be in harm's way. These snakes are fast and wary. The compliance plan relies on biological monitors being able to scan acres of habitat with 100% reliability and certainty that all frogs and snakes will be observed, moved, or lawn mowing delayed until the subpecies are clear from danger. However, the protocol implemented cannot reach this level of certainty, and will inevitably result in an under-observance of frogs and snakes. I know from experience that maintaining that kind of focus, especially when you have not seen your target species in a long time, requires uncommon levels of discipline, motivation, and focus.

32. This is why the plaintiffs' requested relief is essential to protect the San Francisco gartersnake. It is my professional opinion that all mowing and cart use within roughly two hundred meters of the delineated wetland boundary area be prohibited, in order to provide upland habitat for basking and other essential SFGS upland activity. I believe that at minimum, this

relief should extend through trial, after which further facts useful in tailoring the relief may become available.

33. In my experience and judgment, it is also the case that these activities are precisely the kinds of activities for which HCPs are needed. HCPs are the Section 10 mechanism for obtaining a take permit when there is not federal nexus. To my knowledge, daily operation of the golf course does not require permits from the Army Corps of Engineers nor is it funded by a federal agency, the two most typical avenues for entering into Section 7 Consultation. In the absence of this nexus and with a continued potential for take, the option remaining to ensure that the golf course complies with the Endangered Species Act is preparation and approval of an HCP.

34. It is my professional opinion that Sharp Park is an extremely important recovery area for the CRLF and the SFGS. Preservation and enhancement of this area is essential for the subspecies to recover, and if areas like Sharp Park are not preserved and enhanced for the benefit of the subspecies, the subspecies may go extinct. In my opinion, the potential for Sharp Park to provide a habitat connection from Coast Side to Bay Side populations of these species is critical to the conservation and recovery of both species. Genetic interchange across these small, isolated populations, even when infrequent, may preclude dangerous levels of inbreeding, disease, and other deleterious harms that face small populations.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on this 23rd day of September, 2011. s/Wendy Dexter

Wendy Dexter

I, Brent Plater, hereby attest that Wendy Dexter's concurrence in the e-filing of this document has been obtained.

Executed on: September 23, 2011

Brent Plater

EXHIBIT A

CONDOR COUNTRY
CONSULTING, INC.

Wendy Dexter

President/Principal Biologist

Ms. Dexter has twenty years of professional experience as a wildlife biologist, emphasizing herpetology, raptor biology, and large freshwater branchiopod biology. Over the years she has gained valuable experience with local, state and federal government projects. She has provided biological documentation, Section 7 consultation, and directed special-status species surveys for various private, county, state and federal clients including the San Francisco Public Utilities Commission, San Mateo County Public Works, the Federal Emergency Management Agency, Lawrence Livermore National Laboratory/University of California, California Energy Commission, Caltrans, Contra Costa County Public Works, and the City of Hercules.

Examples of projects she has participated in include endangered species recovery actions, habitat enhancement efforts, habitat management plans, numerous road construction and realignment projects, flood control projects, construction monitoring, long-term mitigation and monitoring for a dam project, hydroelectric facility recertification, timber harvest projects, natural community conservation planning, and numerous small development projects. Her involvement with these projects included performing habitat assessments, preparing Biological Assessments and Natural Environment Studies, GIS/GPS habitat mapping, mitigation site analysis, surveys and/or trapping for San Francisco garter snake, Alameda whipsnake, California red-legged frog, foothill yellow-legged frog, California tiger salamander, fairy shrimp, tadpole shrimp, western pond turtle, numerous raptors, bats, small mammals, and fish. She has also prepared habitat assessments, biology sections for CEQA and NEPA documents, and managed formal Section 7 consultation with NMFS and USFWS regarding salmonids, spotted owls, and other federally listed species.

EDUCATION

University of California, Davis
B.S., Environmental Planning and Management, 1990
California State University, Hayward
Biology, graduate coursework complete, 1996-1998

EXPERIENCE

- **Principal**, Condor Country Consulting, Martinez, CA (07/01-Present)
  Responsible for all aspects of a biological consulting business. Projects include managing large-scale biology surveys, monitoring, and mitigation projects. She has worked on projects with foothill yellow-legged frog, fairy shrimp, California red-legged frogs, San Joaquin kit fox, burrowing owls, California tiger salamander, small and large mammals, fish, Swainson's hawk, California and Northern spotted owl, Alameda Whipsnake and San Francisco garter snake. She is USFWS permitted for work with California red-legged frog, California tiger salamander, listed branchiopods, Alameda Whipsnake, and San Francisco garter snake.
- **Project Biologist**, Impact Sciences, Oakland, CA (06/00-06/01)
  Responsible for preparation of numerous CEQA documents for a wide variety of projects across northern and southern California. Directed habitat assessments and special status species surveys. Biological work within California included work pertaining to the following species: California red-legged frog, western spadefoot, California tiger salamander, Tehachapi slender salamander, yellow-blotched salamander, San Joaquin pocket mouse, vernal pool tadpole shrimp, and several species of fairy shrimp.
- **Wildlife Biologist**, MSE Group, Oakland, CA. (01/00 – 05/00)

Responsible for supervision and coordination of biological monitoring activities for the BART extension to the San Francisco International Airport on the West of Bayshore property. Supervised six biologists in providing monitoring for various construction activities. Coordinated with several levels of environmental compliance monitors, the US Fish and Wildlife Service representative, and the California Department of Fish and Game representative. Monitored construction activities for compliance with the biological opinion and other inter-agency agreements. Trapped work areas for San Francisco garter snakes. Captured and relocated California red-legged frogs and other animals in harm's way.

- **Wildlife Biologist**, URS Greiner Woodward Clyde, Oakland, CA. (10/97-01/00)
  Responsible for preparing documents and permits for varied projects requiring NEPA and CEQA compliance. These include biological assessments, natural environment studies, and mitigation plans. Practiced in compliance with the Federal and California Endangered Species Acts, the Migratory Bird Treaty Act, and other regulations relevant to the protection of biotic resources. Consulted with federal and state wildlife agencies on two FEMA projects in Mendocino County.
- **Research Assistant**, California State University, Hayward, Foundation. (2/96-6/98)
- **Teaching Assistant**, California State University, Hayward. (9/96-6/98)
- **Wildlife Biologist**, Jones and Stokes Associates, Sacramento, CA. (11/94-10/98)
- **Field Biologist**, North State Resources, Redding, CA. (6/94-11/94
- **Field Biologist**, Beak Consultants, Kirkland, WA. (6/93-8/93)
- **Wildlife Biology Technician**, U.S.D.A. Forest Service, El Dorado National Forest, Amador Ranger District, Pioneer, CA. (4/90-11/93)

SPECIAL STATUS SPECIES PERMITS

U.S. Fish and Wildlife 10(a)(1)(A) Permit for San Francisco garter snake, California tiger salamander, all listed Branchiopods in California, California red-legged frog, and Alameda Whipsnake.

California Department of Fish and Game Scientific Collecting Permit and MOU for San Francisco garter snake, Alameda Whipsnake, California tiger salamander, and California red-legged frog work under federal permit.

PROFESSIONAL MEMBERSHIPS

- The Wildlife Society, Western Section
- Society for Conservation Biology
- Society for the Study of Amphibians and Reptiles

CERTIFICATIONS/TRAINING

- Proficient use of Trimble Global Positioning System, ArcView GIS, and Microsoft Word/Excel. Comfortable with Macintosh and PC environments.
- Aerial Photograph Interpretation, 1992, USDA Forest Service, Placerville, CA.
- Wild Animal Handling and Restraint, 1991, California Dept. of Fish and Game, Sacramento, CA.
- Basic Firefighting, 1990, Sierra Community College, Placerville, CA.

Wild Equity Institute v. City and County of San Francisco,

No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 6

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **DECLARATION OF MARC HAYES, PH.D.**

I, Dr. Marc Hayes, declare as follows:

1. I am submitting this declaration in support of plaintiff's motion for preliminary injunction. For nearly four decades, I have worked professionally as a research and field ecologist and herpetologist, studying reptiles and amphibians in California, Oregon, Washington, Mexico, Costa Rica, and Florida. During this time, I have supervised over 70 projects addressing the ecology and habitat needs of the herpetofauna of these areas, working with the California Department of Fish and Game, the United States Fish and Wildlife Service, the California Academy of Sciences, and diverse other public and private entities. My studies have resulted in over 120 peer-reviewed publications and reports over my career. I am a member of the following professional scientific organizations: American Society of Ichthyologists and Herpetologists (life member), The Herpetologist's League (life member), The Wildlife Society (associate member), Society for Northwestern Vertebrate Biology (life member), Society for Conservation Biology (life member), Society for Integrative Biology (life member), Societas Europea Herpetologica (life member), Society for the Study of Amphibians and Reptiles (life member), Desert Tortoise Council (life member), and the Association of Zoos and Aquariums (associate member).

2. I received my Bachelors degree in biology in 1972 from UC Santa Barbara, my Masters in Biological Sciences in 1975 from California State University, Chico, and my PhD in Herpetological Ecology in 1991 from the University of Miami, Florida. Currently, I serve as an Adjunct Professor at each of Central Washington University (Ellensburg, WA), The Evergreen State College (Olympia, WA), Portland State University (Portland, OR), and the University of Washington (Seattle, WA); I am also an Affiliate Curator in Herpetology at the Burke Museum at the University of Washington; and I serve as a Senior Research Scientist with the Washington Department of Fish and Wildlife ("WDFW"). In 2010, I received the prestigious Conservation Award from WDFW, the highest award the department grants, specifically for my work on amphibian conservation. More detailed information about my research can be found in my curriculum vitae, which is attached as Exhibit A.

3. My research and field experience have been particularly focused on rare and endangered amphibians and reptiles in California. In 1994, I co-authored a 255-page report for the California Department of Fish and Game (CDFG) entitled *Amphibians and Reptiles of Special Concern in California.* That report, which was a compilation of the status and threats facing all rare amphibians and reptiles in the state, was designed to help guide CDFG in making determinations of whether these species were eligible for protection under state or federal law.

4. In the course of that work, we discovered that the California red-legged frog, *Rana draytonii*, was facing severe threats, it had suffered a marked contraction in its geographic range over the preceding century, and remaining populations were at risk due to a suite of factors, and yet it remained unprotected by federal endangered species law. We therefore submitted a petition to list the species under the federal Endangered Species Act to the United States Fish and Wildlife Service. This petition ultimately led to the current listing of the frog as Threatened under the Endangered Species Act.

5. I have also conducted numerous field studies on the California red-legged frog, logging hundreds of hours searching for, identifying, and monitoring the species during all stages of its life cycle. For example, from 1974 to 1983, I studied populations of the CRLF in Corral Hollow (San Joaquin County), Pico Creek (San Luis Obispo County), and Cañada de la Gaviota (Santa Barbara County). From 1988 to 2002, I studied the last remaining CRLF population in southern California south of Los Angeles at Cole Creek on the Nature Conservancy Santa Rosa Plateau Preserve (Riverside County).

6. Besides field research, I have studied historic species accounts, laboratory specimens, and popular writing about California's frogs and snakes, with a particular emphasis on the California red-legged frog. I have reviewed specimens and historic accounts in the American Museum of Natural History in New York, the Burke Museum at the University of Washington, the California Academy of Sciences in San Francisco, the California State University Chico Vertebrate Museum, the Carnegie Museum in Pittsburgh, the Los Angeles County Museum of Natural History, the Museum of Comparative Zoology at Harvard University, the Museum of Vertebrate Zoology at the University of California at Berkeley, the Museum of Zoology at the University of Michigan, the Oregon State University Vertebrate Museum, the Portland State University Vertebrate Museum, the San Diego Museum of Natural History, the Slater Museum at the University of Puget Sound, the Southern Oregon State College Vertebrate Museum, the University of Kansas Vertebrate Museum, and the Smithsonian and its Archives in Washington, D.C. I have published many of these studies in peer-reviewed journals, including studies that have explained the historic overharvest of CRLF in California revealing that humans, not American Bullfrogs, as previously supposed, were the primary reason for the decline of the species near the turn of the 19th century. I have also demonstrated that the decline of ranid frogs in the North American west is generally better explained by introduced fishes than introduced American Bullfrogs; and that differences in the vocal sac was the first strong indication that two

species (now called California and northern red-legged frogs) existed within what was formerly simply termed red-legged frogs.

7. More generally, I have been active in research and field study of many frog species in the family *Ranidae*, to which the California red-legged frog belongs. These frogs are sometimes called “true frogs.” True frogs share many similarities, and therefore, lessons learned from one species can help scientists understand the habitat needs of other ranid frogs, while gaining a better understanding of each species’ unique evolutionary path. For example, I have studied the ecology and distribution of the stream-dwelling Foothill yellow-legged frog (*Rana boylii*) in western Oregon and shown that it has also sustained a severe contraction in its geographic range over the last 100 years, and that introduced fishes, especially Smallmouth bass (*Micropterus dolomieu*), better explain this species' regional disappearance than do American Bullfrogs.

8. My research has also addressed reptiles in California, including rare and endangered snakes. For example, I observed and recorded information on the San Francisco gartersnake (“SFGS”) in the course of my studies of the California red-legged frog at Pescadero Marsh. Those studies suggest that the SFGS is seasonally dependent on California red-legged frog juvenile production as a summer food resource.

9. Through my research and study, I have become an expert in identifying frog and snake species, particularly closely related species, in any and all life stages. I can readily identify egg, larvae, juvenile, and adult phases of all California frog species and eggs, juveniles, and adults of all California snake species through visual inspection, aural calls (typically only applicable to frogs and toads), habitat range, and habitat characteristics.

10. My research and study has also made me an international expert in the habitat and ecological needs of frogs and snakes, and the types of habitat modifications that threaten these species. I have studied the US federal candidate Oregon spotted frog (*Rana pretiosa*) over much of the last 20 years in the Pacific Northwest. Via extensive surveys, I have shown that this

species has probably been extirpated from the Willamette Valley floor in Oregon and across its geographic range in California. I have also shown that the Oregon spotted frog is resistant to the amphibian chytrid fungus, a pathogen known to have decimated frogs worldwide, but that Oregon spotted frogs are highly vulnerable to predation by introduced American bullfrogs because of their aquatic habits. In the region of Monteverde, Costa Rica, I worked on the entire amphibian and reptile fauna for over three years, and characterized the ecology and distribution of the over 110 species present, demonstrating marked changes in species composition across a rain- to dry-forest gradient.

11. I am also very familiar with Sharp Park, including its main aquatic habitat features: Laguna Salada, Horse Stable Pond, and Sanchez Creek. I have visited Sharp Park on several occasions throughout my career, most recently on June 25, 2011, and I have observed and studied the California red-legged frog on Sharp Park and surrounding lands. I have also reviewed all available reports, studies, and publications regarding California red-legged frog and the San Francisco gartersnake at Sharp Park and the surrounding lands, with a particular focus on frogs and snakes that have been reported injured or killed at Sharp Park, and official publications prepared by the U.S. Fish and Wildlife Service and the City and County of San Francisco. I am also familiar with restoration efforts that have occurred at Mori Point, a national park unit next to Sharp Park, and the habitat enhancements that have been implemented there for the above species by the National Park Service.

12. It is my professional opinion that Sharp Park is an extremely critical recovery area for the California red-legged frog and the San Francisco gartersnake. For imperiled species in general, their long-term survival and recovery generally depends on maintaining an adequate number of independent populations, to protect against stochastic events, disease, or other threats. Avoiding the loss of the populations of these two species at Sharp Park is essential to protect and manage this area to allow for the long-term viability of existing populations of the species and to

reestablish populations within the frog's historic range. Preservation and enhancement of Sharp Park is essential for the California red-legged frog to recover, and if areas like Sharp Park are not preserved and enhanced for the benefit of the species, and take avoided or at least minimized, the California red-legged frog may never recover.

13. The threatened California red-legged frog faces a wide variety of threats to its continued existence, and if these threats are not arrested and reversed, a high probability exists that the species will one day go extinct. By the mid-1980s, the species had already been lost from 70% of its historic range, and extirpation of a number of populations extant at that time has occurred since then. Destruction and adverse modification of the species' terrestrial and aquatic habitat is the primary reason for these declines, though this has been exacerbated by periodic extreme drought conditions over the last 25 years. The latter conditions are a poorly recognized part of climate change. In the climate change signature under which we currently exist, more extraordinary measures are necessary to protect the terrestrial and aquatic habitat for the California red-legged frog.

14. The endangered SFGS is critically imperiled, and is the most endangered serpent in North America. The species' natural range, centered on San Mateo County, is intrinsically small. However, many of the species' most important known habitats were lost to urbanization and development, and today the species is found in significant numbers in only a few fragmented locations. The species is now so rare that accurate estimation of its total population size is difficult. This is because it is inherently difficult to find rare species when few individuals are present overall, and surveys that have even one SFGS detection are therefore infrequent. This zero-inflated (i.e., an excess of zero surveys due to the species rarity) survey makes population estimation, even using mark-recapture approaches, unreliable. survey frequency makes population estimation, even using mark-recapture approaches, unreliable.

15. It is my professional opinion that the threats that caused these species to decline range-wide continue to impact both the California red-legged frog and the San Francisco gartersnake at Sharp Park. As I will explain further below, it is my professional opinion that both species are present at Sharp Park; both species have been taken – *e.g.*, killed, wounded, harmed – by the operations and management of Sharp Park Golf Course; and it is reasonably certain that both species will continue to be taken into the foreseeable future unless specific measures, as described below, are implemented by the Recreation and Parks Department. Moreover, in my experience and judgment, the appropriate and ordinary manner in which authorization for these kinds of activities is provided under the ESA is through the Section 10 permitting and Habitat Conservation Planning ("HCP") process.

16. The presence of the California red-legged frog at Sharp Park is well documented. Several publications and reports of the City and County of San Francisco have confirmed the presence of the species on the property, including the Sharp Park Conceptual Restoration Alternatives Report and biological reports prepared by the City's biological consultants. On June 26, 2011, I also personally observed adult California red-legged frogs in Laguna Salada, in Horse Stable Pond and in Sanchez Creek just above Horse Stable Pond. Attached as Exhibit B are true and correct copies of photographs of the California red-legged frog that were taken during my visit to Sharp Park on June 26, 2011. It is my unqualified professional judgment that the California red-legged frog is present at Sharp Park.

17. It is similarly my unqualified professional judgment that the SFGS is present at Sharp Park. The recorded literature shows that over 40 specimens were collected there in the mid-1940s, that similar numbers were observed near Horse Stable Pond in the 1970s, and that more recently four SFGS were recorded at Horse Stable Pond in 2005, and two more were observed in 2008. Two SFGS have also been observed at Mori Point to date in 2011, directly adjacent to Sharp Park to the South.

18. My judgment that SFGS continue to occupy Sharp Park is also based on the fact that a prey base on which the SFGS is seasonally dependent, juveniles of the CRLF, remains available at Sharp Park, though this prey base is being harmed by the Recreation and Parks Department's activities as discussed below. Moreover, many other lines of evidence indicate that SFGS continue to occupy Sharp Park. The habitat characteristics at Sharp Park, including the presence of prey species and aquatic foraging habitats, combined with the proximity to known SFGS habitats at Mori Point and San Francisco Public Utility Commission watershed lands, indicate that the SFGS continues to occupy Sharp Park.

19. Similar to many snakes, SFGS are difficult to detect, even under the best conditions. In fact, SFGS are even more difficult to detect than more inland-dwelling gartersnakes because they have shorter time windows during which they can be exposed and surface-active in the cooler, summer fog heavy, maritime conditions characteristic of much of their small geographic range. Further, those conditions are pronounced in the strongly maritime environment of Sharp Park. The species also has a relatively small overall body size, coloration that is highly cryptic in the mosaic shade and color backdrop of its preferred habitats (that is, it strongly color matches its background), and temperature requirements that allow it to be less exposed or fundamentally more secretive. In concert, these factors make visual observation of the species very difficult. Because of this, even systematic visual observations are likely to underestimate its population numbers, especially, as noted previously, when population levels are probably low.

20. Accordingly, the fact that a SFGS has not been specifically observed in Sharp Park in several years does not call into question the continued presence of the species. To the contrary, I concur with the conclusion of the City and County of San Francisco's own biologist, Karen Swaim, who concluded in a 2008 report that past "observations, the abundance of prey items in these areas, their proximity to observations of the snake at Mori Point and Horse Stable Pond,

and historical occurrence suggest that SFGS likely forage in and move through the areas around Lower Sanchez Creek, Laguna Salada, the canal, and Horse Stable Pond."

21. While both the California red-legged frog and the SFGS are present at Sharp Park, in my professional opinion unless golf course operations that cause ongoing take of these species is halted, both populations at Sharp Park may be lost, and the SFGS' entire species will be in jeopardy. In my view there are a host of activities being undertaken by the Recreation and Parks Department at Sharp Park that are harming the California red-legged frog and the SFGS, both directly and indirectly. For purposes of this declaration I will address the activities that I understand are the focus of plaintiffs' request for a preliminary injunction, activities which, as I will explain, if left unchanged are virtually certain to cause ongoing take of the species. These activities include water pumping, which leaves frog egg masses exposed to the air and entrains frog tadpoles, metamorphs or juveniles in the pumps or injures juveniles and possibly adults by plastering them against the intake screens of the pumping gate; mowing, which can kill or injure both species with their blades or by crushing them with their wheels; golf cart use both on and off golf cart paths, which can crush California red-legged frogs and SFGS; and gopher control, which both catch these species in traps made for gophers and also reduce habitat quality for the species, both of which use these holes to find shelter and hide.

A. Water Management Activities

22. When the winter rains come, the golf course at Sharp Park floods. Attached as Exhibit B are photographs of flooding events at Sharp Park. To eliminate the flooding, the golf course has installed two pumps that drain Sharp Park's aquatic features and send the water through an earthen berm and onto a relatively saline pool on a sandy beach at low tide and out to sea at high tide. It is my professional opinion that pumping operations causes take of the California red-legged frog in three distinct ways: (1) through desiccation of egg masses; (2) through

entrainment in the pumps; and (3) through modification of habitat in Sharp Park water bodies. Pumping is also reasonably certain to be taking SFGS.

23. **Egg Desiccation**. The California red-legged frog is the largest frog native to the west. Like all true frogs, the species requires aquatic habitats in which to breed, lay eggs, and for tadpoles to develop, metamorphose into juveniles, and become adults. Under normal conditions, the frog will lay its eggs during late winter rains, and attach its egg masses to aquatic vegetation near the high water mark. If the water levels are of sufficient depth and duration, the eggs will hatch, tadpoles will emerge and feed, and eventually become adults.

24. By pumping water from Sharp Park Golf Course during the rainy season, the golf course exposes California red-legged frog egg-massed to the air, causing these eggs to desiccate or become stranded, and the animals will die. I base this conclusion on my decades of work on the species, my understanding of the Recreation and Parks Departments' egg mass monitoring data, as well as my review of reports published by the City and County of San Francisco. I concur with the view expressed in the Conceptual Alternatives Report, which explains (at page 39) that at Sharp Park, when "the water levels drop, these egg masses can be stranded on dry ground and desiccate," and that "[e]ven if water persists long enough for eggs to hatch in these areas, most tadpoles would have limited mobility in the dense vegetation in the marsh area and may be stranded well before metamorphosis."

25. California red-legged frogs attach their eggs to a vegetation brace near the water surface because it ensures higher survivorship at hatching.[1] Because the eggs are attached at a particular

[1] Survivorship is increased because attaching eggs to vegetation lower in the water column (a) greatly increases the probability of exposing eggs to a lower dissolved oxygen environment; (b) greatly increases the probability of increasing shading on the eggs (the quantity of light declines with water depth and its quality changes, shorter wavelengths [for example, the red end of the visible spectrum, penetrates less deeply]), which makes it more likely that lethal fungi will become established (wavelengths in the UV spectrum inhibit fungal growth); and (c) greatly increases the probability that salinities lethal to embryos will be encountered in an environment like Laguna Salada, where there is a clear increase in salinity with depth).

point on aquatic vegetation, they have limited ability to rise and fall with water levels, and it does not require much lowering of water levels to strand CRLF eggs. Pumping therefore puts CRLF egg masses at high risk of being killed. When pumping occurs during the peak-breeding season, an entire annual cohort (generation) of California red-legged frogs can be jeopardized at once. Peak breeding season corresponds with the times that the golf course floods, and therefore every year with sufficient rains it is virtually certain that the golf course pumping operations will take California red-legged frog eggs.

26. **Entrainment in pumps**. The second way that the pumping operations inevitably cause take of the California red-legged frog is by entraining tadpoles or other mobile life stages of the species in the pumps as they suck water from Horse Stable Pond out to sea. I have reviewed documents indicating that the City has long known that the massive amounts of water sucked from Horse Stable Pond have a high degree of probability of entraining California red-legged frogs. On June 25, 2011, during a visit to Sharp Park, I personally observed an adult California red-legged frog on flotsam that had accumulated immediately adjacent to the debris grate to the inflow compartment of the Sharp Park pump house in Horse Stable Pond. Attached as Exhibit C is a copy of a photograph of that frog in this location. Had the pump been turned on with any frog life stage adjacent to this debris grate, it would be at high risk of entrainment. Entrained animals small enough would go through the grate, and if they survived the sheer stress of moving through the outflow pipe, would be swept into inhospitable (saline) habitat in the pool below the outflow pipe on the upper beach. If they were too large to go through the grate, such as an adult California red-legged frog might be, they would be plastered against the grate until the suction was reduced when the pump was shut off. An animal remaining plastered to the grate for too long an interval (that is, the pump remaining on continuously for a long time) would likely either drown if it was beneath the water line or be irreversibly injured because it was unable to do the normal buccal pumping (a movement of its throat muscles) required for it

to ventilate its lungs. The latter would deprive the Frog of sufficient oxygen. I have observed several individuals of a closely related species, the northern red-legged frog (*Rana aurora*), die because they were plastered to a grate with similar-sized mesh through which they were only moderate flows, and based on the capacity of the pumps at Sharp Park (over 25 CFS) the same fate would befall the California red-legged frog.

27. It is also my professional opinion that it is virtually certain that California red-legged frog tadpoles have been taken, and will continue to be taken, by the Sharp Park pumping operations as they are drawn into the pump and spewed out to sea. Crayfish are strong swimmers and have a hard exoskeleton. Fish are also strong swimmers and have robust bone structure. I have reviewed documents reflecting that both of these have been observed sucked through the pumps at Horse Stable Pond. Attached as Exhibit D is a photograph of a freshwater crayfish observed inside Sharp Park's outfall pipe. The crayfish could only have gotten here by being pumped through the pump house. California red-legged frog eggs and tadpoles, on the other hand, are gelatinous to cartilaginous, and tadpoles are weak swimmers, particularly during the very early stages of development. Since strong swimming species such as crayfish and fish have been observed dead after being sucked through the pump house, it is reasonably certain that tadpoles are also sucked into the pump house under the same or weaker forces.[2]

28. **Habitat modification**. The third way the pumping operations cause take of the California red-legged frog is by keeping the aquatic habitats artificially shallow. These shallow conditions promote the growth of cattails and tules, aquatic plant species that cannot tolerate deeper water conditions. Over the years, Sharp Park's aquatic features have become encroached

[2] Because tadpoles, and in particular recent hatchlings, are extremely delicate, it is highly likely that once the tadpole enters the pump, it will be shredded or torn into unidentifiable pieces before these pieces are spewed to the beach. The bony structures of fish and crayfish, on the other hand are likely to remain at least partially intact through such trauma, making them much easier to observe and, in my professional opinion, good indicators of take of the California red-legged frog in this manner.

by these two plant species, greatly reducing the amount of open water, floating or low emergent vegetation habitat available for the frog – and snake – to breed and feed. This reduces the overall habitat quality for these two species, and reduces the habitat footprint needed for individual frogs and snakes to perform the behaviors they require for survival, behaviors like breeding, feeding, and sheltering. It is my professional opinion that this encroachment, which is really a promotion of succession in a coastal lagoon system that would not otherwise exist at present, is a direct consequence of the golf course's ongoing pumping of Sharp Park Golf Course. Lagoons along the coast of California typically have a stream dynamic, largely through winter high flows, that renews their open water habitat footprint. Laguna Salada is a historic lagoon, where its system dynamics are already constrained to varying degrees. Although these constraints might be expected to alter the lagoon over a long timeline (many decades to a few hundred years), the pumping pattern from Horse Stable Pond has rapidly accelerated he timeline for this encroachment, impairing the species' habitat in a manner that is directly impacting the species' breeding, feeding, sheltering and other essential life functions in a such a manner as to result in the death or injury of individual frogs.

29. These same consequences of the City's water management activities at Sharp Park are also reasonably certain to take the SFGS. First, by destroying egg masses, and in turn, reducing the number of California red-legged frogs in the Park, the pumping reduces the available prey base for the Snake in such as a manner as to reduce the prospects for survival of individual Snakes that depend on the site. Second, Snakes may also become plastered against the grate – or juveniles sucked through the grate – just as with the Frog. Third, as noted, these activities adversely modify the Snake's habitat in such a manner as to limit the ability of the Snake to feed, breed, and engage in other critical life functions.

30. It is my understanding that the City has prepared an "Endangered Species Compliance Plan" ("Compliance Plan") for Sharp Park, which I have reviewed. It is my professional opinion

that, even if the Compliance Plan were fully implemented, take of California red-legged frog egg masses is nonetheless reasonably certain to continue through pumping-promoted desiccation and other means. Moreover, based on records of pump management and operations I have reviewed, my own observations of Sharp Park, and my professional opinion, I believe that the City is not implementing, and cannot actually implement the Compliance Plan.

31. As an initial matter, the Compliance Plan is predicated on the City's ability to manage water levels to avoid desiccating frog egg masses. The inadequacy of this premise was made clear this past winter, when more than one hundred California red-legged frog egg masses were put at risk of desiccation, and at least one egg mass was killed by the pumping operations at Sharp Park, despite the Compliance Plan protocols.

32. It is my understanding, based on City records, that beginning in January, 2011, Recreation and Park Department staff Jon Campo was required to move over 100 egg masses which he concluded would be stranded and desiccate if left in place. I have also reviewed photographs of an egg mass was that was documented in Horse Stable Pond completely exposed to the air, and was ultimately found completely desiccated and partially frozen.

33. All of these egg mass strandings occurred despite the Compliance Plan, because the pumps do not pump water as fast as the rain flows into the system, causing floodwaters to rise above the level at which the Compliance Plan holds the water must be retained. As the pumps draw the water back down to the original water level, any frog egg mass that is laid during the interim will be stranded and die. Because it can take days for the water to be drawn down from a large storm, many California red-legged frog egg masses that were laid under high water conditions will be exposed to the air, even though the Compliance Plan would be functioning as designed. In addition, because the Compliance Plan allows, indeed commands, so much water to be pumped out to sea, the water that remains to secure egg and tadpole development is reduced. If a large rain event is followed by an extended drought, the buffer of rain water provided by the

initial storm event will have been eliminated, and the frog eggs and tadpoles will be at risk of desiccation and stranding.

34. The ineffectiveness of the Compliance Plan is further exacerbated by the inadequacy of the City's approach to saving egg masses by moving them, which cannot eliminate the reasonable certainty of ongoing stranding and desiccation of egg masses. In particular, this approach relies on perfect observation data by biological monitors as they search for California red-legged frog egg masses in the tules, cattails, and bulrushes around Sharp Park's many acres of waterways, ponds, and canals. However, even with attached, essentially immobile life stages like eggs, it is not possible to detect all of the egg masses, or even estimate their individual detectability rate (a condition necessary to estimate egg mass abundance), using single-pass surveys. It is my understanding, based on testimony produced in this case, that Mr. Campo agrees that he cannot observe all egg masses due to several observation constraints, and that he has explained this to his supervisors previously. I concur with this sentiment. In my extremely broad field experience with amphibians and reptiles, I know that detecting the frogs and snakes present in a single-pass survey is nearly impossible to do, even where habitat complexity is extraordinarily low and the surveyor has the highest possible visibility of the habitat.

35. While it is my understanding that the U.S. Fish and Wildlife Service has authorized the City to move egg masses that are detected on an emergency basis pursuant to a permit that was issued to the National Park Service, I agree with the Fish and Wildlife Service's assessment that such activities should be approved, if at all, only through an Incidental Take Permit ("ITP") and associated Habitat Conservation Plan ("HCP"). I have broad experience working with HCPs. For example, I have been directly involved in coordinating adaptive management science involving the HCP involving the largest area of landscape of any HCP in North America, the Forests and Fish HCP in Washington State, which addresses over 9,000,000 acres of private timberlands and addresses ITPs for no fewer that seven species of amphibians in that landscape.

Based on this experience, the kind of activities occurring at Sharp Park are those requiring a ITP under an HCP.

36. Because these actions are intended to mitigate the adverse impacts caused by the golf course, rather than to aid in the species recovery, it is evident to me that these activities are not recovery actions. Even as mitigation measures, their efficacy is highly questionable. Most of the egg masses moved last winter were on the eastern and southern border of Laguna Salada, and they were moved into Horse Stable Pond. California red-legged frogs typically deposit eggs in habitats where at least some of the offspring have a high probability of survival, otherwise the species would rapidly go extinct. Movement of egg masses from Laguna Salada to Horse Stable Pond, where a number of California red-legged frog egg masses have already been laid, risks decreasing the survivorship of tadpoles in Horse Stable Pond because tadpole density has been greatly increased. Moreover, California red-legged frog egg masses are delicate, and individual eggs, and even entire egg masses, can be harmed and become unviable when they are moved. It is my understanding from the testimony produced in this case that Mr. Campo, who is charged with moving these egg masses, when he moves egg masses, he does not ensure that the egg mass is attached to a brace at the new location to which it was moved. He has also observed egg masses break apart as a consequence of the move; he has further observed that the egg masses sometimes disappear from places he has relocated them. Since a CRLF egg mass, when laid, is attached to a vegetation brace, after being moved, it must be removed from that brace and either re-attached to a new brace if in deep water or placed in shallow water to ensure survival. This is because egg masses through the first two-thirds of the developmental interval will sink (they are denser than water) in deep water if unattached, which will increase the likelihood of mortality for the reasons previously discussed. Egg masses placed in shallow water to avoid the sinking problem will risk stranding if pumping occurs or risk being moved into deeper water if unattached and any disturbance occurs.

37. In addition, because the City's practices has been to move all egg masses into Horse Stable Pond—where the suction from the pumps is highest—the egg mass movement puts tadpoles at a higher risk of entrainment and impingement. Based on my experience in participating in and contributing to ITPs and HCPs, it is clear to me that all of these and other survival and recovery-related issues all should be considered comprehensively in the appropriate regulatory process, *i.e.*, the process for considering and approving an ITP and HCP, rather than handled on an emergency, *ad hoc* basis.

38. The Compliance Plan also lacks adequate protocols to prevent impingement or entrainment of tadpoles or other mobile life stages of the CRLF. In particular, the Compliance Plan does not provide for regular observation or monitoring once pumps are turned on after egg masses hatch; it does not provide for a screening mechanism around known oviposition sites that would prevent tadpoles, particularly hatchlings, from wandering too close to the pump intake port during a pumping event; and it does not provide for some kind of velocity reduction mechanism, such as screening baffles, associated directly with the intake port to reduce the likelihood of CRLF life stages being plastered against the screen.

39. It is my professional opinion that in order to reduce the likelihood of unauthorized take of California red-legged frogs and SFGS, the Recreation and Parks Department should be prohibited from operating the pumps at Sharp Park until a decision is rendered in this matter. Prohibiting pumping will stop pump-related strandings of frog egg masses and will insure that tadpoles are not entrained or impinged.

40. Ceasing pumping would stabilize water levels at Sharp Park and allow egg masses to develop, and tadpoles to metamorphose to adult frogs before water levels decrease when the rains stop. This has been recognized by a wide variety of research, and is the appropriate conclusion based on my many years of research. I concur with the statement contained in Alternative C of the City's "Sharp Park Conceptual Restoration Alternatives Report," in which

the City's consulting biologist, Karen Swaim, concluded that "[d]iscontinuing pumping at Horse Stable Pond would be expected to result in reduced fluctuations in water level and a lower risk of egg mass desiccation. . . . Under ambient conditions, rainfall and inflow from the rest of the watershed during this period would prevent egg masses from becoming stranded above the waterline." I also concur with Ms. Swaim's recommendation in the same report that the City should "[e]liminate unnatural water level reductions during the frog breeding season."[3]

41. Discontinued pumping would also ensure that tadpoles or other mobile life stages of the Frog are not entrained or impinged by the pump, since no pumping would be occurring.

42. Discontinuing pumping would have the added benefit of improving overall habitat conditions for the California red-legged frog by limiting the growth of tules and cattails, which are currently encroaching on a large number of acres of habitat for the frog. Tules and cattails cannot grow in deep water, and they are eventually replaced by other vegetation types or open water as water levels rise. This would provide additional habitat availability for frog breeding, egg laying, and tadpole development, significantly improving habitat quality and eliminating the impediments to the California red-legged frogs' essential breeding patterns currently imposed by the golf course water management. Discontinuing pumping would also have the benefit of reducing the likelihood of saltwater intrusion into Laguna Salada, and as a consequence, increase the likelihood that CRLF would make greater use of the Laguna Salada for breeding. Water quality data collected within the last 10-year window in Laguna Salada coupled with my own direct observations of the vegetation on selected areas on the west side of Laguna Salada

---

[3] I have observed atypical water level fluctuations, the consequence of pumping, inhibit breeding in a pond used by Northern red-legged frogs and observed individuals breed in an immediately adjacent pond. Excessive water level fluctuation inhibits breeding in the stream-breeding Foothill yellow-legged frog, so it would not surprise me that atypical fluctuations might not only inhibit breeding at the appropriate time in the California red-legged frog, but it risks egg mortality from stranding after breeding has begun. Any action that minimizes water level fluctuation prior to or during breeding for the California red-legged frog would enhance its successful breeding.

strongly suggest that a salinity influence on Laguna Salada currently exists that appears to vary seasonally. Pumping is likely to exacerbate salinity to levels that would be lethal to CRLF embryos, but not frogs during their late winter-early spring breeding window.[4]

B. Mowing and Other Activities

43. Mowing and/or golf cart operations have also been documented to cause take of endangered species at Sharp Park in the past, and it is my professional opinion that these operations also are reasonably certain to result in take of California red-legged frogs and/or SFGS in the future.

44. According to the FWS's 2006 Five-year Status Review of the SFGS, which I have reviewed, a dead SFGS found at Sharp Park in 2005 had been killed by a golf course lawn mower. I have reviewed the photographs of this snake and have read the correspondence that accompanied the file, both of which are attached as Exhibit E and I concur that the snake was killed either by a lawn mower or another mechanized vehicle, such as a golf cart. The dorso-ventral compression indicated in the picture of this animal is characteristic of road-killed snakes that have been run over by a vehicle, of which I have observed many thousands during thousands of hours or road-riding for snakes in my career. However, animals road-killed by car-sized vehicles or larger, especially those the size of a SFGS, typically show extreme dorso-ventral compression, that is they are often paper thin because they have been run over by a number of large vehicles (cars, trunks, or semis) in a relatively short period of time. This animal show only a moderate amount of dorso-ventral compression, indicating that the mass of the vehicle or

---

[4] Dredging Laguna Salada to reduce its dense vegetation footprint could result in much more harm and risk to both the CRLF and the SFGS. In particular, the excavation of anoxic organic wetland soils can result in the excessive release of toxic sulfides and their acid sulfur oxidation products can subsequently become manifest. Dr. Peter Baye, an expert in ____, has explained that the "failure to address sulfide and sulfate toxicity in wetland excavation can result in extreme mortality to wildlife, and inhibition of wetland vegetation."

vehicles that ran it over was not as extreme, such as something in the mass range of a mower or a golf cart.

45. Though golf carts have traditionally been viewed as innocuous, recent work clearly demonstrates that they are responsible for substantial mortality among snakes. A 2010 study by Brett DiGregorio and his colleagues on an Outer Banks golf course in South Carolina (attached as Exhibit F), in an area where car-sized vehicle traffic is virtually non-existent, concluded that nearly all of the more than 200 snakes found road-killed in the study were killed by golf carts or lawn mowers, since no other vehicles are used on golf course grounds. Further, all direct observations by these investigations of a golf cart striking a snake resulted in the death of that snake (B. DiGregorio, *personal communication*).

46. It is reasonably certain that many more gartersnakes have been killed by mowing and golf cart operations in Sharp Park than have been documented. One of the earliest known scientific observations of a SFGS at Sharp Park was by Wade Fox in 1946. Upon finding a dead SFGS, he concluded that it was likely "killed by golfers: they probably die frequently in this manner."

47. However, detecting dead SFGS is also difficult to do, because snake carcasses are rapidly scavenged. Corvid (various species of crows, ravens and jays) and larid (various species of gulls) birds, a number of carnivores (especially foxes, coyotes) and various other species are highly opportunistic scavengers on carrion that will rapidly remove carcasses when these become available. During my two recent (2011) short (partial day) visits to Sharp Park, I observed many crows, gulls, jays, and heard ravens, and I also directly observed one or two foxes on each visit. The foxes were scavenging from human garbage, suggesting that they were food-limited. In such an environment, I would expect carcasses of either SFGS or CRLF to be available for an observer to detect for only a short time. In fact, Brett DiGregorio and his colleagues clearly demonstrated in a study currently in press (B. DiGregorio, *personal communication*) that a suite

of effective scavengers can result in substantial underestimate of road-kill mortality. My observations of the scavenger set at Sharp Park indicates that numerous effective scavengers are clearly present, so severely underestimating road-kill mortality there is the anticipated result.

48. Even if fully implemented, the City's Compliance Plan does not eliminate the reasonable certainty that take from mowing and golf operations will occur, given that the scale of mowing and golf cart use, particularly around the edge of water features, is so massive. As I understand the Compliance Plan, it relies on biological monitors being able to monitor numerous acres of habitat with 100% reliability to ensure that all frogs and snakes will be detected, moved, or mowing delayed until the species are clear from danger. However, the protocol, even if implemented faithfully, cannot reach this level of certainty; rather it is reasonably certain to be *unable* to detect all frogs and snakes present. No species of amphibian or reptile has perfect individual detectabilities, and where detectability has been measured it is typically far less than one, with snakes often having detectabilities less than 0.2 (a detectability of 0.2 simply means that for every individual you see, there are 4 other you did not observe). In addition, in imperfect detectability situations, which are the norm for amphibians and reptiles, detectability estimation to enable one to determine what is missed cannot be estimated using single-pass surveys. I cannot overemphasize that single pass surveys can never estimate detectability.

49. For these reasons it is my professional opinion that in order to reduce the risk of take of the SFGS and the California red-legged frog the Court should grant plaintiffs' request to prohibit all mowing and golf cart use within roughly 200 meters of the delineated wetland boundary area, which will provide a reasonably large swath of buffer and edge habitat that will be free from mowing and wheels that could compress and take endangered frogs and snakes. Moreover, the size of the buffer area will ensure that edge and upland habitats will extend out beyond the high water mark of flooded areas, and provide refuge, estivation and underground habitat for snakes and frogs that will not be flooded.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on this 23rd day of September, 2011. s/Marc Hayes

Marc Hayes

I, Brent Plater, hereby attest that Marc Hayes' concurrence in the e-filing of this document has been obtained.

Executed on: September 23, 2011 Brent Plater

Brent Plater

EXHIBIT A

CURRICULUM VITA

Marc Philip Hayes

Birthdate: 12 October 1950
Birthplace: Marysville, California
Nationality: American, first generation (French mother)

Specializations: I am a research herpetological ecologist. The large majority of my career has focused on the ecology of amphibians and reptiles. My work has emphasized aquatic herpetofauna; in particular, the ecology of western North American ranid frogs and Pacific Northwest stream-associated amphibians, fish-amphibian and gartersnake-amphibian interactions, and the ecology of the two Pacific coast turtle species. Most of my work also focuses on native species conservation.

Current Foci: Movement ecology of the northern red-legged frog (*Rana aurora*); the influence of predation on the movement patterns of ranid frogs; Oregon spotted frog (*Rana pretiosa*) ecology, demography and overwintering patterns; ecology of the stream-breeding Coastal tailed frog (*Ascaphus truei*); and influences of altered hydrologies on amphibian habitat use.

Education:

1991 PhD *with distinction*, University of Miami, Miami, Florida
Dissertation: Attendance in the tropical, leaf-breeding frog *Centrolenella fleischmanni* (Anura: Centrolenidae): A study in parental care.
Major Advisor: Jay M. Savage

1975 MA *with highest honors*, California State University, Chico, California
Thesis: Systematics and ecology of the California mountain kingsnake (*Lampropeltis zonata*).
Major Advisor: Frank S. Cliff

1972 BA University of California, Santa Barbara, California

1970 AA *salutatorian*, Yuba College, Marysville, California

1968 Diploma Yuba City High School, Yuba City, California

Teaching Experience:

2010 (April) Society of Wetland Scientists (SWS); Amphibian Management Workshop.

2009 (March) SWS; Amphibian ID & Habitat Assessment Workshop;.

1999 (spring) Portland State University; Vertebrate Zoology (BI 387); lecture and lab.

1999 (June) Bureau of Land Management, Klamath Falls; Workshop on Amphibian and Reptile ID and Habitat Evaluation.

1998 (June) Portland State University; Field Herpetology (BI 505); lecture and lab; techniques course.

1992-8 Portland Community College; Biology [for non-majors] (BI 101,102,103); Principles of Biology [for majors] (BI 211,212,213), and Habitat courses (BI 141[Forest], BI 142[Aquatic], BI 143[Marine]); lecture and lab in all except BI 101 and 103, where lab only.

1996	US Fish and Wildlife Service and Willamette National Forest; Workshop on ecology of the Oregon spotted frog (*Rana pretiosa*).
1996 (spring)	Workshop on the western pond turtle (*Clemmys marmorata*); US Fish and Wildlife Service.
1995 (spring)	Portland State University; Herpetology (BI 413/513); lecture and lab; team taught with Drs. Richard Forbes and Stanley Hillman.
1993 (spring)	Pacific University; Behavioral Statistics (PSY 350); lecture and lab.
1993 (spring)	Oregon Zoo; Taught a ZooUniversity course on Amphibian Ecology.
1992 (fall)	Oregon Zoo; Taught a ZooUniversity course on Arctic Ecology.
1983-1986	University of Miami; Taught the laboratory sections of courses in Elementary Ecology (BSC 103) and General Biology (BSC 111/112). [both lower division college courses.]
1978-1982	University of Southern California; As a teaching assistant, taught laboratory sections in Ecology and Evolutionary Biology (BIO 215), Fundamentals of Vertebrate Biology (BIO 302), General Biology (BIO 106L), and Genetics (BIO 210) and Humans and their Environment (BIO 102) [all lower division college courses]; and taught lecture and lab in Ornithology (BIO 477L) and Herpetology (BIO 543L). [both upper division and graduate college courses]
1976-1978	Butte College; Taught Environmental Quality Protection (ESC 200) [lecture course]; Field Biology (BIO 205), Field Botany (BIO 204), Human Anatomy (BIO 220), and Human Physiology (BIO 221) [lab and lecture for all courses], and Natural History of Butterfly Botanical Area (INP 100) [field course]. [all were lower division college-level courses].
1975 (spring)	Bureau of Land Management, northern California; Taught Amphibian and Reptile Identification/Ecology Workshop.
1974-1975	California State University, Chico; As teaching assistant, taught laboratory sections in General Zoology (BIO 107) and Human Anatomy (BIO 122) [both lower division college-level courses].

Work Experience:

2006-present	Senior Research Scientist, Science Team, Habitat Program, Washington Department of Fish and Wildlife; Expanded responsibilities addressing adaptive management research on amphibians in headwater streams; coordinate multi-state co-operation for Recovery of the Oregon spotted frog.
2001-2003	Conducted overwintering study of the Oregon spotted frog at Conboy Lake National Wildlife Refuge; Washington State Department of Transportation (sponsor).
2000-2005	Research Scientist, Science Team, Habitat Program, Washington Department of Fish and Wildlife; Primary responsibility addresses leading adaptive management research on amphibians in headwater streams to ultimately test whether the patch buffers prescribed in the statewide Forest

	and Fish Agreement are effective in protecting the resources in headwater streams through timber harvest rotations.
2000-	Bullfrog selectivity study; on-going work at Conboy Lake National Wildlife Refuge designed to determine whether bullfrogs exhibit any dietary selectivity (positive or negative), especially with respect to the Oregon spotted frog as prey; w/ Christopher A. Pearl and R. Bruce Bury, US Fish and Wildlife Service (sponsor).
2000-2001	Oregon spotted frog demographic study; on-going work at Conboy Lake National Wildlife Refuge designed to determine whether significant larger Oregon spotted frogs found at Conboy exhibit differences in growth or age population from those elsewhere, US Fish and Wildlife Service and The Wildlife Society (sponsors).
1999-2002	Coordinator and Scientific Lead; Rivergate Project; Leading 10-person team in an on-going ecosystem study of South Rivergate Corridor (Lower Columbia River) with focus on western painted turtle (*Chrysemys picta*); Port of Portland (sponsor).
1999-2002	Northern red-legged frog (*Rana aurora aurora*) movement study; work on the Tiller Ranger District of the Umpqua National Forest (southwestern Oregon) designed to determine seasonal spatial patterns of habitat utilization; w/ Christopher A. Pearl and Christopher J. Rombough, Oregon Zoo and the Umpqua National Forest (sponsors).
1999-2001	Northern red-legged frog (*Rana aurora aurora*) overwintering study; work at Burlington Bottoms (Lower Columbia River) designed to determine overwintering patterns; w/ Dr. Peter I. Ritson, US Fish and Wildlife Service (sponsor).
1996-2001	Herpetological Scientific Advisor, North Umpqua Hydroelectric Project; Scientific advisor during FERC relicensing on dynamics of hydrological modifications as influencing the amphibian and reptile fauna of the North Umpqua Hydroelectric Project; Advisor for Stillwater Sciences, Berkeley, California.
1999-2000	Oregon spotted frog/bullfrog habitat partitioning study; on-going work at Conboy Lake National Wildlife Refuge designed to determine how habitat utilization of the Oregon spotted frog and bullfrog differ; w/ Joseph D. Engler, US Fish and Wildlife Service (sponsor).
1998-2000	Co-operator on movement and overwintering study of the Columbia spotted frog (*Rana luteiventris*); w/ Dr. Evelyn Bull, Pacific Northwest Forest Range and Experiment Station, La Grande.
1998-2001	Co-operator on study of headwater stream amphibians that builds an empirically based model of amphibian response in undisturbed versus disturbed (timber harvested) situations; w/ Stillwater Sciences (consultants); NCASI (sponsor), timber industry-funded entity addressing major environmental issues.

1998-9	Oregon spotted frog overwintering study; pilot study design to identify basic overwintering patterns; US Fish and Wildlife Service (sponsor).
1996	Expert panelist; Amphibians and reptiles; Habitat-Species project; Numerous sponsors collectively led by David Johnson and Tom O'Neill, respectively, with the Washington and Oregon Departments of Fish and Wildlife.
1987-1988	Laboratory Coordinator; Organized and coordinated teaching assistants and laboratory technicians in teaching, lab prep, and testing for General Biology (BSC 111/112) at University of Miami.
1972-1997	Researcher, co-operator, participant in over 60 ecological projects for various federal, state, local and private entities.

Other Experience:

2011-	Member, Washington State Aquatic Nuisance Species Guidance Committee; committee formulates policy and addresses approaches for dealing with exotic and nuisance aquatic species.
2010**-**	Adjunct Professor, Central Washington University, Ellensburg, Washington. Serving on Committee for Brandon Fessler Masters Degree Candidate working on the movement ecology of the Coastal giant salamander (*Dicamptodon tenebrosus*).
2007**-**	Adjunct Professor, University of Washington, Department of Fisheries, Served on Committee for Amy Yahnke, who complete a Masters Degree on stillwater amphibian ecology in stormwater ponds; and serving on Committee for Amy Yahnke, PhD candidate working on contaminants affecting amphibians in stormwater ponds.
2002**-**	Affiliate Curator, Herpetology, University of Washington Burke Museum. Herpetological collection research and curation.
2001**-**2006	Adjunct Professor, The Evergreen State College, Olympia, Washington. Served on Committee's for Jennifer Serra Shean and Joanne Schuett-Hames, both graduate students that completed Masters theses on the movement ecology of Northern red-legged frogs (*Rana aurora*).
2001**-**2009	Herpetological Review, Section Editor, Natural History Notes, Herpetological Review; editor for natural history notes on amphisbaenids, crocodilians, lizards, and tuataras (*Sphenodon*).
2000-	Committee Member for two Master's level student projects at The Evergreen State College addressing northern red-legged frog movement and habitat utilization ecology.
2000-2001	Panel Member, Washington State Aquatic Nuisance Species Committee; committee addresses all issues regarding all categories of exotic animal and plant nuisance species ranging from immediate problems to education to research.
1998-2000	Panel Member, Wildlife Integrity Committee of the Oregon Department of Fish and Wildlife; committee developed scientifically based designations for imported and exotic wildlife.

1992- Adjunct Assistant, then Adjunct Associate Professor (1995-), Portland State University; served on Committees for Aaron Borisenko, a graduate student who obtained a Master's degree on the status of the Foothill yellow-legged frog (*Rana boylii*) in Oregon; and Catherine Callison, a graduate study who obtained a Master's degree on the Northern red-legged frog oviposition behavior and ecology.

Posters and Presentations:

2009 "Amphibian production in stormwater detention ponds, King County, Washington." presented at the 2009 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and Washington Chapter of the Wildlife Society held at Skamania Lodge, Stevenson, Washington, February 18-21, 2009. w/ Amy Yahnke and Christain Grue. (contributed poster)

2009 "Sex-specific identification of *Ascaphus truei* at maturity." presented at the 2009 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and Washington Chapter of the Wildlife Society held at Skamania Lodge, Stevenson, Washington, February 18-21, 2009. w/ April Barreca and Teal Waterstrat. (contributed poster)

2009 "Torrent Salamander movement ecology: perspective on a 'sedentary' species." Abstracts from the 2009 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and Washington Chapter of the Wildlife Society held at Skamania Lodge, Stevenson, Washington, February 18-21, 2009. w/ Julie Tyson. (contributed poster)

2007 "Species identification and body size estimation of amphibians in Washington State based on foot morphology. Abstracts from the 2007 Annual Meetings of the Society for Northwestern Vertebrate Biology, Northwest Scientific Association and Northwest Lichenologists held jointly at Harbour Towers & Suites, Victoria, BC, February 21-24, 2007. Northwestern Naturalist 88:101-127. (contributed poster)

2007 "Comparative diet of three species of terrestrial forest-dwelling amphibians (*Rana aurora*, *Dicamptodon tenebrosus*, and *Rhyacotriton kezeri*) in western Washington." Abstracts from the 2007 Annual Meetings of the Society for Northwestern Vertebrate Biology, Northwest Scientific Association and Northwest Lichenologists held jointly at Harbour Towers & Suites, Victoria, BC, February 21-24, 2007. w/ Casey Richart and Ryan O'Donnell. (contributed talk)

2007 "Differentiating *Ascaphus truei* at sexual maturity." presented at the 2007 Annual Meetings of the Society for Northwestern Vertebrate Biology, Northwest Scientific Association and Northwest Lichenologists held jointly at Harbour Towers & Suites, Victoria, BC, February 21-24, 2007. w/ April Barreca and Teal Waterstrat. (contributed talk)

2006 "Trends in the breeding population of Oregon Spotted Frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge. Abstracts from the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology

	and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Joseph Engler and Christopher Rombough. (contributed talk)
2006	"Washington terrestrial slugs and snails." presented at the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Casey Richart and William Leonard. (contributed poster)
2006	"Dispersion of Coastal Tailed Frog (*Ascaphus truei*): A hypothesis relating occurrence of frogs in non-fishbearing headwater basins to their seasonal movements." presented at the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Timothy Quinn, Daniel Dugger, and Tiffany Hicks. (invited talk)
2006	"Torrent Salamander distribution within headwater streams." presented at the 2006 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society held jointly at Evergreen State College, Washington, March 27-April 1, 2006. w/ Amberlynn Pauley, Stephen West and Marty Raphael. (contributed poster)
2005	"Foothill Yellow-legged Frog abundance in Cow Creek." Abstracts from the 2005 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Oregon Chapter of the Wildlife Society held jointly at Corvallis, Oregon, February 22-25, 2005. w/ Christopher Rombough and Nancy Duncan. (contributed talk)
2005	"Columbia Torrent Salamander (*Rhyacotriton kezeri*) occurrence in headwater streams: the importance of water," presented at the 2005 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Oregon Chapter of the Wildlife Society held jointly at Corvallis, Oregon, February 22-25, 2005. w/ Daniel Dugger and Timothy Quinn. (contributed talk)
2005	"*Plethodon* Salamander occupancy in managed landscapes in southwest Washington." presented at the 2005 Annual Meeting of the Society for Northwestern Vertebrate Biology and the Oregon Chapter of the Wildlife Society held jointly at Corvallis, Oregon, February 22-25, 2005. w/ Aimee McIntyre, Timothy Quinn, Daniel Dugger, and Tiffany Hicks. (contributed talk)
2003	"Population changes in the Oregon spotted frog at Conboy National Wildlife Refuge: The pivotal role of hydrology", presented at the 2003 Annual Meeting of the Washington Chapter of The Wildlife Society in Port Townsend, Washington, April 15-17 w/ Joseph D. Engler. (invited talk).
2003	"Comparing Amphibian Sampling Methods : Which is Best for Headwater Streams?", presented at Amphibian Sampling Symposium at the 2003 Annual Meeting of the Society for Northwestern Vertebrate Biology in

	Arcata, California, March 19-22. w/ Daniel J. Dugger, Tiffany L. Hicks, and Timothy Quinn. (invited talk).
2003	"Headwater Habitat Variation: Its Relationship to Stream Amphibian Distribution", presented at the 2003 Annual Meeting of the Society for Northwestern Vertebrate Biology in Arcata, California, March 19-22. w/ Daniel J. Dugger, Tiffany L. Hicks, and Timothy Quinn (invited poster).
2003	"Headwater Habitat Variation: Its Relationship to Stream Amphibian Distribution", presented at the 2003 Annual Meeting of the Society for Northwestern Vertebrate Biology in Arcata, California, March 19-22. w/ Daniel J. Dugger, Tiffany L. Hicks, and Timothy Quinn (invited poster).
2000	"Egg attendance in the frog genus *Hyalinobatrachium*: Function and Phylogenetic Implications", part of the Symposium on Ecology and Evolution in the Tropics: Essays in Tribute to Jay M. Savage, presented at the 80th Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Roy W. McDiarmid (invited talk).
2000	"Oregon spotted frog *Rana pretiosa* oviposition: Conservation Implications", presented at the 80th Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Joseph D. Engler (contributed talk).
2000	"Oviposition patterns in the northern red-legged frog: Factors in site choice", presented at the 80th Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Christopher J. Rombough, presenter (contributed talk).
2000	"Foothill yellow-legged frog *Rana boylii* decline in Oregon: Conservation implications", presented at the 80th Annual Meeting of the American Society of Ichthyologists and Herpetologists in La Paz, Mexico, June 14-20. w/ Aaron N. Borisenko, presenter (contributed talk).
2000	**"**Oregon spotted frog *Rana pretiosa* oviposition: Conservation Implications**"**, part of the Symposium on Terrestrial and Riparian Amphibians, presented at the year 2000 Joint Annual Meeting of the Society for Northwestern Vertebrate Biology and the Washington Chapter of the Wildlife Society in Ocean Shores, Washington, March 15-17. w/ Joseph D. Engler (invited talk).
1999	"Oregon spotted frog in the Klamath Basin: History and Ecology"; Third Klamath Basin Ecological Conference, sponsored by the Klamath Basin Ecological Restoration Office (invited talk)
1999	"Oregon spotted frog oviposition: Conservation implications"; First Annual Northwest Conservation Research Consortium, sponsored by the Oregon Zoo (invited talk)
1998	"Oregon spotted frog: History and current ecology"; Symposium on the spotted frogs of Oregon, sponsored by US Fish and Wildlife Service (invited talk)

1998	"Vulnerability to predation of the Oregon spotted frog to the bullfrog"; Annual meeting of the Society for Northwestern Vertebrate Biology (contributed talk)
1998	"The status of Oregon spotted frog across its geographic range"; Joint annual meeting of the ASIH, Herpetologists League, and SSAR (invited poster)
1997	"The egg-laying reptile fauna of the Squaw Flat Research Natural Area: Implications for forest management"; The Wildlife Society annual regional meeting, Bend, Oregon (invited talk)
1997	"Vulnerability of the postmetamorphic stages of the Oregon spotted frog"; The Wildlife Society annual regional meeting, Bend, Oregon (contributed talk)
1975-1996	Over 30 invited talks and two invited posters, mostly on various aspects of amphibian ecology and conservation.

Publications

Tidwell, K.S., D.J. Shepherdson, and M.P. Hayes. Inter-populational variability in evasive behavior in the Oregon Spotted Frog (*Rana pretiosa*). *Journal of Herpetology* (in review)

Padgett-Flohr, G., and M.P. Hayes. 2011. Assessment of the vulnerability of the Oregon spotted frog (*Rana pretiosa*) to the Amphibian chytrid fungus (*Batrachochytrium dendrobatidis*). *Herpetological Conservation and Biology* 6(2):99-106.

Conlon, J.M., M. Mechkarska, E. Ahmeda, L. Coquet, T. Jouenne, J. Leprince, H. Vaudry, M.P. Hayes, and G. Padgett-Flohr. 2011. Host defense peptides in skin secretions of the Oregon spotted frog *Rana pretiosa*: Implications for species resistance to chytridiomycosis. *Developmental and Comparative Immunology* 35:644-649.

Palmeri-Miles, A.F., K.A. Douville, J.A. Tyson, K.D. Ramsdell and M.P. Hayes. 2010. Field observations of oviposition and early development of the Coastal Tailed Frog (*Ascaphus truei*). *Northwestern Naturalist* 91(2):206-213.

Hayes, M.P., C.J. Rombough, G.E. Padgett-Flohr, L.A. Hallock, J.E Johnson, R.S. Wagner, and J.D. Engler. 2009. Amphibian chytridiomycosis in the Oregon spotted frog (*Rana pretiosa*) in Washington State, USA. *Northwestern Naturalist* 90(2):148-150.

McIntyre, A.P., M.P. Hayes and T. Quinn. 2009. *Type N Feasibility Study*. A report submitted to the Landscape and Wildlife Advisory Group, Amphibian Research Consortium, and the Cooperative Monitoring, Evaluation, and Research Committee. Washington Department of Fish and Wildlife, Olympia, Washington. 48 pp. + appendices

Ricketts, N.L., and M.P. Hayes. 2009. *2009 Pilot Citizen Science Stillwater Amphibian Protocol Summary Report*. Washington Department of Fish and Wildlife, Olympia, Washington. 33 pp. + appendices

Curry, T.R. and M.P. Hayes. 2009. *Rana aurora* (Northern Red-legged Frog). Egg mass disturbance. *Herpetological Review* 40(2):208-209.

Kroll, A.J., M.P. Hayes, and J.G. MacCracken. 2009. Concerns regarding the use of amphibians as metrics of critical biological thresholds: a comment on Welsh and Hodgson (2008). *Freshwater Biology* 54(11):2364-2373.

Tyson, J.A., K.A. Douville and M.P. Hayes. 2009. *Rhyacotriton olympicus* (Olympic Torrent Salamander). Maximum larval size. *Herpetological Review* 40(1):67.

Lund, E.M., M.P. Hayes, T.R. Curry, J.S. Marsten, and K.R. Young. 2008. Predation on the Coastal Tailed Frog (*Ascaphus truei*) by a shrew (*Sorex* spp.) in Washington State. Northwestern Naturalist 98():200-202.

Hayes, M.P; T. Quinn; K.O. Richter; J.P. Schuett-Hames; and J.T. Serra Shean. 2008. Maintaining Lentic-Breeding Amphibians in Urbanizing Landscapes: The Case Study of the Northern Red-Legged Frog (*Rana aurora*). Pp. 445-461. *In*: Mitchell, J.C., R.E. Jung Brown, and B. Bartholomew (editors), *Urban Herpetology*, Society for the Study of Amphibians and Reptiles, Herpetological Conservation 3. [Book chapter]

Hayes, M.P., T. Quinn, and T.L. Hicks. 2008. *Implications of Capitol Lake Management for Fish and Wildlife*. Report to the Washington State Department of General Administration, Olympia, Washington. 88 pp. + appendices

Hayes, C.B., and M.P. Hayes. 2008. *Elgaria coerulea* (Northern Alligator Lizard). Juvenile growth. *Herpetological Review* 39(2):222-223.

Hicks, T.L., D.E. Mangan, A.P. McIntyre and M.P. Hayes. 2008. *Rhyacotriton kezeri* larval diet. *Herpetological Review* 39(4): 456-457.

Rombough, C.J. and M.P. Hayes. 2008. *Rana pretiosa* (Oregon Spotted Frog). Reproduction. *Herpetological Review* 39(3):340-341.

Waterstrat, F.T., A.P. McIntyre, M.P. Hayes, K.M. Phillips, and T.R. Curry. 2008. *Ascaphus truei* (Coastal Tailed Frog). Atypical Amplexus. *Herpetological Review* 39(4):458.

Richart, C.H., M.P. Hayes and R.P. O'Donnell. 2007. Comparative diet of three species of terrestrial forest-dwelling amphibians (*Rana aurora*, *Dicamptodon tenebrosus*, and *Rhyacotriton kezeri*) in western Washington. *Northwestern Naturalist* 88(2):121-122. [abstract]

Quinn, T.; Hayes, M.P.; D.J. Dugger; T.L. Hicks; and A. Hoffmann. 2007. Comparison of two techniques for surveying headwater stream amphibians. *Journal of Wildlife Management* 71(1):282-288.

Barreca, A.B., F.T. Waterstrat, and M.P. Hayes. 2007. Differentiating *Ascaphus truei* at sexual maturity. *Northwestern Naturalist* 88(2):102-103. [abstract]

O'Donnell, R.P., T. Quinn, M.P. Hayes and K.E. Ryding. 2007. Comparison of three methods for surveying amphibians in forested seep habitats in Washington State. *Northwest Science* 81(4):274-283.

Hayes, M.P. 2007. Size record? *Herpetological Review* 38(4):393.

Rombough, C.J. and M.P. Hayes. 2007. *Rana boylii* (Foothill Yellow-legged Frog). Reproduction. *Herpetological Review* 38(1):70-71.

Waterstrat, F.T., R.L. Crawford, and M.P. Hayes. 2007. *Ascaphus truei* (Tailed Frog). Spider Prey. *Herpetological Review* 38(3):318.

Hayes, M.P., C.J. Rombough and C.B. Hayes. 2007. *Rana aurora* (Northern Red-legged Frog). Movement. *Herpetological Review* 38(2):192-193.

Hayes, M.P; T. Quinn; D.J. Dugger; T.L. Hicks; M.A. Melchiors; and D.E. Runde. 2006. Dispersion of coastal tailed frog (*Ascaphus truei*): An hypothesis relating occurrence of frogs in non-fish-bearing headwater basins to their seasonal movements. *Journal of Herpetology* 40(4):531-543.

Hayes, M.P., T. Quinn, D.J. Dugger, and T.L. Hicks. 2006. Dispersion of Coastal Tailed Frog (*Ascaphus truei*): A hypothesis relating occurrence of frogs in non-fishbearing headwater basins to their seasonal movements. *Northwestern Naturalist* 87(2):171-172. [abstract]

Karraker, N.E., D.S. Pilliod, E.L. Bull, P.S. Corn. L.V. Diller, L.A., Dupuis, M.P. Hayes, B.R. Hossack, G.R. Hodgson, E.J. Hyde, K. Lohman, B.R. Norman, L.M. Ollivier, C.A. Pearl, C.R. Peterson. 2006. Taxonomic variation in the oviposition by Tailed Frogs (*Ascaphus* spp.). *Northwestern Naturalist* 87(2):87-97.

Hayes, M.P., J.D. Engler, and C.J. Rombough. 2006. Trends in the breeding population of the Oregon spotted frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge. *Northwestern Naturalist* 87(2):171. [Abstract]

Hayes, M.P., J.D. Engler and C.J. Rombough. 2006. *Rana pretiosa* (Oregon Spotted Frog). Predation. *Herpetological Review* 37(2):209-210.

Hayes, M.P., M.R. Jennings, and G.B. Rathbun. 2006. *Rana draytonii* (California red-legged frog). Prey. *Herpetological Review* 37(4):449.

Price, R.F., D.J. Dugger, T.L. Hicks and M.P. Hayes. 2006. *Dicamptodon copei* (Cope's Giant Salamander). Predation. *Herpetological Review* 37(4):436-437.

Rombough, C.J., M.P. Hayes and J.D. Engler. 2006. *Rana pretiosa* (Oregon Spotted Frog). Maximum size. *Herpetological Review* 37(2):210.

Richart, C.H., M.P. Hayes and W.P. Leonard. 2006. Washington terrestrial slugs and snails. Northwestern Naturalist 87(2):184. [abstract]

Hayes, M.P., and L.L.C. Jones. 2005. *Rhyacotriton olympicus*. Pp. 880-882. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Hayes, M.P. and T. Quinn. 2005. *Rhyacotriton kezeri*. Pp. 876-880. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Hayes, M.P. 2005. *Rhyacotriton cascadae*. Pp. 874-876. *In*: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Pearl, C.A., and M.P. Hayes. 2005. *Rana pretiosa*. Pp. 577-580. In: Lannoo, M.J. (editor), *Amphibian Declines: The Conservation Status of United States Species*. University of California Press, Berkeley. [Book section]

Jennings, M.R. and M.P. Hayes. 2005. *Rana boylii* (Foothill Yellow-legged Frog). Coloration. *Herpetological Review* 36(4):438.

Rombough, C.J., M.P. Hayes, N.L. Duncan. 2005. Foothill Yellow-legged Frog abundance in Cow Creek. *Northwestern Naturalist* 86(2):114-115.

Dugger, D.J., M.P. Hayes, T. Quinn. 2005. Columbia Torrent Salamander (*Rhyacotriton kezeri*) occurrence in headwater streams: the importance of water. *Northwestern Naturalist* 86(2):92. [abstract]

Hayes, M.P., A.P. McIntyre, T. Quinn, D.J. Dugger, and T.L. Hicks. 2005. *Plethodon* salamander occupancy in managed landscapes in southwest Washington. *Northwestern Naturalist* 86(2):98. [abstract]

Rombough, C.J., and M.P. Hayes. 2005. Novel aspects of oviposition site preparation by female foothill yellow-legged frogs (*Rana boylii*). *Northwestern Naturalist* 86:157-160.

Rombough, C.J., J. Chastain, A.M. Schwab and M.P. Hayes. 2005. *Rana boylii* (Foothill Yellow-legged Frog). Predation. *Herpetological Review* 36(4):438-439.

Eaton-Mordas, A., E.P. Urling, M.P. Hayes, D.J. Dugger, and T. Quinn. 2003. *Plethodon dunni, Plethodon vehiculum* (Dunn's Salamander, Western Red-backed Salamander). Behavior. *Herpetological Review* 34(1):54-55.

Hayes, M.P., and C.B. Hayes. 2004. *Rana aurora aurora* (Northern red-legged frog): Vocalizations. *Herpetological Review* 35(1):52-53.

Hayes, M.P., and C.B. Hayes. 2004. *Bufo boreas boreas* (Boreal toad): Behavior. *Herpetological Review* 35(4):369-370.

Hayes, M.P., and C.B. Hayes. 2003. *Rana aurora aurora* (Northern red-legged frog): Juvenile Growth and Male Size at Maturity. *Herpetological Review* 34(3):112-133.

Hayes, M. P. and C.B. Hayes. 2003. *Ensatina eschscholtzii oregonensis* (Oregon Ensatina). Colonization. *Herpetological Review* 34(1):45-46.

Pearl, C.A. and M.P. Hayes. 2002. Predation by Oregon Spotted Frog (*Rana pretiosa*) on Western Toads (*Bufo boreas*) in Oregon. *American Midland Naturalist* 147(1):145-152.

Bull, Evelyn; and M.P. Hayes. 2002. Overwintering of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. *Northwest Science* 76(2):141-147.

Hayes, M.P., C.A. Pearl, and C.J. Rombough. 2001. *Rana aurora aurora*: Movement. *Herpetological Review* 32(1):35-36.

Bull, Evelyn; and M.P. Hayes. 2001. Post-breeding movements of Columbia spotted frogs (*Rana luteiventris*) in northeastern Oregon. *Western North American Naturalist* 61(1):119-123.

Altman, R.; M.P. Hayes, R.D. Forbes, and S.D. Janes. 2001. Chapter 10: Wildlife communities of westside grassland and chaparral. In: D.H. Johnson and T. O'Neill (editors), *Habitat-Species Relationships of Oregon and Washington*, Oregon State University Press. [Book chapter]

Hayes, M.P., J.D. Engler, S. Van Leuven, D.C. Friesz, T. Quinn, and D.J. Pierce. 2001. Overwintering of the Oregon Spotted Frog (*Rana pretiosa*) at Conboy Lake National Wildlife Refuge, Klickitat County, Washington, 2000-2001. Final

Report to the Washington Department of Transportation, Washington Department of Fish and Wildlife, Olympia, Washington. 38 pp.

Bull, E.L., and M.P. Hayes. 2000. Livestock effects on reproduction of the Columbia spotted frog. *Journal of Range Management* 53(3):291-294.

Hayes, M.P.; M.R. Jennings; and J.D. Mellen. 1998. Beyond mammals: Environmental enrichment for amphibians and reptiles. Pp. 205-235. In: Hutchinson, M.; J. Mellen; and D. Shepherdson (editors), *Second Nature: Environmental enrichmental for captive animals*, Smithsonian Institution Press, Washington, D.C. [Book chapter]

Mellen, J.D.; M.P., Hayes, M.P.; and D.J. Shepherdson. 1998. Captive environments for small felids. Pp. 184-201. In: Hutchinson, M.; J. Mellen; and D. Shepherdson (editors), Second Nature: Environmental enrichmental for captive animals, Smithsonian Institution Press, Washington, D.C. [Book chapter]

Hayes, M.P. 1997. Counting annuli. Pp. 37-38. In: R.B. Bury and J.R. Sisk (editors), Western pond turtle: Biomonitoring and Survey Plan. Publication of the Western Pond Turtle Working Group.

Jennings, M.R., and M.P. Hayes. 1994. Decline of ranid frogs in the desert southwest. Pp. 183-212. In: Brown, P.R., and J.W. Wright (editors), Proceedings of a Symposium on the Herpetology of North American Deserts, Southwestern Herpetological Society, Special Publication (5).

Jennings, M.R., and M.P. Hayes. 1994. Amphibians and reptiles of special concern in California. Final report submitted to The California Department of Fish and Game, Inland Fisheries Division, 1701 Nimbus Road, Rancho Cordova, CA 95701 under Contract Number 8023. 255 pp.

Hayes, M.P. 1994. The status of the spotted frog (*Rana pretiosa*) in western Oregon. Oregon Department of Fish and Wildlife Technical Report 94-2:1-11. + appendices.

Hayes, M.P. 1994. The spotted frog (*Rana pretiosa*) in western Oregon. Oregon Department of Fish and Wildlife Technical Report 94-1:1-30. + appendices

Holland, D.C., M.P. Hayes, and E. McMillan. 1990. Late summer movement and mass mortality in the California tiger salamander (*Ambystoma californiense*). The Southwestern Naturalist 35(2):217-220.

Hayes, M.P., J.A. Pounds, and W.W. Timmerman. 1989. An annotated list and guide to the amphibians and reptiles of Monteverde, Costa Rica. SSAR Herpetological Circular (17):1-67.

Hayes, M.P., and M.R. Jennings. 1989. Patterns in the commercial exploitation of frogs. Proceedings of the First World Congress of Herpetology, University of Kent, Canterbury, England. [Abstract]

Hayes, M.P., J. Le Corff, and R. Gaby. 1989. SSAR Life History Notes: *Gopherus polyphemus*. SSAR Herpetological Review 20(2):55-56.

Hayes, M.P., and M.R. Jennings. 1989. Habitat correlates of distribution of the California red-legged frog (Rana aurora draytonii) and the foothill yellow-legged

frog (Rana boylii): Implications for management. Pp. 144-158. In: Szaro, R.E., K.E. Severson, and D.R. Patton (technical coordinators): Proceedings of the Symposium on the Management of amphibians, reptiles, and small mammals in North America [July 19-21, 1988 – Flagstaff, Arizona], USDA General Technical Report RM-166:1-458.

Hayes, M.P., and P.N. Lahanas. 1987. Nesting of the aquatic salamander *Amphiuma means*. Florida Scientist 50(Supplement 1):16. [Abstract]

Hayes, M.P., J.A. Pounds, and D.A. Robinson. 1986. The fringe-limbed treefrog, *Hyla fimbrimembra*: New records from Costa Rica. Florida Scientist 49(3):193-198.

Hayes, M.P., and D.C.F. Rentz. 1986. Observations on the biology of the Neotropical katydid *Haemodiasma tesselata* Brunner (Orthoptera: Tettigonidae). *Entomological News* 97(5):222-224.

Hayes, M.P., and M.R. Jennings. 1986. Declines of ranid frogs in western North America: Are bullfrogs responsible? *Journal of Herpetology* 20(4):490-509.

Hayes, M.P., and D. M. Krempels. 1986. Vocal sac variation among frogs of the genus *Rana* in western North America. *Copeia* 1986(4):927-936.

Hayes, M.P. 1986. Selection against frequent brooding in a leaf-breeding frog. *American Zoologist* 26(4):7A. [Abstract]

Hayes, M.P., and F.C. Shaffner. 1986. Life history notes: *Rana catesbeiana*. SSAR *Herpetological Review* 17(2):44-45.

Miyamoto, M.M., M.P. Hayes, and M.R. Tennant. 1986. Biochemical and morphological variation in Floridean populations of the bark anole (*Anolis distichus*). *Copeia* 1986(1):76-86.

Hayes, M.P., and J. Warner. 1985. Life history notes: *Rana catesbeiana*. SSAR *Herpetological Review* 16(4):109.

Hayes, M.P. 1985. Life history notes: *Coluber constrictor priapus*. SSAR *Herpetological Review* 16(3):78.

Hayes, M.P., and M.R. Tennant. 1985. The diet and feeding behavior of the California red-legged frog (*Rana aurora draytonii*). Southwestern Naturalist 30(4):601-605.

Hayes, M.P. 1985. Geographic distribution: *Centrolenella euknemos*. SSAR *Herpetological Review* 16(2):59.

Hayes, M.P., and D. M. Krempels. 1985. Geographic distribution: *Centrolenella vireovittata*. SSAR *Herpetological Review* 16(1):31.

Jennings, M.R., and M.P. Hayes. 1985. Pre-1900 overharvest of California red-legged frogs (*Rana aurora draytonii*): The inducement for (*Rana catesbeiana*) introduction. *Herpetologica* 41(1):94-103.

Hayes, M.P. 1985. Nest structure and attendance in the stream-dwelling frog, *Eleutherodactylus angelicus*. *Journal of Herpetology* 19(1):168-169.

Hayes, M.P., and M.M. Miyamoto. 1984. Biochemical, behavioral, and body size differences between the red-legged frogs, *Rana aurora aurora* and *Rana aurora draytonii*. *Copeia* 1984(4):1018-1022.

Hayes, M.P. 1983. A technique for partitioning hatching and mortality estimates in leaf-breeding frogs. *Herpetological Review* 14(4):115-116.

Hayes, M.P., R. LaVal, M. Fogden, and P. Fogden. 1983. The mammals of Monteverde: An annotated checklist to the mammals of Monteverde – Monteverde, Costa Rica. Published by the Pensión Quetzal, Monteverde, Costa Rica.

Hayes, M.P. 1983. Predation on the adults and prehatching stages of glass frogs. *Biotropica* 15(1):74-76.

Hayes, M.P., and F.S. Cliff. 1982. A checklist of the herpetofauna of Butte County, the Butte Sink, and Sutter Buttes, California. *Herpetological Review* 13(3):85-87.

Hayes, M.P., and C. Guyer. 1981. The herpetofauna of Ballona. Pp. H1-H80. In: Schreiber, R.W. (editor), *The biota of the Ballona region*. Publication of the Los Angeles County Planning Commission with assistance from the United State Office of Coastal Zone Management and the National Oceanic and Atomspheric Administration.

Timmerman, W.W., and M.P. Hayes. 1981. The reptiles and amphibians of Monteverde. Published by the Pensión Quetzal, Monteverde, Costa Rica in cooperation with the Tropical Sciences Center, San Jose, Costa Rica.

Hayes, M.P., and H. Starrett. 1980. Notes on a collection of centrolenid frogs from the Colombian Chocó. Bulletin of the Southern California Academy of Sciences.

Hayes, M.P., R.A. Schlising, and H. Wurlitzer. 1979. *Calycadenia fremontii* – rediscovered? Fremontia 7(1):14-15..

Additionally, over 40 over non-referreed reports and publications have been produced.

Reviewed manuscripts or books for:

Biological Conservation
Biotropica
Copeia
Forest Science
Herpetologica
Herpetological Review
Journal of Herpetology
The Northwestern Naturalist
The Southwestern Naturalist
McGraw Hill: Interactive text in aquatic ecology
Society of NW Vertebrate Biology: Book on sampling amphibians in lentic habitats
Smithsonian Press: Book on environmental enrichment

Professional Societies:

1996-	Life Member of the American Society of Ichthyologists and Herpetologists
1996-	Member of The Wildlife Society
1995-	Member of the National Association of Environmental Professionals
1995-	Member of the Society of Northwestern Vertebrate Biology
1995-	Member of the International Association for Bear Research and Management

1989-	Member of the Society for Conservation Biology
1988-	Life Member of the American Society of Zoologists
1987-	Member of the American Association for the Advancement of Science
1987-	Member of the Societas Europea Herpetologica
1986-	Life Member of the Society for the Study of Amphibians and Reptiles

Professional Societies: (continued)

1980-	Life Member of the Desert Tortoise Council

Also a member of 10 minor, regional, or local professional societies.

Grants, awards, and contracts:

$568,000	2000-2	Department of Natural Resources; funding for Forest and Fish Adaptive Management in headwater streams
$12,800	2000	US Fish and Wildlife Service; funding for deformity study of the Oregon spotted frog at Conboy Lake
$2,025	2000	Oregon Zoo Foundation; funding for PIT tags and skeletochronology on Umpqua northern red-legged frog study
$950	2000	The Wildlife Society; funding for skeletochronology on Conboy Lake Oregon spotted frog study
$124,000	1999-2000	Port of Portland; Rivergate western painted turtle study
$8,500	1999-2000	US Fish and Wildlife Service; Oregon spotted frog habitat partitioning study
$12,000	2000	US Fish and Wildlife Service, SAR funding; bullfrog selectivity study (R. Bruce Bury, principal investigator)
$9,600	1999	US Fish and Wildlife Service; Northern red-legged frog overwintering
$1,200	1999	Umpqua National Forest; funding for temperature data loggers for northern red-legged frog habitat utilization study
$8,700	1999	US Fish and Wildlife Service; Oregon spotted frog oviposition
$4,200	1998-2000	PNW Range and Experiment Station; Columbia spotted frog movements
$35,860	1996-1997	US Fish and Wildlife Service, Oregon Department of Fish and Wildlife; Study of the status of the foothill yellow-legged frog in Oregon
$32,300	1994-1997	Winema National Forest; Aquatic amphibian and reptile studies in the Sky Lake Wilderness
$24,600	1996	Umpqua National Forest; Studies of the amphibian and reptile fauna of the Squaw Flat Research Natural Area

Additionally, I have obtained over 10 additional grants, awards, or contracts totalling over $150,000 during the period 1988-1996.

Languages spoken:

French	fluent
Spanish	near fluent

EXHIBIT B

EXHIBIT B, p.1
December 19, 2010, 3:03pm
Flooding at Sharp Park Golf Course, Hole 9/12

EXHIBIT B, p.2
December 19, 2010, 3:30pm
Flooding at Sharp Park Golf Course, Hole 14

EXHIBIT B, p.3
February 19, 2011, 3:50pm
Flooding at Sharp Park Golf Course, Hole 14

EXHIBIT B, p.4
February 19, 2011, 3:52pm
Flooding at Sharp Park Golf Course, Hole 14

EXHIBIT B, p.5
December 19, 2010, 3:30pm
Flooding at Sharp Park Golf Course, Hole 14

EXHIBIT C

EXHIBIT C, p. 1
June 25, 2011
California Red-legged Frog at Sharp Park Golf Course, Horse Stable Pond

EXHIBIT C, p. 2
June 25, 2011
Close-up of California Red-legged Frog at Sharp Park Golf Course, Horse Stable

EXHIBIT D

EXHIBIT D

December 18, 2010, 12:00pm
Dead Freshwater Crayfish Inside Sharp Park Golf Course Outfall Pipe, Ocean Side

EXHIBIT E

Lucy Triffleman/SAC/R1/FWS/DOI
07/13/2006 02:31 PM

To David Kelly/SAC/R1/FWS/DOI@FWS
cc
bcc
Subject Fw: Dead Snake at Mori

Another document and photos to print out and put in binder. Sorry!
Lucy Triffleman
US Fish and Wildlife Service
Coast-Bay Delta branch
2800 Cottage Way room W-2605
Sacramento, CA. 95825
Ph. (916) 414-6628
Fax (916) 414-6712
----- Forwarded by Lucy Triffleman/SAC/R1/FWS/DOI on 07/13/2006 02:31 PM ---

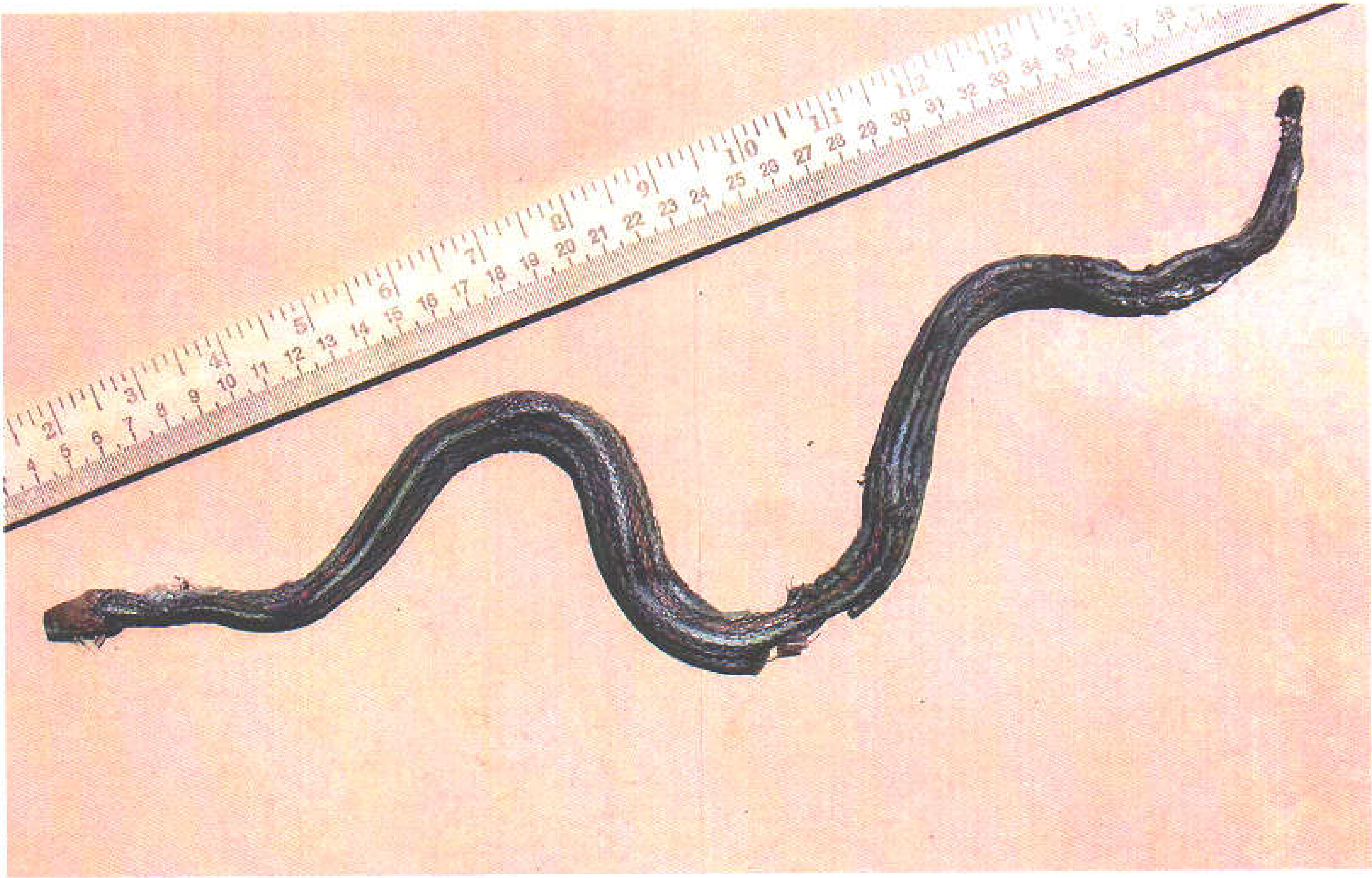
Mary Hammer/SAC/R1/FWS/DOI
07/13/2006 10:13 AM

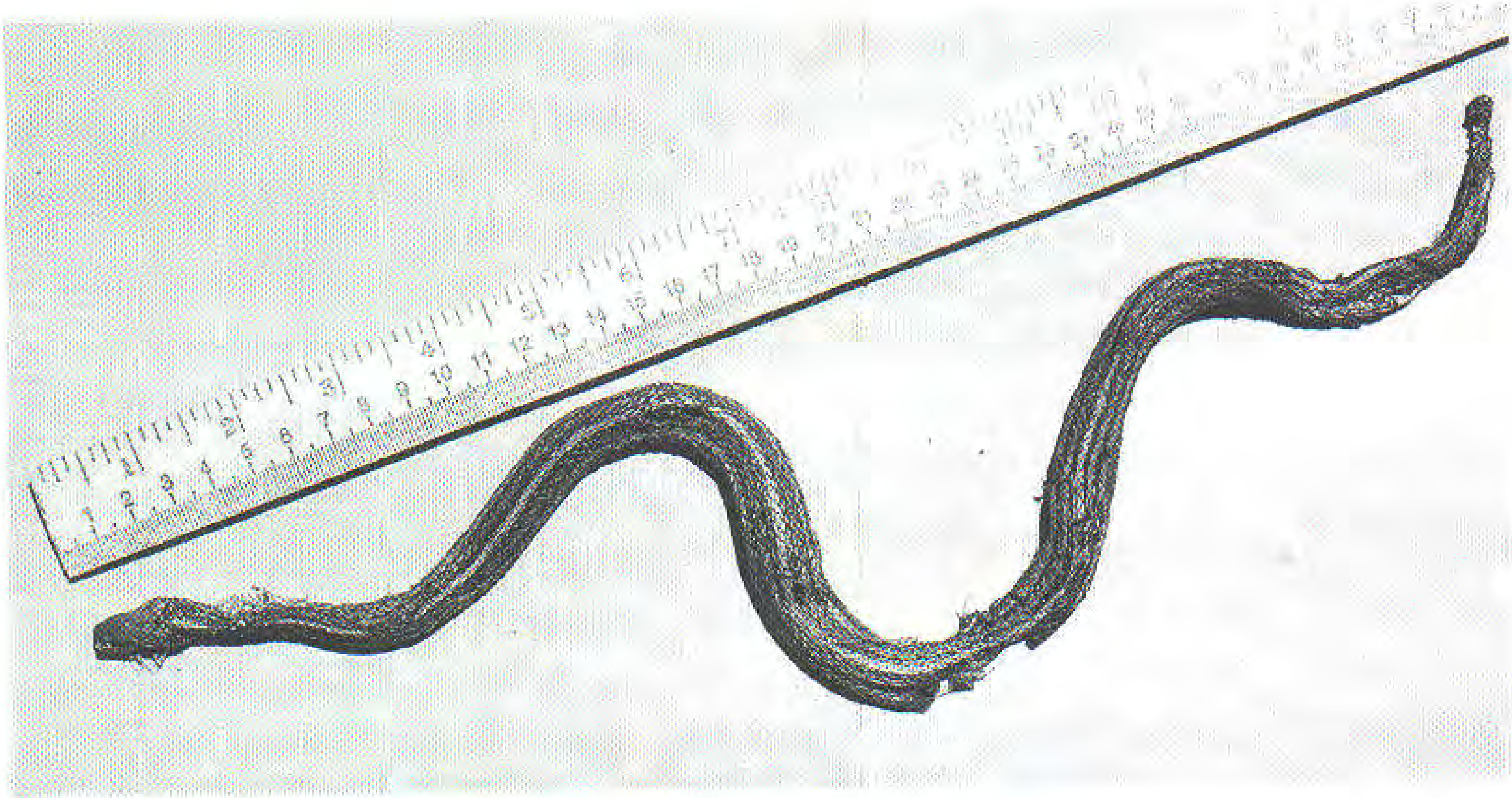
To Lucy Triffleman/SAC/R1/FWS/DOI@FWS
cc
Subject Fw: Dead Snake at Mori

---- Forwarded by Mary Hammer/SAC/R1/FWS/DOI on 07/13/2006 10:13 AM -----

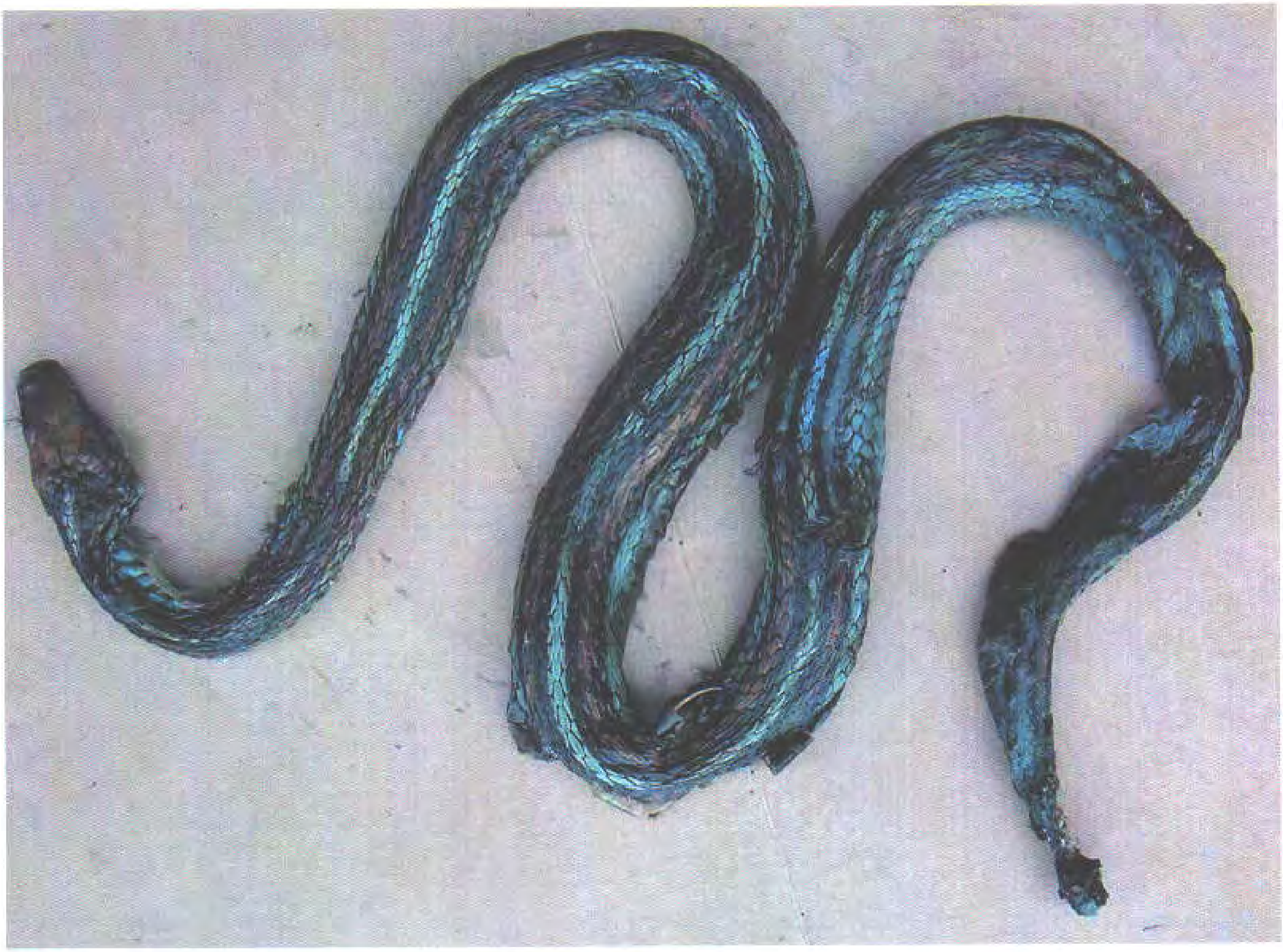
"Sue Gardner" <SGardner@ParksConservancy.org>
05/20/2005 03:31 PM

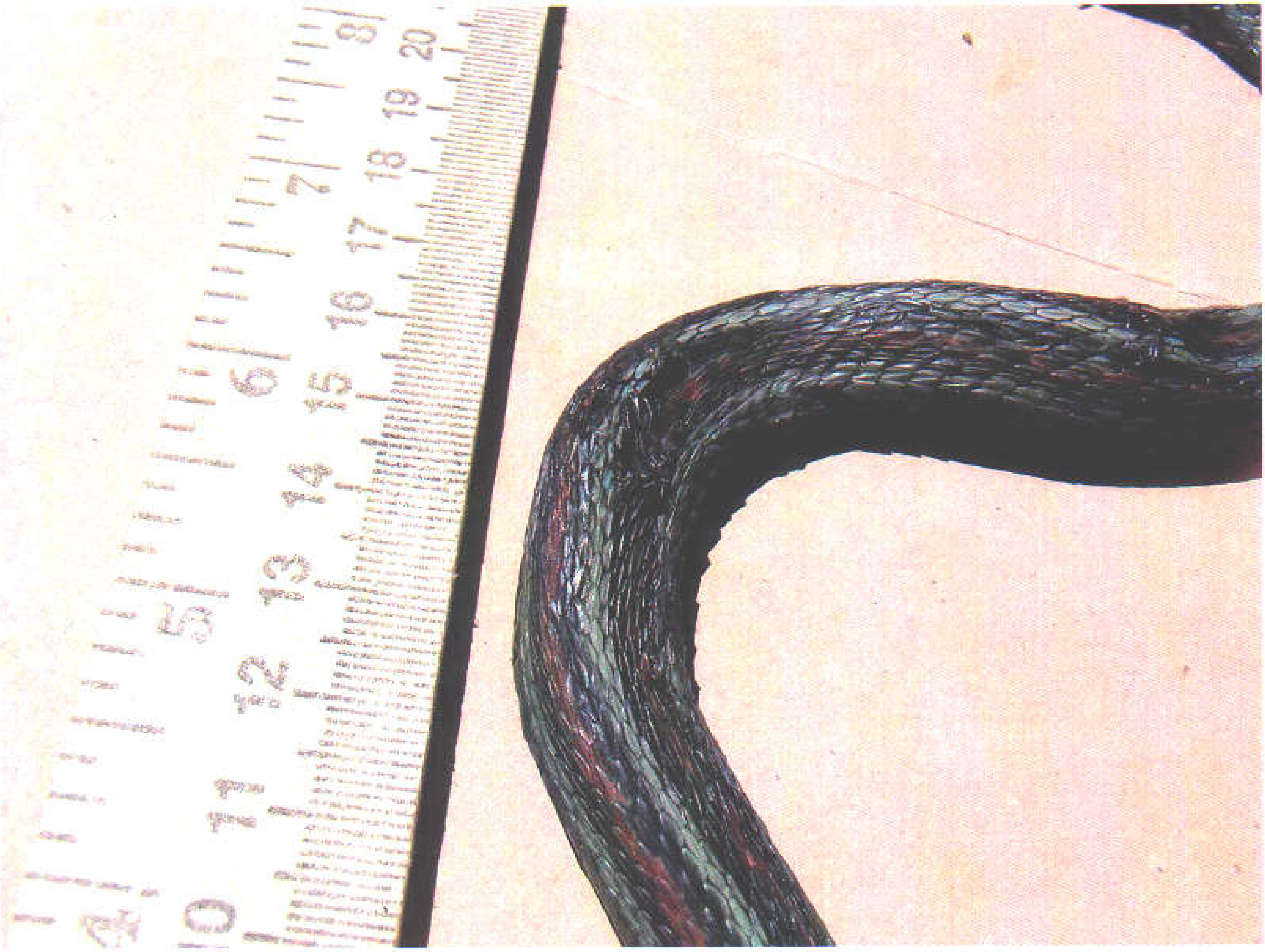
To: <Harry_McQuillen@fws.gov>, <Sheila_Larsen@fws.gov>
cc: <alison_willy@fws.gov>, <Darren_Fong@nps gov>, <don_hankins@fws.gov>, "Karen Swaim" <kswaim@swaimbio.com>, <Mary_Hammer@fws.gov>, <daphne_hatch@nps gov>
Subject: Dead Snake at Mori






16
17
18
19
20
21
22
23





All I've alerted Harry to this already - but one of the neighbors at Mori found a dead garter snake on the golf course near the frog pond at Mori Our intern ran down there and picked it up (very dead, very smelly) From what we know (thanks Karen) its a San Francisco garter snake Attached are some digital images Per Harrys request we are collecting info from the individual who found the snake, double bagging it, and putting in our freezer

Sad day for me considering its the first SFGS I've seen!

Sue

San Francisco Garter Snake1.JPG San Francisco Garter Snake2.JPG San Francisco Garter Snake3.JPG

San Francisco Garter Snake5.JPG San Francisco Garter Snake6.JPG

David Kelly/SAC/R1/FWS/DOI
09/23/2008 10:08 AM

To Christopher Miller/SAC/R1/FWS/DOI@FWS
cc
bcc
Subject Gardiner in litt 2006 SFGS

David Lee Kelly
Fish and Wildlife Biologist
Recovery Branch
US Fish and Wildlife Service
2800 Cottage Way
Sacramento, CA 95825
Ph. (916) 414-6492
----- Forwarded by David Kelly/SAC/R1/FWS/DOI on 09/23/2008 10:07 AM -----

Josh Hull/R8/FWS/DOI
09/23/2008 09:48 AM

To David Kelly/SAC/R1/FWS/DOI@FWS
cc
Subject Fw: Check This Out!

----- Forwarded by Josh Hull/R8/FWS/DOI on 09/23/2008 09:47 AM -----

Chris Nagano/SAC/R1/FWS/DOI
02/10/2006 08:40 AM

To
cc
Subject Fw: Check This Out!

FYI. Report from the National Park Service about sightings of the endangered San Francisco garter snake and the threatened California red-legged frog at Mori Point on the ocen side of San Mateo County.

----- Forwarded by Chris Nagano/SAC/R1/FWS/DOI on 02/10/2006 08:29 AM -----

"Sue Gardner" <SGardner@ParksConservancy.org>
02/09/2006 09:59 AM

To: <Chris_nagano@fws.gov>
cc: <alison_willy@fws.gov>, <Darren_Fong@nps.gov>, 'Karen Swaim' <kswaim@swaimbio.com>, <Harry_McQuillen@fws.gov>, <Sheila_Larsen@fws.gov>, "Jennifer Greene" <JGreene@ParksConservancy.org>
Subject: Check This Out!

The office is abuzz this morning and we are all changing your plans to zip down to Mori Why?

Because we believe we have had a major SF garter snake and red-legged frog siting in the new pond (the one closest to the road) at Mori yesterday Two of our interns were out there and report seeing several snakes swimming in the water There snapped a few digital images (not great quality) and the red head is clearly visible! They also saw at least 8 red-legged frogs in the pond and 3 - 4 egg masses

Here are a few of the images -- enlarge them and let me know what you think

Happy Day! Sue

DSCF0103.JPG good red legged frog 2-8-06.JPG SF garter snake head 2-8-06.JPG SF garter snake head out of water 2-8-06.JPG

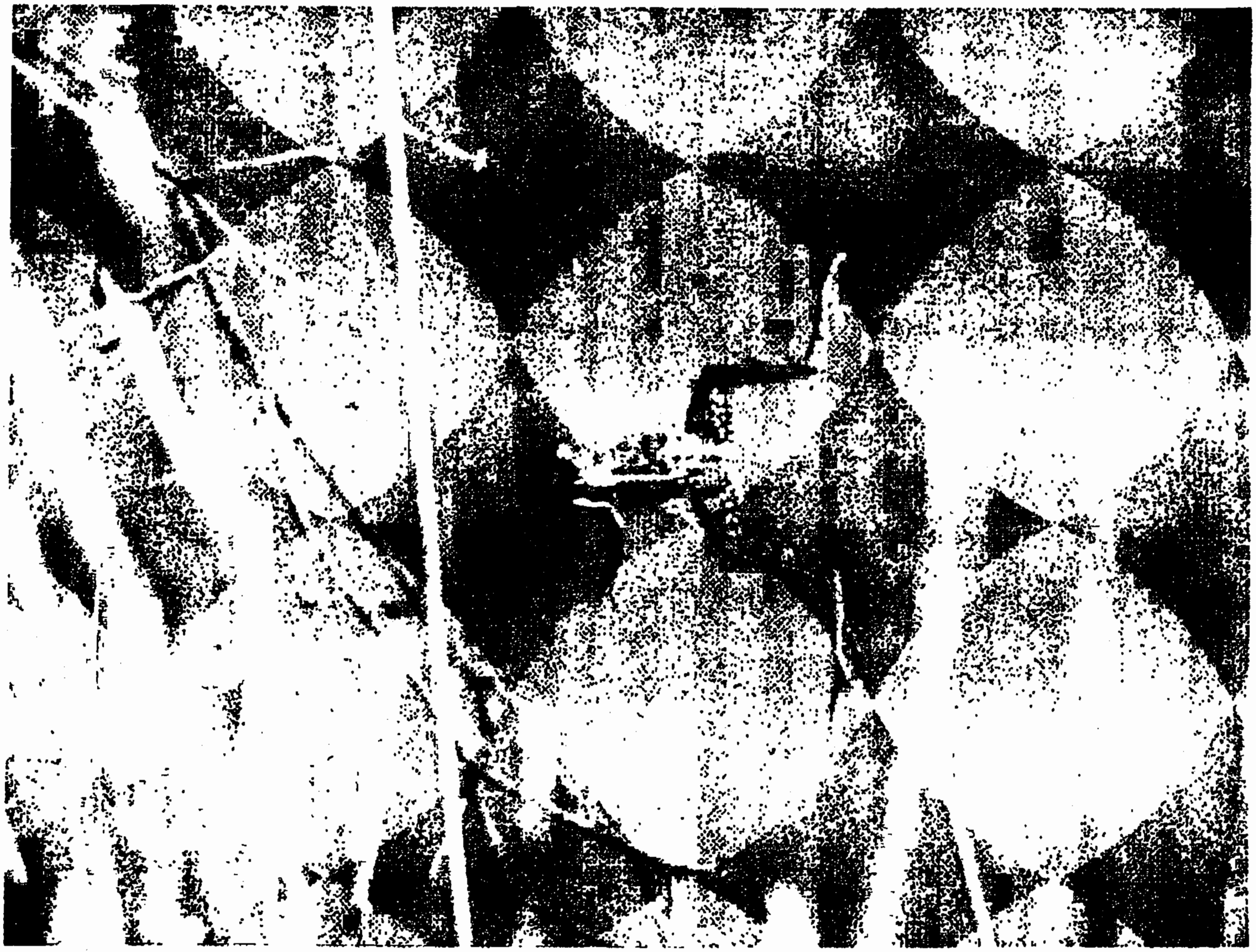


EXHIBIT F

HOW QUICKLY ARE ROAD-KILLED SNAKES SCAVENGED? IMPLICATIONS FOR UNDERESTIMATES OF ROAD MORTALITY

BRETT A. DEGREGORIO

Savannah River Ecology Lab, University of Georgia, Drawer E, Aiken, SC 29801

THOMAS E. HANCOCK, DAVID J. KURZ, and SAM YUE

Bald Head Island Conservancy, Bald Head Island, NC 28461

Abstract: Annually, millions of snakes are killed on roads in the United States. Because of their potential abundance and ease of collection, many researchers have used road-killed snakes to examine community composition, movement patterns, and population dynamics. However, few previous studies have accounted for snake carcasses that are removed from roads by scavengers. Snake carcasses were placed at randomly selected locations along 2 km of road, one traversing maritime forest and the other surrounded by dune habitat. Carcasses in forested habitat were removed more often (100% vs 40%) and more quickly (8 hr vs 11 hr) than those placed in dune habitat. Half of the carcasses (50%) were removed within eight hours of placement and all carcasses were removed at night. Species and size of carcasses did not affect removal time. Removal time and scavenging intensity of snake carcasses most likely varies across regions and habitats. Furthermore, because scavenging appears to occur quickly and to such a significant extent, it may confound results of studies examining patterns of road-mortality. Thus, investigators that use data from road-killed snakes would benefit from a concurrent investigation of scavenging and application of appropriate correction factors to avoid underestimation of snake mortality.

Key Words: Road mortality; Scavenging; Reptiles; Conservation

---

INTRODUCTION

Annually, millions of vertebrates are killed on the 6.5 million km of roads in the United States (Rosen and Lowe 1994; McCurry-Schmidt 2010). Because of a variety of physiological (Klauber 1939; Sullivan 1981), behavioral (Andrews and Gibbons 2005), migratory (Seigel and Pilgrim 2002), and morphological attributes, snakes are often one of the most heavily impacted taxa. Roads may reduce the size and viability of snake populations (Rosen and Lowe 1994; Row et al. 2007), cause population and genetic isolation (Clark et al. 2010), and degrade habitat (Sullivan 1981; Freeman and Bruce 2006) for certain snake species. As a result, snake-road mortality has garnered significant research attention (Reviewed in Andrews et al. 2008).

The high abundance of road-killed snakes in some areas may provide researchers with a unique opportunity to investigate snake-road interactions with minimal effort. Surveys for snake carcasses on roads can provide insight into community composition (Klauber 1939; Bernardino and Dalrymple 1992), species abundances (Hellman and Telford 1956; Enge and Wood 2002), migratory and reproductive timing (Bonnet et al. 1999), and diet (Freeman and Bruce 2006). However, the availability of snake carcasses on roads also provides ample opportunites for enterprising scavengers including raccoons (*Procyon lotor*), red fox (*Vulpes vulpes*), vultures (*Cathartes aura* and *Coragyps atratus)*, opossum (*Didelphis virginiana*), red imported fire ants (*Solenopsis invicta*) and other snakes (e.g. DeVault and Krochmal 2002; DeVault et al. 2003; Antworth et al. 2005; DeGregorio and Nordberg *In Press*). In situations where researchers and scavengers both actively seek road-killed carcasses, the two may be in direct competition.
It is easy to imagine that in such competitive instances a scenario in which the "early bird" gets the dead snake. How early (or how often or at what times) a researcher needs to be in the field to out compete scavengers is a question that must be taken into account in the experimental design

of studies seeking data using road-killed snakes. Many studies that collect snakes from roads conduct surveys on a daily basis (Bonnet et al. 1999; Enge and Wood 2002; Shepard et al. 2008; DeGregorio et al. 2010) or less frequently (Bernardino and Dalrymple 1992; Ciesiolkiewicz et al. 2006; Jochimsen 2006). Few studies have experimentally tested the time to removal of carcasses on roads. In one notable exception Antworth et al. (2005) reported most baited snake and chicken carcasses were removed within 38 hrs on a Florida road. In a similar study conducted in Wales, UK, Slater (2002) determined that wildlife road mortality may be underestimated by a factor of 12-16 because of the efficient removal of carcasses by scavengers.

The speed and extent to which scavengers remove snake carcasses from roads is unresolved for most geographic regions; these parameters also likely vary across regions and habitat types. Understanding the timing, speed, and intensity of carcass removal is critical for studies attempting to infer road mortality rates as these factors have the potential to confound results. Our objectives were to 1) experimentally test scavenging rates and time to removal of snake carcasses on two roads located on Bald Head Island, North Carolina, 2) assess timing of carcass removal, and 3) compare scavenging rates and time to removal of snake carcasses in two coastal habitat types.

METHODS

Study Site: Bald Head Island (BHI), is an 800 ha barrier island located in southeastern North Carolina (33^{o} 50’ 14” N, 78^{o} 00’ 01” W). The majority of the island is forested and contains large tracts of intact maritime forest including the Bald Head Island Maritime Reserve, a 75 ha forest preserve free of development. The island is bordered to the north by 4,000 ha of protected salt marsh habitat with the Atlantic Ocean located to the East and South and the Cape Fear River to the West. Much of the western portion of BHI has been converted to a golf course with 15 freshwater lagoons and large expanses of managed lawn. The southern portion of the island is mostly sand dune with sparse low-growing vegetation and little to no tree canopy. There are currently 1000 homes on the island; however town ordinance requires that the natural habitat around each house may not be cleared and there are currently fewer than 200 year-round residents.

Approximately 35 km of paved road exist on the island. Roads have two lanes which are often divided by a median of dune or maritime forest vegetation. BHI is separated from mainland North Carolina by a 5 km wide section of the Cape Fear River and can only be accessed via passenger ferry departing Southport, NC. Vehicular traffic on island is restricted to electric golf carts and the rare gas-powered vehicle used by public emergency personnel and private contractors. Posted speed limits do not exceed 29 km/hr. Despite the predominance of slow-moving golf carts, considerable snake road mortality has been documented (DeGregorio et al. 2010).

Sampling Methods: To investigate how long road-killed snakes remain on a road before being scavenged, ten trials in which a pair of snake carcasses was placed at randomly chosen locations along two roads and their time to removal was recorded. Road-killed snake carcasses were opportunistically collected from 1 May to 29 June 2010. Each carcass was identified to species and its snout to vent length (SVL) measured. Only recently road-killed carcasses that had not been torn open were collected for use in this study to control for body condition. All carcasses were kept frozen until used in a trial at which time they were completely thawed prior to placement. The two specimens used in each trial were the same species and of similar size (<150 mm size difference). Two specimens were simultaneously placed at randomly determined locations along a 2 km road traversing the maritime forest and a 2 km road traversing dune habitat.

Each trial took place over a separate 24-hr period between 20 July to 1 August 2010. To best simulate real circumstances, carcasses of diurnal snake species (Rough Green Snakes (*Opheodrys aestivus*) and Black Racers (*Coluber constrictor))* were placed on roads in the early afternoon and carcasses of nocturnal or crepuscular snakes (Yellow Rat Snakes (*Pantherophis allegheniensis*) and Scarlet Snakes (*Cemophora coccinea*)) at sundown. All carcasses were placed on the periphery of the road to avoid constant collisions with traffic and subsequent rapid deterioration of carcass condition. Carcasses were visually inspected every hour for the first three hours after they were set and every four hours afterward for a 24-hr period. Carcasses that were not scavenged during the 24 hr period were removed.

Data Analysis: Each carcass was characterized as scavenged or not scavenged based upon whether or not they were removed from the road. Scavenging speed of each carcass was determined by quantifying the amount of time between the placement of a carcass and the time at which it was observed missing. Because some of our carcass checks were spaced four hours apart scavenging may have occurred hours earlier than recorded; as a result all of our estimates of time to removal are conservative meaning that they overestimate the time snake carcasses remained on roads. For analyses requiring a non-zero value for time to removal, the value of 24 was assigned, indicating that carcasses remained unremoved for a 24 hr period. A Kruskall-Wallis test was used to examine differences in scavenging speed between species (Zar 2009). Species for which no difference in mean time to removal was detected were grouped for further analysis. A Chi-square test was used to compare time to removal between carcasses on the maritime forest road and the dune road (Zar 2009). Linear regression was used to describe the relationship between snake size (SVL) and scavenging speed (Zar 2009). All tests were performed with SPSS 15.0 (SPSS Inc. Chicago, IL) and alpha levels were set at 0.05.

RESULTS

Ten trials were conducted between 20 July and 1 August 2010 with 20 snake carcasses (10 *O. aestivus*, 4 *P. alleghaniensis*, 4 *C. constrictor*, and 2 *C. coccinea*) placed at randomly selected locations. All ten (100%) of the carcasses placed on the maritime forest road were scavenged, while four (40%) of the carcasses on the dune road were taken (Table 1) within a 24 hr period. Half of all carcasses (50%) were removed by scavengers within 8 hrs of placement (Fig 1). No difference was detected in scavenging speed for the different species (χ^2 = 3.65, df = 3, P = 0.30), therefore all species were grouped for analysis. Carcasses located in maritime forest were removed by scavengers faster ($\bar{x}$ = 8.1 hrs ± 2.2) than those located in dunes ($\bar{x}$ = 20.7 hrs ± 2.2; χ^2 = 8.57, df = 1, P = 0.03). However, if only scavenged carcasses are considered, mean removal time of dune carcasses is reduced to 11.7 ± 8.1 hrs. No relationship was detected between carcass length and scavenging rate (F = 0.21, r^2 = 0.01, P = 0.66). All scavenging events took place between the hours of 19:30 (dusk) and 06:15 (dawn) regardless of when carcasses were placed.

DISCUSSION

When 20 snakes carcasses were placed at randomly determined locations on two different roads, 70% were scavenged within 16 hrs. Carcasses removed from roadsides were taken during the first night they were placed and 50% were removed during the first 8 hrs (Fig 1). Although several carcasses on the dune road were never removed, carcass removal occurred as quickly as 1 hr on the forest road. Scavenging has long been acknowledged as a significant source of carcass removal along roadsides by numerous animals of various taxa (DeVault and Krochmal 2002; DeVault et al. 2003). Antworth et al. (2005) documented an even higher rate of snake carcass removal (97%) than we did and a high rate of removal of chicken carcasses (60-76%), although the study allowed a 36 hr window for scavenging to occur whereas we only provided 24 hrs. The majority of carcasses placed on roadsides by Antworth et al. (2005) were removed within 36 hrs while Bumann and Stauffer (2002) reported a mean removal time of 68 hrs with a minimum of 1 hr 46 min for dead grouse in Virginia.

Removal of carcasses can be influenced by time of day, weather, temperature, species and condition of carcass, traffic density, topography, season, and species of predators (Bumann and Stauffer 2002; Slater 2002). Although our results did not indicate differences in removal time for different species of snakes, we did notice a significant difference in removal time by habitat type. Carcasses in forested habitat were removed more often (100% vs 40%) and more quickly (8 hr vs 20 hr) than those placed in dune habitat, likely reflecting differences in scavenger distribution across BHI. Both our results and those of Antworth et al. (2005) indicate no difference in removal time of carcasses based upon their size. Slater (2002) attributed much of the observed scavenging in his study on feral cats (*Felis familiaris*) while Antworth et al. (2005) predominantly credited raccoons, vultures, and fire ants. Vultures on BHI are rare and fire ants and feral cats have not become established; instead, all predation observed by the authors was the result of red fox and on one occasion sow bugs (*Armadillidium spp.).* The rarity of vultures and lack of fire ants on BHI likely contributes to the lack of diurnal carcass removal noted in our study as compared to those of others (Antworth et al. 2005). Nocturnal removal of carcasses on

BHI is likely attributable to the crepuscular and nocturnal foraging habits of the red fox (Macdonald 1977; Lovari et al. 1994).

The rapid and intense removal of road-killed carcasses by scavengers can have serious implications for researchers examining patterns in road-mortality. If surveys are not properly timed and conducted at an optimal frequency, researchers run the risk of seriously underestimating actual road-mortality. Slater (2002) estimated that actual mortality rates may be a factor of 12-16 times higher than rates calculated from observed carcasses on roads in the United Kingdom. Most studies that collect snakes from roads conduct surveys on a daily basis (Bonnet et al. 1999; Enge and Wood 2002; Shepard et al. 2008) or less frequently (Bernardino and Dalrymple 1992; Ciesiolkiewicz et al. 2006). Those studies likely underestimated mortality rates or fail to collect carcasses that may confound results. For instance, DeGregorio et al. (2010) documented roughly 200 road-killed snakes on BHI during the summer of 2009. Based upon the composition of their sample, the authors concluded that diurnal species were the type of snake most often encountered dead on the road. However, because all snake carcasses placed in our study were removed at night, the scarcity of nocturnal species documented by DeGregorio et al. (2010) may stem from prompt nocturnal scavenging; the result is likely an under-representation of nocturnal snakes in the sample. Future efforts to document snake road-mortality on barrier islands as well as other habitats should be structured so that the effect of scavengers is minimized, either by surveying twice daily or timing surveys to collect snake carcasses before scavenging occurs.

Very few studies have investigated patterns in snake carcass removal along roads. Carcass removal is likely influenced by a number of factors including time of day, weather, temperature, species and carcass condition, traffic density, topography, season, and species of predators (Slater 2002). Further investigations are needed to quantify the effects of the aforementioned variables on scavenging patterns. Until scavenging is better understood on multiple regional scales, we recommend that investigations of snake road-mortality incorporate a concurrent scavenging component to better compensate for local conditions and to tailor experimental designs to minimize confounding effects of carcass removal.

Acknowledgements: Manuscript preparation was aided by Contract DE-AC09-76SROO-819 between the US Dept of Energy and the University of Georgia's Savannah River Ecology Laboratory. Thanks to the Bald Head Island Conservancy for logistical support. Thanks to everyone who helped us collect dead snakes including Mary Mack Gray, Patrick Barnhart, Andrew Niccum, Alyssa Taylor, Kit Straley, Lauren Marks, and Jess Messer. Thanks to J.D. Willson, Justin Henningsen, and Kimberly Andrews for manuscript advice.

LITERATURE CITED

ANDREWS, K.M. AND J. W. GIBBONS. 2005. How do highways influence snake movement? Behavioral responses to roads and vehicles. Copeia 2005:772–782.

ANDREWS, K.M., J.W. GIBBONS AND D.M. JOCHIMSEN. 2008. Ecological effects of roads on amphibians and reptiles: a literature review. *in* Urban herpetology 3. J.C. Mitchell, R.E. Jung Brown, and B. Bartholomew (Eds.). SSAR books, Salt Lake City, UT.

ANTWORTH, R.L., D.A. PYKE AND E.A. STEPHENS. 2005. Hit and run: effects of scavenging on estimations of roadkilled vertebrates. Southeast. Nat. 4: 647-655.

BERNARDINO, JR. F.S., AND G.H. DALRYMPLE. 1992. Seasonal activity and road mortality of the snakes of the Pa-hay-okee wetlands of Everglades National Park, USA. Biol. Conserv. 61:71–75.

BONNET, X., G. NAULLEAU AND R. SHINE. 1999. The dangers of leaving home: dispersal and mortality in snakes. Biol. Conserv. 89:39-50.

BUMANN, G.B. AND D.F. STAUFFER. 2002. Scavenging of ruffed grouse in the Appalachians: influences and implications. Wild. Soc. Bull. 3: 853-860.

CIESIOLKIEWICZ, J., ORLOWSKI, G. AND A. ELZANOWSKI. 2006. High juvenile mortality of Grass Snakes *Natrix natrix* on a suburban road. Polish J. Ecology 54:465–472.

CLARK, R.W., W.S. BROWN, R. STECHERT AND K.R. ZAMUDIO. 2010. Roads, interrupted dispersal, and genetic diversity in timber rattlesnakes. Conserv. Biol. 4: 1059-1069.

DEGREGORIO, B.A. AND E.J. NORDBERG. *In Press*. *Coluber constrictor priapus* (scavenging). Herpetol. Rev.

DEGREGORIO, B.A., E.J. NORDBERG, K.E. STEPANOFF AND J.E. HILL. 2001. Patterns in snake road mortality on an isolated barrier island. Herpetol. Con. Biol. 5: 341-347.

DEVAULT, T.L., AND A.R. KROCHMAL. 2002. Scavenging by snakes: a literature review. Herpetologica 58: 429-438.

DEVAULT, T.L., O.E. RHODES JR AND J.A. SHIVAK. 2003. Scavenging by vertebrates: behavioral, ecological, and evolutionary perspectives on an important energy transfer pathway in terrestrial ecosystems. Oikos 102: 225-234.

ENGE, K.M., AND K.N. WOOD. 2002. A pedestrian road survey of an upland snake community in Florida. Southeast. Nat. 1:365–380.

FREEMAN, A. AND C. BRUCE. 2006. The things you find on the road: roadkill and incidental data as an indicator of habitat use in two species of tropical python. *in* R.W. Henderson and R. Powell (Eds.), The Biology of Boas and Pythons. Eagle Mountain Publishing Compay, Eagle Mountain, CO.

HELLMAN, R.E. AND S.R. TELFORD, JR. 1956. Notes on a large number of Red-Bellied Mudsnakes, *Farancia a. abacura*, from northcentral Florida. Copeia 1956:257–258.

JOCHIMSEN, D. 2006. Ecological effects of roads on herpetofauna: A literature review and empirical study examining seasonal and landscape influences on snake road mortality in eastern Idaho. M.S. Thesis. Idaho State University. Boise, Idaho, USA 199 p.

KLAUBER, L.M. 1939. Studies of reptile life in the arid southwest, Part 1. Night collecting in the desert with ecological statistics. Bull. Zool. Soc. San Diego 14:2–64.

LOVARI, S., P. VALIER AND M.R. LUCCHI. 1994. Ranging behaviour and activity of red foxes (Vulpes vulpes) in relation to environmental variables, in a Mediterranean mixed pinewood. J. Zoology 2: 323-339.

MACDONALD, D.W. 1977. On food preference in the Red Fox. Mammal Rev. 7: 7-23.

MCCURRY-SCHMIDT, M. 2010. Pull over for roadkill. Frontiers in Ecol. Environment. 8:513.

ROSEN, P.C., AND C.H. LOWE. 1994. Highway mortality of snakes in the Sonoran Desert of southern Arizona. Biol. Conserv. 68:143–148.

ROW, J. R., G. BLOUIN-DEMERS AND P. J. WEATHERHEAD. 2007. Demographic effects of road mortality in black ratsnakes (*Elaphe obsoleta*). Biol. Conserv. 137: 117–124.

SEIGEL, R.A. AND M.A. PILGRIM. 2002. Long-term changes in movement patterns of massasaugas (*Sistrurus catenatus*), Pp. 405–412. *in* Biology of the Vipers. G.W. Schuett, M. Hoggren, M.E. Douglas and H.W. Greene (Eds.). Eagle Mountain Publishing, Eagle Mountain, Utah.

SHEPARD, D.B., M.J. DRESLIK, B.C. JELLEN AND C.A. PHILLIPS. 2008. Reptile road mortality around an oasis in the Illinois corn desert with emphasis on the endangered eastern massasauga. Copeia 2: 350-359.

SULLIVAN, B.K. 1981. Observed differences in body temperature and associated behavior of four snake species. J. Herpetol. 15: 245-246.

SLATER, F.M. 2002. An assessment of wildlife road casualties – the potential discrepancy between numbers counted and numbers killed. Web Ecology 3: 33-43.

ZAR, J.H. 2009. Biostatistical Analysis. Prentice Hall Publishers. Upper Saddle River,

New Jersey (USA).

FIGURE LEGENDS

FIG. 1: Time to removal of snake carcasses placed at randomly selected locations along roads on Bald Head Island, NC during the summer of 2010.

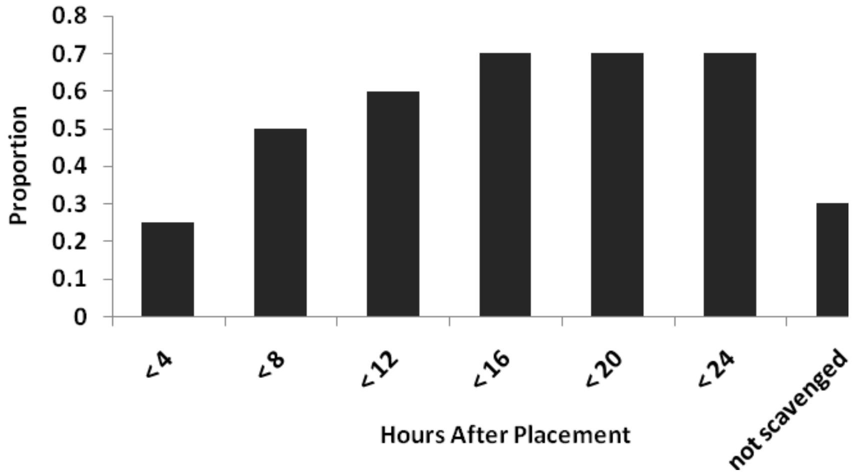


Table 1: Intensity, timing, and speed of removal of snake carcasses by scavengers on Bald Head Island, NC.

Habitat	Number of Carcasses Placed	Number of Carcasses Scavenged	Mean (± SE) Hours to Removal	Percent Removed at Night
Maritime Forest	10	10	8.1 ± 2.2	100
Dune	10	4	11.7 ± 8.1	100
Combined	20	14	9.8 ± 4.2	100

Wild Equity Institute v. City and County of San Francisco,

No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 11

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **MONITORING DECLARATION OF MARGARET GOODALE**

I, Margaret Goodale, declare as follows:

1. I am a long time resident of Pacifica, California, residing within a few miles of Sharp Park. I am a member of the Wild Equity Institute, and over the past thirteen months, in addition to visiting Sharp Park to view wildlife, I have visited Sharp Park to monitor golf course compliance plan activities. While observing activities in the Park I kept contemporaneous records of what I observed. I have relied on these records in preparing this declaration.

2. On August 8, 2010, from approximately 5:30am until approximately 8:00am, I monitored compliance plan activities at Sharp Park Golf Course. At 7:25am, I observed a lawn mower on the approach and green of hole 15. I also observed the lawn mower on the green of hole 17. I did not see a biological monitor survey the area before the mowing occurred.

3. On August 11, 2010, from approximately 5:20am until 7:40am, I monitored compliance plan activities at Sharp Park Golf Course. At 5:45am, I observed a lawn mower on hole 9. I did not see a biological monitor survey the area before the mowing occurred. At 7:25am, I observed a lawn mower on hole 15. I did not see a biological monitor survey the area before the mowing occurred. At 7:43am, I observed a lawn mower on hole 17. I did not see a biological monitor survey the area before the mowing occurred.

4. On August 13, 2010, from approximately 5:30am until 8:40am, I monitored compliance plan activities at Sharp Park Golf Course. At 7:13am, I observed a lawn mower on hole 15. I did not see a biological monitor survey the area before the mowing occurred. At 7:33am, I observed a lawn mower on holes 8 & 9. I did not see a biological monitor survey the area before the mowing occurred. At 8:34am, I observed two golf carts driving rapidly on the fairway of hole 9. Attached as Exhibit A is a photograph of the golf carts I observed on the fairway of hole 9.

5. On August 17, 2010, from approximately 9:55am until 11:00am, and again from approximately 5:30pm until 6:30pm, I monitored compliance plan activities at Sharp Park Golf Course. At 9:59am, I observed a golf cart driving down the middle of the fairway of hole 9, and I observed several clear golf cart tracks in the dew on the fairway grasses. At 10:52am, I observed a golf cart driving on the fairway of hole 17. At 10:55am, I observed a golf cart parked on the fairway of hole 9. At 5:55pm, I observed a golf cart driving on the fairway of hole 17.

6. On August 18, 2010, I monitored compliance plan activities at Sharp Park Golf Course. I observed a golf cart driving back and forth on the fairway of hole 17, apparently searching for a lost golf ball. Attached as Exhibit B are two photos of what I observed.

7. On August 27, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 12:07pm, I observed a golf cart on the fairway of hole 16 driving to within 100 yards of the marshy areas of Laguna Salada, and then returning to the fairway hole 16.

8. On August 29, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 7:45pm, I observed a golf cart on the fairway of hole 14 driving to within 100 yards of the marshy areas of Laguna Salada.

9. On August 31, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 11:07am, I observed two golf carts on the fairway of hole 9.

10. On September 1, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 1:03pm, I observed two golf carts on the fairway of hole 14, within 50 feet of the marshy areas of Laguna Salada.

11. On September 2, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 12:17pm, I observed a golf cart driving on the fairway of hole 17. A minute later, I also observed a golf cart driving on hole 14.

12. On September 5, 2010, from roughly 12:30pm until 2:30pm, I monitored compliance plan activities at Sharp Park Golf Course. At 12:42pm, I observed two golf carts driving on the fairway of hole 17. At 12:52pm, I observed another golf cart driving on the fairway of hole 17. At 1:03pm, and again at 2:02pm, I observed a golf cart driving on the fairway for hole 13. At 2:14pm, I observed a golf cart driving on fairway for hole 17. Attached as Exhibit C are photographs of what I observed.

13. On September 6, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 1:09pm, I observed a golf cart driving on the fairway of hole 17. At 1:10am I observed a golf cart driving on the fairway of hole 14.

14. On September 8, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 2:08pm, I observed two golf carts driving on the fairway of hole 9.

15. On September 10, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 2:59pm, I observed two golf carts driving on the fairway for hole 14.

16. On November 1, 2010, I monitored compliance plan activities at Sharp Park Golf Course. At 10:24am, I observed a golf cart driving on the fairway of hole 9. At 10:25am, I observed what I believe is the course marshal driving off the golf cart path near the fairway of hole 9. Attached as Exhibit D are photographs of the golf cart and course marshal I observed.

17. On February 11, 2011, I monitored compliance plan activities at Sharp Park Golf Course. At 11:25am, I observed a lawn mower operating on the fairway of hole 9. I did not observe a

biological monitor survey the area before the mowing occurred. Attached as Exhibit E is a photo of the mowing activity I observed.

18. On July 17, 2011, from approximately 9:20am until 11:05am, I monitored compliance plan activities at Sharp Park Golf Course. At 9:58am, I observed a lawn mower operating on the tee of hole 13. I did not observe a biological monitor survey the area before the mowing occurred. At 10:09am, I observed a lawn mower operating near the green of hole 9 and the tee of hole 12. I did not observe a biological monitor survey the area before the mowing occurred. Attached as Exhibit F are photos of the mowing activity I observed.

19. On August 14, 2011, from 7:45am until 10:15am, I monitored compliance plan activities at Sharp Park Golf Course. At 8:00am, I observed a lawn mower on the green for hole 15. I did not observe a biological monitor survey the area before the mowing occurred. I also observed a golf cart off-path on the fairway for hole 11, and a maintenance cart driving on the green for hole 12, and a maintenance cart driving off the path to the green on hole 9.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on this 23rd day of September, 2011. s/Margaret Goodale

Margaret Goodale

I, Brent Plater, hereby attest that Margaret Goodale concurrence in the e-filing of this document has been obtained.

Executed on: September 23, 2011

Brent Plater

EXHIBIT A
Declaration of Margaret Goodale
August 13, 2010, 8:34am
Fairway of Hole 9, Sharp Park Golf Course

EXHIBIT B, p. 1
Declaration of Margaret Goodale
August 18, 2010, 12:50pm
Fairway of Hole 17, Sharp Park Golf Course

EXHIBIT B, p.2
Declaration of Margaret Goodale
August 18, 2010, 12:50pm
Fairway of Hole 17, Sharp Park Golf Course

EXHIBIT C, p. 1
Declaration of Margaret Goodale
September 5, 2010, 12:42pm
Fairway of Hole 17, Sharp Park Golf Course

EXHIBIT C, p. 2
Declaration of Margaret Goodale
September 5, 2010, 12:52pm
Fairway of Hole 17, Sharp Park Golf Course

EXHIBIT C, p. 3
Declaration of Margaret Goodale
September 5, 2010, 1:03pm
Fairway of Hole 13, Sharp Park Golf Course

EXHIBIT C, p. 4
Declaration of Margaret Goodale
September 5, 2010, 2:02pm
Fairway of Hole 13, Sharp Park Golf Course

EXHIBIT C, p. 5
Declaration of Margaret Goodale
September 5, 2010, 2:14pm
Green of Hole 17, Sharp Park Golf Course

EXHIBIT D, p. 1
Declaration of Margaret Goodale
November 1, 2010, 10:24am
Fairway for Hole 9, Sharp Park Golf Course

EXHIBIT D, p. 2
Declaration of Margaret Goodale
November 1, 2010, 10:25am
Off of Golf Cart Path for Hole 9, Sharp Park Golf Course

EXHIBIT E
Declaration of Margaret Goodale
February 11, 2011, 11:25am
Fairway, Hole 9, Sharp Park Golf Course

EXHIBIT F, p. 1
Declaration of Margaret Goodale
July 17, 2011, 9:58am
Tee for Hole 13, Sharp Park Golf Course

EXHIBIT F, p. 2
Declaration of Margaret Goodale
July 17, 2011, 10:09am
Tee for Hole 12, Green of Hole 9, Sharp Park Golf Course

Wild Equity Institute v. City and County of San Francisco,

No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 16

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.*, Plaintiffs, vs. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **Declaration of Laurie Graham**

I, Laurie Graham, declare as follows:

1. I have lived in South San Francisco, in San Mateo County, California, for thirteen years. Prior to moving to South San Francisco I lived in San Francisco for over eighteen years years. My home is approximately six miles from Sharp Park. I am an avid birder and wildlife viewer who, along with my husband, enjoys exploring the parks and trails in San Mateo County. While on my birding outings, my husband and I also enjoy looking for the San Francisco Garter Snake ('the Snake") and the California Red-legged Frog ("the Frog") and other species in Mori Point, Sharp Park, and the other natural areas surrounding the park. As a member of plaintiffs Wild Equity Institute and Sequoia Audubon Society, I submit this standing declaration in support of plaintiffs' motion for a preliminary injunction. I rely upon the Wild Equity Institute and Sequoia Audubon Society to advocate on my behalf.

2. I first became interested in birding in the mid-seventies while living in Wisconsin. When my husband and I moved to San Mateo County in late 2004 my interest was renewed due to the abundance of bird watching opportunities and the variety of species in the area. The parks and other natural areas provide excellent habitats for many species.

3. My first trip to Mori Point was in July 2006. Since that trip my husband and I have returned over twenty times to view ducks and shorebirds. We are always on the lookout for the elusive Snake and have seen the Frogs. We primarily visit in the latter half of the year, as that is the time of year when we can see some of our favorite bird species. We typically spend approximately four hours in the park when we visit. I fully intended to keep visiting Mori Point

and Sharp Park in the future, but I am fearful of having diminished opportunities to view the birds and wildlife if the golf course's practices continue.

4. Over the course of my many visits to the park, I have explored and observed the natural surroundings hoping to see interesting and rare birds, as well as Snakes, Frogs, and other wildlife. I have explored all the trails in the park, from up to Mori Point and all the way down into the valley.

5. I am active in the local conservation community through various organizations. In addition to being a member of the Sequoia Audubon Society for over seven years, I serve on the board of directors as secretary. I also volunteer at the Audubon Canyon Ranch. I have also participated in two field trips with the Golden Gate Audubon Society to view birds and wildlife in Sharp Park.

6. I have led birding trips for the Sequoia Audubon Society in Sharp Park on three occasions. We spend approximately three to four hours in the park and look for all kinds of birds and other native wildlife. Additionally I have led one three hour field trip with the Golden Gate Audubon Society. During these and all my trips I like to keep an eye out for the Snake but since it is so rare I have not yet seen one. I am hopeful that one day I will be able to see the Snake in the wild. On the other hand, I have seen Frogs on a number of my trips.

7. Some of the best viewing times have been when the Sharp Park golf course has been flooded. The bird and wildlife viewing opportunities become more interesting as different species come to wade and forage in the wet areas. My interest in birds is intrinsically tied into the fate of the Frog and the Snake. In the natural food chain birds I enjoy viewing, like Great Blue Herons, eat the Frogs (who are also eaten by the Snakes). If development and pumping continue then the natural cycle could be irreversibly disrupted.

8. I enjoy visiting Sharp Park and my interest in the Frogs has been harmed as I have observed the pumping of the ponds by the golf course and have seen the water levels drop to reduce the flooding on some of the golf holes. I would rather the golf course stop operating than have the large-scale death of the Frog egg masses continue, which is undermining my ability to enjoy the Frog in the future.

9. My interests have also been harmed as my ability to see the rare Snake on a future trip is being diminished. Any actions threatening the Snake jeopardizes my future potential of finally viewing the Snake. The continued practices of the golf course threaten my chances of this viewing ever occurring.

10. It is important to me to know that these species are in Sharp Park, and I can possibly see them while I am visiting with my husband or other nature lovers. My interests are harmed by the golf course's practices that threaten the Snake and Frog.

11. Protecting the Frogs and Snakes further would help increase the natural beauty of the park and increase my enjoyment of the park. I hope to be able to continue to visit a Sharp Park unhindered by significant threats to the survival of the native wildlife.

Pursuant to 28 U.S.C. §1746, I hereby declare under penalty of perjury that foregoing is true and correct to the best of my knowledge and belief.

Executed on this 23rd day of September, 2011. s/Laurie Graham

Laurie Graham

I, Brent Plater, hereby attest that Laurie Graham's concurrence in the e-filing of this document has been obtained.

Executed on: September 23, 2011 [signature]

Brent Plater

Wild Equity Institute v. City and County of San Francisco,
No. 3:11-CV-00958 SI (N.D. Cal.)

Plaintiffs' Motion for a Preliminary Injunction

Plaintiffs' Exhibit 26

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION

WILD EQUITY INSTITUTE, a non-profit corporation, *et al.* Plaintiffs, v. CITY AND COUNTY OF SAN FRANCISCO, *et al.*, Defendants.	Case No.: 3:11-CV-00958 SI **DECLARATION OF JOHN BOWIE**

I, John Bowie, declare as follows:

1. I lived in Pacifica, California from 2010-2011, residing within a few miles of Sharp Park. I moved recently to attend graduate school. I am a member of the Wild Equity Institute, and in 2010-2011 I visited Sharp Park to monitor golf course compliance plan activities. While observing activities in the Park I kept contemporaneous data of what I observed. I have relied on these records in preparing this declaration.

2. On February 20, 2011, I monitored compliance plan activities at Sharp Park. The Horse Stable Pond pumps were operating and pumping significant amounts of water from the pond. Attached as Exhibit A is a photograph of the pumping operations I observed that day.

3. On February 22, 2011, I monitored compliance plan activities at Sharp Park. I was informed by Jewel Snavely of a possible egg mass stranding at Horse Stable Pond, and I searched for it in the vicinity she directed. I found the egg mass completely exposed to the air. The pumps were still operating, draining more water from Horse Stable Pond. Attached as Exhibit B are photos of the exposed egg mass and the pumps operating from February 22, 2011.

4. On February 23, 2011, I returned to Sharp Park Golf Course to check on the egg mass. The egg mass was still completely exposed to the air. I observed the water levels and they

appeared lower based on the gauge in the Sharp Park Golf Course pump house. Attached as Exhibit C are two photographs of the gauge and the egg mass that I observed.

5. On February 24, 2011, I returned to Sharp Park Golf Course to check on the egg mass. The egg mass was still exposed to the air. Attached as Exhibit D is a photograph of the egg mass from that day.

Pursuant to 28 U.S.C. § 1746, I hereby declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Executed on this 23rd day of September, 2011. s/John Bowie

John Bowie

I, Brent Plater, hereby attest that John Bowie's concurrence in the e-filing of this document has been obtained.

Executed on: September 23, 2011 Brent Plater

Brent Plater

EXHIBIT A
Declaration of John Bowie
February 20, 2011, 1:37pm
Sharp Park Golf Course Outfall Pump

EXHIBIT B, p. 1
Declaration of John Bowie
February 22, 2011, 10:44am
California red-legged Frog Egg Mass, Southeast Horse Stable Pond

Exhibit B, p. 2
February 22, 2011, 10:44am
Pumphose at Sharp Park Golf Course

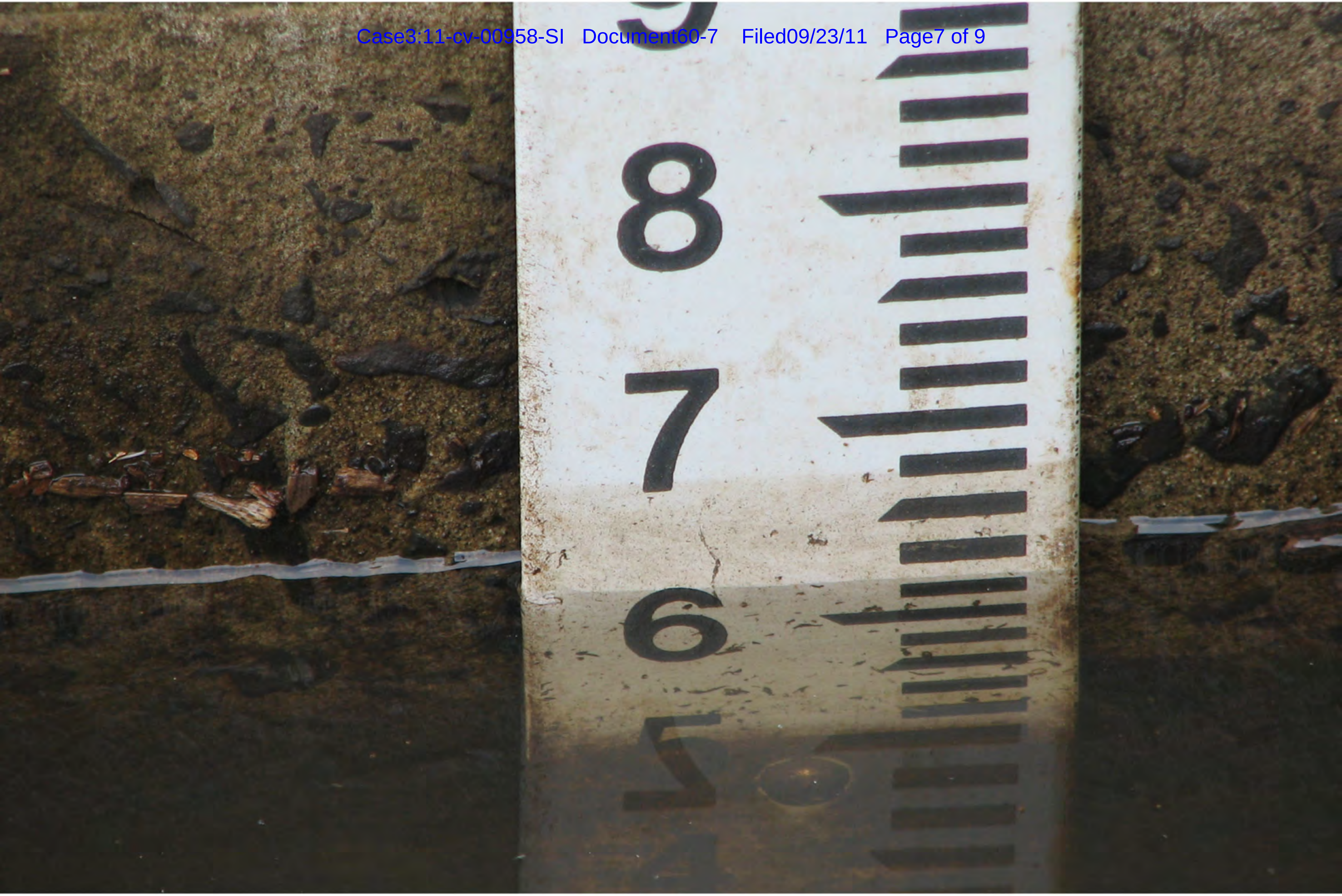


EXHIBIT C, p. 1
Declaration of John Bowie
February 23, 2011, 11:04am
Water Gauge, Sharp Park Golf Course Pump House, Horse Stable Pond

EXHIBIT C, p. 2
Declaration of John Bowie
February 23, 2011, 6:46am
California Red-legged Frog Egg Mass, Southeastern Horse Stable Pond

EXHIBIT D
February 24, 2011, 3:47pm
California Red-legged Frog Egg Mass, Southeastern Horse Stable Pond