Law Offices of
THOMAS N. LIPPE

329 Bryant Street
Suite 3D
San Francisco, California 94107

Telephone: 415-777-5600
Facsimile: 415-777-9809
Email:Lippelaw@sonic.net

February 6, 2006

Brian Amme
PEIS Project Manager
Nevada State Office
1340 Financial Boulevard
P.O. Box 12000
Reno, Nevada 89520-0006

Re: Comments of the California Oak Foundation on the Draft Programmatic Environmental Impact Statement for Vegetation Treatments Using Herbicides on Bureau of Land Management Lands in 17 Western States

Dear Mr. Amme:

1 This office represents the California Oak Foundation, a California non-profit organization committed to preserving the state's oak forest ecosystem. We have reviewed the Draft Programmatic Environmental Impact Statement ("Draft PEIS"), the Draft Programmatic Environmental Report (Draft "PER"), and the Draft Biological Assessment ("Draft BA"), prepared by the Bureau of Land Management ("BLM") pursuant to the National Environmental Policy Act ("NEPA") for its proposed use of herbicides to treat vegetation on BLM managed land in 17 western states, including California.

2 On or about January 9, 2006 I submitted to your office three binders containing all of the exhibits referenced in this letter and identified in the List of Exhibits set forth at the end of this letter. Those exhibits are incorporated by reference into this comment letter.

I. INTRODUCTION

A. Summary of Comments

3 As discussed in more detail below, the Oak Foundation has several concerns about the sufficiency of the environmental documents prepared for this program. To summarize, the Draft PEIS fails to adequately describe the program in sufficient detail to allow meaningful public comment. For example, the extent to which the BLM may apply herbicides to BLM managed lands that contain oak woodlands or are adjacent to non-BLM managed lands that contain oak woodlands is unknowable from the data provided.

4 Also, the Draft PEIS fails to consider the potential effects of increased herbicide use on oak woodland ecosystems. Because oak woodlands in California are home to numerous endangered, threatened, and protected species, the failure to adequately assess the impacts to oak woodlands constitutes a failure to assess the impacts on these special-status species.

5 Furthermore, the cumulative impact analysis in the Draft PEIS is deficient. Specifically, the document fails to properly assess the current and historic use of herbicides and pesticides in California. Numerous studies document the use of these chemicals and their destructive effects on various species inhabiting oak woodlands, but the Draft PEIS fails to incorporate this information. Accordingly, the Draft PEIS fails to assess the cumulative effects of applying herbicides to BLM managed land adjacent to non-BLM managed land where herbicide and pesticide use has been pervasive. Ariel drift, groundwater seepage, stormwater runoff, and other factors will cause the application of herbicides on BLM land to contaminate adjacent land and water. And, because much of this adjacent non-BLM managed land has historically been treated with herbicides and other pesticides, the BLM's proposed use of herbicides on its land will exacerbate the current levels of these chemicals in the environment. The omission of this analysis represents a serious flaw in the Draft PEIS.

B. Oak Woodlands Are Essential Components of California's Diverse Ecosystems.

6 California has millions of acres of oak woodlands containing numerous species of oak trees, including valley oak (*Quercus lobtata*), blue oak (*Q. douglasii*), coast live oak (*Q. agrifolia*) interior live oak (*Q. wislizenii*), canyon live oak (*Q. chrysolepsis*), California black oak (*Q. kelloggii*), Engelman oak (*Q. engelmannii*), and Oregon white oak (*Q. garrayana*). (Exhibits 1 and 2 .) These species exist in hardwood rangelands along the northern coast, throughout the central valley, and up into the Sierra Nevada foothills. (Exhibit 3.) The BLM estimates that over 3 million acres of public land in California are within regions containing oak woodlands. (Draft PEIS, at pp. 3-24 to 3-25.)

7 Oak woodlands provide habitat for the largest assemblage of wildlife species of any habitat type in California, approximately 313 breeding species. (Exhibit 4.)

8 > These habitats support a rich wildlife fauna because they are complex and diverse, with many plant species and layers, providing many habitats and niches. This layering, or "vertical edge,"is the most important element contributing to the diversity of these hardwood communities. [] Gophers, moles, and mushrooms occupy the subsurface layer; grasses, forbs, duff, mulch, and litter clothe the forest floor and support mice, towhees, skunks and many other species. Subcanopy layers (e.g., shrubs) vary in number and support representative wildlife, especially birds. The canopy itself may be layered, and supports its own characteristic fauna. Some wildlife species are restricted to one layer; some use all. Note all hardwood stands

> have as many layers as a mature stand, but even a lone oak tree contains parts of several layers, and is, by itself, a rich habitat element.

9 (*Ibid.*) Moreover, 2,000 plant species and an estimated 5,000 species of insects exist within oak woodland habitats. (Exhibit 5.)

Within California, there are five dominant woodland habitat types: valley oak woodland; blue oak woodland; blue oak-foothill pine woodland; coastal oak woodland; and Montane hardwood forest. (Exhibit 5.) Woodlands comprised of valley oaks, which are endemic to California, are found primarily in patches throughout the Sacramento-San Joaquin valley. (*Ibid.*) "Blue oak woodlands 10 form a nearly continuous band along the Sierra Nevada-Cascade foothills of the Sacramento-San Joaquin valley." (*Ibid.*) Moving up to steeper, dryer slopes, blue oaks mix with foothill pine to comprise a distinct habitat. (*Ibid.*) Coastal oak woodlands run along California's coastal foothills and valleys. (*Ibid.*) And Montane hardwood forests, which contain canyon live oak, interior live oak, black oak, and Oregon white oak, are found primarily along the northern coast. (*Ibid.*)

11 The elements of these oak woodland habitats – riparian zones, vernal pools, wetlands, dead and downed logs and other woody debris, brush piles, snags, rock outcroppings, and cliffs – supply food, water, and cover to sustain wildlife species. (Exhibit 5.) Indeed, "[e]ach habitat element provides unique niches, favoring particular wildlife species." (*Ibid.*)

A critical, and therefore an essential, element is food. Oak woodland habitats provide an essential food source to numerous species.

> 12 Martin et. al. (1951), in their classic study of wildlife food habitats in the United States, found that oaks were fed upon by 96 species of wildlife, more than any other plant group. Wildlife browse leaves, twigs and flowers of oak, gnaw on bark and tender wood, and eat acorns, galls, lichens and mistletoe. Predators catch prey that live in and on oak trees. The list of plant foods, predators, and prey expands rapidly if we consider the entire oak stand or forest, not just individual trees. Associated tree species, shrubs, grasses, forbs, mushrooms and other fungi, all contribute to the rich feeding network provided by oak environments. Verner (1980) listed 45 species of birds that obtain insects from oak foliage, twigs, bark or wood; 9 species that catch aerial insects by launching from perches in oaks; 3 species that eat sap; and 2 species that eat the berries of mistletoe growing in oaks. Moreover, hawks and owls perch in oak trees to search for prey.

(Exhibit 4.) The most important single food supplied by oaks are acorns, which are considered to 13 be as important as any forest wildlife food in the United States. (*Ibid.*) Acorns are an ideal food, providing rich stores of fat and carbohydrates in the fall when wildlife species in California strive to build extra fat stores to survive the winter. Many California species are almost wholly dependant

13 cont.

on seasonal supplies of acorns, including deer, black bear, wild pig, western grey squirrel, wild turkey, wood duck, and acorn woodpecker. (*Ibid.*) Acorns are especially important for deer in California, making up 75% or more of the diet when they are available. (*Ibid.*; *see also* Exhibit 6 [California Fish and Game report discussing wildlife values of California's oak woodlands].)

C. Numerous Endangered, Threatened, or Protected Species Live Within Oak Woodland Habitats.

Of the more than 300 species residing in or expected to be found in oak woodland habitats, a significant number are listed as endangered, threatened, or protected under either the federal Endangered Species Act ("ESA") (16 U.S.C. 1531 et seq.), or California's Endangered Species Act ("CESA") (Cal. Fish & G. Code, § 2050 et seq.). Those include: the Kern County salamander (*Batrachoseps simatus*); the limestone salamander (*Hydromantes brunus*); the long-toed salamander (*Ambystoma macrodactylum*); the Red-legged frog (*Rana aurora*); the Shasta salamander (*Hydromantes shastae*); the Tehachapi slender salamander (*Ambystoma tigrinum*); the tiger salamander (*Ambystoma tigrinum*); the Western spadefoot (*Scaphiopus hammondii*); the blunt-nosed leopard lizard (*Gambelia silus*); the California legless lizard (*Anniella pulchra*); the California mountain snake (*Lampropeltis zonata*); California whipsnake (*Masticophis lateralis*); the coachwhip (*Masticophis flagellum*); the coast horned lizard (*Phrynosoma coronatum*); the common garter snake (*Thamnophis sirtalis*); the giant garter snake (*Thamnophis gigas*); the granite night lizard (*Xantusia henshawi*); the orange throated whiptail (*Cnemidophorus hyperythrus*); the western pond turtle (*Clemmys marmorata*); the bald eagle (*Haliaeetus leucocephalus*); the bank swallow (*Riparia riparia*); the California condor (*Gymnogyps californianus*); the California gnatcatcher (*Polioptila californica*); the California towhee (*Pipilo crissalis*); the golden eagle (*Aquila chrysaetos*); the loggerhead shrike (*Lanius ludovicianus*); the peregrine falcon (*Falco peregrinus*); the savannah sparrow (*Passerculus sandwichensis*); the spotted owl (*Strix occidentalis*); Swainson's hawk (*Buteo swainsoni*); the white-tailed kite (*Elanus leucurus*); the brush rabbit (*Sylvilagus bachmani*); the California vole (*Microtus californicus*); Heermann's kangaroo rat (*Dipodomys heermanni*); the island fox (*Urocyon littoralis*); the kit fox (*Vulpes macrotis*); the little pocket mouse (*Perognathus longimembris*); the mountain beaver (*Aplodontia rufa*); the mountain lion (*Felis concolor*); the ringtail (*Bassariscus astutus*); and the San Joaquin kangaroo rat (*Dipodomys nitratoides*). (Exhibit 4; Draft PEIS, App. H.)

14

Additionally, numerous species identified by the BLM as species of concern are expected to be found within these oak woodland habitats. Those include: the foothill yellow-legged frog (*Rana boylei*); the western toad (*Bufo boreas*); the common kingsnake (*Lampropeltis getulus*); the desert night lizard (*Xantusia vigilis*); the desert spiny lizard (*Sceloporus magister*); the long-nosed snake (*Rhinocheilus lecontei*); the sagebrush lizard (*Sceloporus graciosus*); the black swift (*Cypseloides niger*); the ferruginous hawk (*Buteo regalis*); the flammulated owl (*Otus flammelous*); the hairy woodpecker (*Picoides villosus*); Lewis's woodpecker (*Melanerpes lewis*); the long-eared owl (*Asio otus*); the mountain quail (*Oreortyx pictus*); the northern goshawk (*Accipiter gentilis*); the

15

northern harrier (*Circus cyaneus*); the olive-sided flycatcher (*Contopus borealis*); the osprey (*Pandion haliaetus*); the phainopepla (*Phainopepla nitens*); the prairie falcon (*Falco mexicanus*); the purple martin (*Progne subis*); the red-naped sapsucker (*Sphyrapicus ruber*); the short-eared owl (*Asio flammeus*); Townsend's warbler (*Dendroica townsendi*); the white-headed woodpecker (*Picoides albolarvatus*); the big brown bat (*Eptesicus fuscus*); the Brazilian free-tailed bat (*Tadarida brasiliensis*); the California myotis (*Myotis californicus*); the fringed myotis (*Myotis thysanodes*); the hoary bat (*Lasiurus cinereus*); the little brown myotis (*Myotis lucifugus*); the long-eared myotis (*Myotis evotis*); the long-legged myotis (*Myotis volans*); the pallid bat (*Antrozous pallidus*); the river otter (*Lutra canadensis*); the San Joaquin pocket mouse (*Perognathus inornatus*); the silver-haired bat (*Lasionycteris noctivagans*); the spotted bat (*Euderma maculatum*); the western pipistrelle bat (*Pipistrellus hesperus*); the western red bat (*Lasiurus blossevillii*); the western small-footed myotis (*Myotis ciliolabrum*); and the Yuma myotis (*Myotis yumanensis*). (Exhibit 4; Draft PEIS, App. H.) In addition to these avian, mammal, amphibian, and reptile species, "[a] number of [special status] salmon populations are found in rivers" in California, which can be in or near oak woodland habitats. (Draft PEIS, at p. 3-33.)

15 cont.

D. Oak Woodlands in California Face Continual Threats from Urbanization, Agricultural Conversion, and Disease that Render Them More Susceptible to Degradation.

Oak woodlands in California decreased by approximately 1.2 million acres from 1945 to 1985 from a combination of factors, including rangeland clearing, fuel-wood harvesting, and residential development. (Exhibit 2.) And, since 1985, the declines in oak populations have been on the rise. For example, in Santa Barbara County, vineyard expansion has accelerated in the 1990's, mostly at the expense of oak woodlands. (Exhibit 7.) Similarly, in Sonoma County between 1990 and 1997, researchers identified 11,600 acres of new vineyards, which replaced over 7,000 acres of oak habitats. (Exhibit 8.) The accelerating loss of woodlands in these counties represent a mere sample of what has happened throughout the state. (See *ibid.* [reporting that vineyard acreage statewide has more than doubled between 1990 and 1997].) More recently, a pathogenic fungus, *Phytophthora ramorum*, also known as Sudden Oak Death, has been decimating populations of oak species such as coast live oak and black oak in several coastal counties, compounding the effects of the human causes of oak depletion discussed above. (Exhibit 9 [oaks are dying from Sonoma County in the north to Monterey County, in both urban and rural areas]; Exhibit 10 [oaks are dying in "epidemic proportions"].)

16

Seeking to address these trends, the California Fish and Game Commission and the State Board of Forestry have developed a joint policy on hardwoods. (Exhibit 11.) This policy recognizes the "natural and biological values and processes" inherent in oak woodland habitats, and charges the departments with implementing a management plan aimed at conserving this "vitally important natural and economic resource." (*Ibid.*) Nevertheless, California continues to loose its oak woodlands. The BLM's proposal to increase the use of herbicides on its lands adjacent to oak woodlands will only further accelerate the loss of this essential habitat.

17

18

II. DISCUSSION

A. The Draft PEIS Fails to Adequately Describe the Program.

19 The Draft PEIS fails to describe the program in sufficient detail to allow meaningful public comment. For example, the extent to which the BLM may apply herbicides to BLM managed lands that contain oak woodlands or are adjacent to non-BLM managed lands that contain oak woodlands is unknowable from the data provided.

20 The PEIS was prepared as a component of the BLM's directive to take aggressive action to reduce catastrophic wildfire risk on public lands. To that end, the BLM proposes to treat vegetation on approximately 4.6 million acres annually in 17 western states by a variety of methods, including the use of 14 currently-approved and four new herbicides on an estimated 932,000 acres annually. The Draft PEIS focuses on the use of herbicides, and identifies two primary objectives: (1) determine which herbicides are available for use on public lands; and (2) develop a "state-of-the science" human health and ecological risk assessment that can be used to assess herbicides that may 21 become available in the future. The Draft PEIS fails to identify, however, which of its lands will be subject to the herbicide treatments.

22 Within California, the BLM administers over 15 million acres of public land, which is roughly 15 percent of the land in California. Of those lands, some overlap with oak woodland ecosystems. Based on rough estimates at the county level, it appears 1,844,000 acres, or about 12 percent, of BLM lands contain oak woodland habitats. Specifically, the counties containing BLM lands with oak woodlands include: Amador, Butte, Calaveras, El Dorado, Fresno, Humboldt, Kern, Lake, Mariposa, Mendocino, Monterey, Napa, Nevada, San Benito, Shasta, Tehama, Tulare, Tuolomne, and Yuba. (Exhibit 12.)

23 The PEIS fails to disclose the extent to which the BLM's use of herbicides on its lands in California will impact the state's oak woodland habitats. Indeed, the PEIS provides the public with virtually no information by which it can determine the extent to which the BLM's proposed use of herbicides will impact this vital resource. And, although the Draft PEIS contemplates additional NEPA documents will be prepared at the local level that will address specific areas to be treated and assess potential effects, the time to assess these impacts at the regional level is now. Otherwise, the current NEPA review process is an empty exercise that allows the BLM to charge ahead with a massive program to vastly increased use of herbicides but without assessing whether that increased use could potentially effect resources, including oak woodlands, and specifically including oak woodlands in California.

24 Under NEPA, the BLM is required to describe its program and its projected impacts on the environment (42 U.S.C. § 4332(2)(C)), and it must do so in a manner that can be readily understood by the interested public. (40 C.F.R. § 1502.8; *Oregon Environmental Council v. Kunzman* (9th Cir.

1987) 817 F.2d 484, 493 ["EIS should be written 'in clear, concise, easily readable form so as to provide a reasonably intelligent non-professional an understanding of the environmental impact' "].)

25 By failing to plainly identify and describe the lands on which the BLM proposes to apply herbicide active ingredients, the Draft PEIS fails to quantify the scope of the BLM's vegetation management program. The result is a legally inadequate environmental document. (*See* 40 CFR § 1505.15 ["The environmental impact statement shall succinctly describe the environment of the area(s) to be affected or created by the alternatives under consideration"]; *Animal Def. Council v. Hodel* (9th Cir. 1988) 840 F.2d 1432, 1439 ["Where the information in the initial EIS was so incomplete or misleading that the decisionmaker and the public could not make an informed comparison of the alternatives, revision of an EIS may be necessary to provide 'a reasonable, good faith, and objective presentation of the subjects required by NEPA.' "].)

B. The Draft PEIS and the Draft BA do not Identify all the Special Status Species That Inhabit Oak Woodlands and Thus Fail to Assess the Potential Impacts to These Species.

26 As set forth above, oak woodlands in California provide habitat for dozens of endangered, threatened, or protected species, as well as numerous species of concern and sensitive species. (See Draft PEIS, App. H; Exhibit 4; Exhibit 13.) Pursuant to the Endangered Species Act ("ESA"), the BLM is required to determine whether a federally endangered or threatened species may be present in the area of the proposed action. (*16 U.S.C. § 1536(c)(1).*) At a minimum, the BLM is required to "evaluate the potential effects of the action on listed and proposed species and designated and proposed critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action." (40 C.F.R. § 402.12(a).)

27 Here, although the Draft BA addresses some of these special status species, it omits at least four that are known to inhabit oak woodlands. Specifically, the Draft BA failed to include discussion of the following endangered species: the long-toed salamander (*Ambystoma macrodactylum*); the loggerhead shrike (*Lanius ludovicianus*); the little pocket mouse (*Perognathus longimembris*); and the mountain beaver (*Aplodontia rufa*). Based on these omissions alone, the Draft BA is inadequate. (*City of Sausalito v. O'Neill* (9th Cir. 2004) 386 F.3d 1186, 1216 [explaining that appellate courts "will find a biological assessment inadequate only if the agency 'entirely failed to consider an important aspect of the problem' "].) Moreover, these endangered species are only those species associated with oak woodlands. It seems likely that if the BA failed to account for these species, it failed to account for endangered or threatened species that inhabit other ecosystems. This constitutes a deficiency in the Draft BA and the Draft PEIS. (*Ibid.*)

28 Additionally, the Draft PEIS does not include all the state and federally protected species likely inhabiting BLM-owned land or land adjacent to BLM-owned land in its catalog of Special Status Species. (See Draft PEIS, App. H.) That short-coming indicates a failure by the BLM to adequately analyze the impacts of its proposed use of herbicides within California's oak woodland

28 cont.

habitats. Based on this data, a far greater number of species are likely to be affected by the anticipated use of herbicides on BLM lands within oak woodland habitats, and the Draft PEIS does not sufficiently address this fact.

C. The BLM's Increased Use of Herbicides in its Vegetation Control Plan Will Exacerbate Existing Significant Impacts on Oak Woodland Habitats Resulting from Historic and Current Use of Herbicides and Other Pesticides.

29

Many of the same herbicide active ingredients the BLM proposes to use have historically been used to control vegetation throughout California generally and within oak woodland habitats specifically. In addition, different active ingredients have accumulated over time in California's agricultural lands, rivers, streams, and oak woodlands, suggesting the potential for far greater environmental impacts as more herbicide active ingredients are emitted into the environment as a result of the BLM's vegetation management proposal. The net result is that the BLM's proposed use of herbicides on its lands containing oak woodland habitats will exacerbate the threat to oak woodlands and the special status species that inhabit or rely on oak woodland ecosystems.

1. The history of herbicide use in California demonstrates that the active ingredients the BLM proposes to use harm indigenous species and damage their ecosystem.

30

The Draft PEIS discusses potential use of several herbicide active ingredients, including 2,4-D, bromacil, dicamba, diflufenzopyr, diquat, diuron, fluridone, glysophate, hexazinone, impazapic, picloram, tebuthiuron, and triclopyr. Several of these, including 2, 4-D, glyphosate, hexazinone, and triclopyr, historically have been used extensively by other land owners in or around oak woodlands. (Exhibits 14.) Studies prove these active ingredients are toxic to amphibians, fish, and other aquatic species, as well as to non-target vegetation.

31

Hexazinone is a group D carcinogen that is persistent and mobile in soil and aquatic environments. (Exhibit 15.) Hexazinone significantly impacts ground water quality, runoff water, and surface water, remaining present for as long as six months in some cases. (*Ibid.*) Moreover, it "exceeds the level of concern for small mammals at several of the higher application rates," prompting the EPA to conclude that "contamination of aquatic sites adjacent to treated areas could be of great ecological significance and may be exacerbated by the persistence and mobility of hexazinone." (*Ibid.*).[1/]

[1/] "Hexazinone is an 's-triazine' herbicide." (Draft PEIS, at p. 4-56.) Other triazines include atrazine, a known human carcinogen that is "mobile and persistent" in the environment. (Exhibits 16 & 17.) The Environmental Protection Agency's preliminary ecological risk assessment indicated that atrazine exceeds levels of concern for chronic effects on mammals, birds, fish, aquatic

32 Another active ingredient proposed for use that is currently prevalent in California is 2,4-D. Studies have revealed that 2,4-D "poses a serious problem in aquatic ecosystems due to [its] potential and often lethal physiological and biochemical effects of the inhabitants of such environments." (Exhibit 19.) Indeed, targeted tests on trench demonstrate that "2,4-D poisoning . . . provoked changes on excretory cell components, which in turn gave rise to impairment of excretory kidney tissue function." (*Ibid.*) Additionally, 2,4-D is toxic to salmonids. (Exhibit 20.)

33 Similarly, triclopyr and glysophate also can have adverse impacts on fish and wildlife, and may contaminate aquatic environments and non-target flora and fauna. (Exhibits 12, 21, 22, 23, 24, 25, 26, 27, 28.) Studies on glysophate's effects on amphibian tadpoles suggest it has the potential to cause "significant DNA damage" (Exhibit 14.) Further tests indicate that the degree of toxicity depends on the type of water in which it is found. For example, tests show glysophate is most toxic in hard water, such as lakes and rivers, which are common elements of many oak woodland habitats. (Exhibit 16; Exhibit 5.)

34 Moreover, all four of these active ingredients, hexazinone, 2,4-D, triclopyr, and glysophate are specifically designed to kill plants, which certainly has the potential for significant environmental impacts in the short and long term to both native flora and wildlife species that rely on such flora for forage and habitat. This impact is particularly pernicious for oaks, which in some cases are the direct targets of the herbicide use. (See e.g Draft PEIS at pp. 4-63, 4-112; Draft PER at p. 4-42). Obviously, the intended destruction of native oaks will impact the oak woodland ecosystem, which, as discussed above, is home to numerous endangered, threatened, or protected species or species of concern. The effect of BLM's proposed herbicide use within or near these ecosystems must therefore be assessed in terms of potential to impact ESA species and their habitats.

35 Although it purports to assess 25 herbicide active ingredients, the Draft PEIS did not specifically analyze 19 active ingredients, including 2,4-D, hexazinone, triclopyr, and glyphosate, which had been analyzed in prior EIS's and previously approved for use on federal lands in the late 1980's and early 1990's. (Draft PEIS, at pp. 2-4 to 2-6.) Instead, for these herbicides, the BLM relied on the previous assessments and a "comprehensive literature review" (Draft PEIS, at p. 2-4; see also p. 4-2 [BLM "consulted risk assessments prepared by the Forest Service for nine other herbicides used by the BLM," including 2,4-D, glyphosate, hexazinone, and triclopyr].) However, as the studies

---

invertebrates, and nontarget plants at typical use rates. (Exhibit 9.) Recent studies have shown that atrazine can disrupt sexual development in amphibians at extremely low concentrations, below what one may expect to occur in stormwater runoff. (Exhibit 18.) As will be discussed in more detail below, atrazine, though not an active ingredient proposed for use by the BLM, is relevant to the Draft PEIS because a closely related active ingredient, hexazinone, *is* proposed for use. Morever, the current and historical use of atrazine in California is a relevant factor that should be considered as part of the cumulative impact analysis.

cited above show, these active ingredients pose a substantial threat to wildlife in and around BLM lands that is not adequately addressed in the Draft PEIS. Morever, the historic use of these and other active ingredients since the 1980's has resulted in an environment that is vastly different than the one assessed by the earlier EIS's, on which the BLM now relies. According to the Draft PEIS, 2,4-D, glyphosate, hexazinone, and triclopyr were assessed in EIS's in 1988, 1991, and 1992. (Draft PEIS, at p. 2-5.) Now, more than a decade later, the BLM proposes a massive vegetation management project, heavily reliant on the use of herbicides in general and two of these active ingredients in particular (see p. 4-46), but fails to conduct any further analysis of the effects of these known toxic ingredients. Reliance on outdated analysis and selective literature does not satisfy the "hard look" at the scientific data that is required by NEPA. (See 40 C.F.R. §§ 1500.1(b); 1502.24; *Native Ecosystems Council v. United States Forest Serv.* (9th Cir. 2005) 418 F.3d 953, 964.)

35 cont.

The PEIS also is deficient for failing to assess the potential of different herbicides to interact cumulatively and/or synergistically in both the aquatic and terrestrial environments. (Exhibit 29.) Research suggests that these cumulative and synergistic effects are responsible, at least in part, for the precipitous decline in yellow-legged frogs and the Yosemite toad over that last two decades. (Exhibits 30 & 31.) Indeed, these studies show that frogs and toads are susceptible to environmental contaminants, even at low levels (Exhibits 11, 13, 22, 24, 32, 33, 34), and that environmental contaminants may disrupt amphibian endocrine functions (Exhibits 11 & 13), increase the risk of disease by harming amphibians' natural immune system from viruses, fungi and bacteria (Exhibit 24), and/or disrupt the natural food chain by killing algae or aquatic invertebrates (Exhibit 23).

36

Additionally, the PEIS fails to adequately address the extent to which BLM's proposed herbicide use will effect regions outside of the application zone. Several studies on pesticide and herbicide drift reveal that application of these toxic active ingredients impacts more area than just the application target. For example, patterns of decline among the federally protected red-legged frog indicate that pesticide drift may be playing a role in that species's decline in the Sierra Nevada. (Exhibit 23 ["wind-born agrochemicals may be an important factor in declines of the California red-legged frog"].) Indeed, concern for herbicide impacts to amphibians led the U.S. Forest Service to conclude that herbicides may not be applied within 500 feet of any yellow-legged-frog and Yosemite-toad habitat. (Exhibit 35.) Moreover, recent U.S. Forest Service decisions have declined to allow the use of hexazinone and atrazine due to the likelihood that these persistent and mobile chemicals will find their way into aquatic environments. (*Ibid.*)

37

Studies on triazines further demonstrate the damaging effects of active-ingredient drift. Atrazine, for example, contaminates far more area than is bordered by its application zone. "Due to its mobility in the environment, it is estimated that between 0.1 and 3 percent of atrazine applied to fields is lost to the aquatic environment." (Exhibit 10.) This translates to 64,000 pounds of atrazine at the low end and 2.4 million pounds at the high end polluting the nation's water resources every year. (*Ibid.*) Triazines are transported by precipitation, including fog, thus triazine contamination can

38

occur "unintentionally through atmospheric transport, runoff from treated fields, drift, irrigation and flooding with contaminated water, and by accident and improper disposal." (*Ibid.*)

39 As one studied concluded, "[t]he pervasiveness of the triazines in the environment is the result of their massive use combined with their mobility and persistence." (Exhibit 10.) Another study revealed that "[e]ach year, vast quantities of pesticides are applied to the intensely agricultural San Joaquin Valley of California. For example, in 1998, 5.9 million kilograms of active ingredients pesticides, or 60% of the total usage in the state of California, were sprayed there." (Exhibit 13.)

40 Ultimately, "little is known about the fate of pesticides (transport, dissolution, degradation, and deposition onto soil, plants, and water) and their impact on ecosystems in the topographically complex landscape of California." (Exhibit 23.) In some cases, pesticide residue in winter and spring rain and snow has been found at levels " 'uncomfortably close' " to the published median concentrations." (*Ibid.*.) And, while efforts at establishing buffer zones have been viewed as an appropriate solution – and indeed, is identified as a mitigation measure in the Draft PEIS (see e.g. Draft PEIS, at pp. 2-17 to 2-24; 4-23 to 4-35), "small lakes and ponds, often favored by amphibians as breeding sites, are not protected from contamination by buffer zones, and the eggs and tadpoles of the resident species are likely to be exposed to low concentrations of the sprayed chemicals." (Exhibit 25.) Therefore, even this accepted mitigation measure is ineffective in some instances.

41

2. Historic pesticide use in California has degraded the quality of many bodies of water and other ecosystems, creating a toxic baseline that must be factored into the proposed addition of herbicides to the environment that will result from BLM's vegetation management proposal.

42

43 In addition to the accumulation in the environment of herbicide active ingredients, the current and historic use of pesticide active ingredients in California is pervasive. Since 1975, pesticide use in the Central Valley has increased considerably, such that in 2000, over 94 million pounds of pesticides were applied in Kern, Fresno, San Joaquin, Madera and Tulare counties. (Exhibit 36.) And, as with herbicides, aerial drift of pesticides is common in the Central Valley, with regular detections at monitoring locations. (Exhibits 37.)

44 In fact, studies have detected pesticides such as chlorpyrifos, diazinon, and malathion in wintertime rain (Exhibit 38), and in air samples and pine needles along an elevation gradient from the Central Valley above 6,000 feet in Sequoia National Park (Exhibit 39). A 1998 Study detected residues of chlorpyrifos, diazinon, malathion, chlorothalonil, endosulfan, and trifluralin in snow, rain and water samples from lower and higher elevations in Sequoia National Park, and from Lake Tahoe, California. (Exhibit 40.) A 1999 Study found the same pesticides in air, dry deposition and surface water samples at 5 different elevations ranging from 200 to 3,332 meters on a gradient running from the Central Valley into Sequoia National Park. (Exhibit 41.)

45 In addition to contaminating the foothills and mountains eastward, pesticide use has degraded the waterways of the low lying valleys as well. Numerous studies over the last decade have shown frequent detections of these pesticides, at levels that exceed the criteria for protection of freshwater aquatic life. (Exhibit 42.)

46 The Central Valley Regional Water Quality Control Board ("Regional Board") has identified a number of "impaired waters" that do not meet applicable water quality standards due to contamination by agricultural pesticides, particularly chlorpyrifos and diazinon. Specifically, the Regional Board identified twenty-four water bodies, totaling 565 miles of rivers and creeks and 488,224 acres of Delta and other waterways in the Central Valley Region alone, that are polluted by agricultural pesticides at levels that do not protect beneficial uses and, in most cases, are acutely toxic to wildlife. Of these waterways, a number are impaired directly due to contaminated runoff containing chlorpyrifos and/or diazinon from agricultural lands.[2] (Exhibit 35.)

47 Other sources of contamination are irrigation return flows containing chlorpyrifos, particularly in the San Joaquin basin, where the San Joaquin River has been designated as water quality impaired due to chlorpyrifos contamination. (Exhibit 35.) A number of studies have described this contamination at levels that often exceed aquatic life criteria set by the Department of Fish and Game. (Exhibits 43, 44, 45, 46, 47, 48, 49].) Recently the Regional Board listed agricultural sloughs in the Delta (French Camp Slough, Duck Slough, Paradise Cut and Ulatis Creek) as candidate water-column toxic hot spots due to elevated levels of chlorpyrifos contamination. (Exhibit 40.) The Regional Board also listed the entire Sacramento-San Joaquin River Delta as a high priority toxic hot spot due to elevated levels of diazinon contamination. (*Ibid.*)

48 These studies demonstrate widespread and continuing pesticide contamination of surface waters throughout the Central Valley and Delta region. Overall, the most frequently detected active ingredients are chlorpyrifos and diazinon, which are contained in agricultural pesticide products applied in this region. Additional studies show surface waters in the Central Valley have been rendered toxic to aquatic life as a result of this cumulative pesticide contamination.

49 For example, a USGS study in which 143 water samples were collected throughout 1993 from sites on the San Joaquin River and three of its tributaries, Orestimba Creek, Salt Slough, and the

---

[2]The following waterbodies have been classified as "impaired" due to diazinon and/or chlorpyrifos contamination: Delta Waterways; Chicken Ranch Slough; Strong Ranch Slough; Arcade Creek; Elk Grove Creek; Elder Creek; Harding Drain; Five Mile Slough; Lower Feather River; Lower Merced River; Morrison Creek; Mosher Slough; Mud Slough; Natomas East Main Drain; Sacramento River (Red Bluff to Delta); Sacramento Slough; Salt Slough; San Joaquin River; Orestimba Creek; Strong Ranch Slough; Lower Tuolumne River; Lower Stanislaus River.

Merced River, reported that the concentrations of seven pesticides, including chlorpyrifos and diazinon, exceeded criteria for the protection of freshwater aquatic life, and that overall, some criteria for protection of aquatic life were exceeded in a total of 97 samples. (Exhibit 50.) Data from a study of pesticide use in California orchards indicate that "during the winter season, toxic levels of diazinon can be present along most of the perennial reach of the San Joaquin River following storms that result in transport of pesticides from agricultural areas." (Exhibit 51.) A study conducted by the Regional Board between 1991 and 1992 found that 47 percent of the water samples collected from the west side of the San Joaquin Valley between April and June tested toxic. And, most of the toxicity was attributed to chlorpyrifos, diazinon, fonofos, and carbaryl, all from agricultural sources. (Exhibit 37.)

49 cont.

A California Urban Water Agencies report announced that "[p]esticides and aquatic toxicity are ubiquitous in surface waters of the Sacramento and San Joaquin basins and the Delta . . . . Bioassay and chemical testing demonstrate that surface waters are toxic to sensitive algae, invertebrates, and fish species." (Exhibit 38.) The report noted that this should be of great concern to the fishing industry, because "the larger rivers in the Central Valley such as the Sacramento, American, Feather, and lower San Joaquin provide critical spawning and rearing habitat for fish such as salmon, steelhead trout, striped bass, shad, and sturgeon." (*Ibid.*) In fact, the study found that "fish from the Bay-Delta ecosystem have elevated concentrations of organochlorine pesticides and pesticide ingredients in their tissues. Adult striped bass from the Sacramento River have exhibited lesions, parasitism, and discolored fatty livers while eggs from these fish had high mortality rates and produced deformed embryos or larvae with skeletal deformities and other abnormalities." (*Ibid.*) Toxicity to Chinook salmon and striped bass has been shown in agricultural drainages, major rivers, and sediments. (*Ibid.*)

50

Another Regional Board study found that "one quarter (2/8) and one half (4/8) of all samples collected at Orestimba Creek and at Sacramento Slough exceeded the acute [recommended diazinon hazard assessment] criteria [to protect freshwater aquatic life] in 1997. These results demonstrate, like in previous years, that exceedances of the acute hazard criteria are common in the [Sacramento] basin after storms." (Exhibit 44.) The study also confirmed that diazinon was present in amounts toxic to *Ceriodaphnia* in water samples collected from San Joaquin River and Sacramento River in 1996 and 1997. (*Ibid.*) Numerous studies corroborate Fish and Game's findings that these levels of chlorpyrifos and diazinon contamination are harmful to aquatic organisms, from small invertebrates such as *Daphina* species to fish species listed under the federal Endangered Species Act. (Exhibits 35, 36, 37, 38, 40, 41, 42, 52, 53, 54, 55.)

51

Just as with herbicides, the damaging effects of pesticide contamination are particularly acute for amphibians. Growing evidence suggests that pesticide exposures may render amphibians more susceptible to the type of diseases that have been implicated as immediate causes of declines in the Sierra, in the western United States and worldwide. (Exhibit 24.) A 1999 study, for example, found that sublethal doses of malathion increased the likelihood of a fatal infection in adult Woodhouse toads (*Bufo woodhousi*) from the bacterium *Aeromonas hydrophila.* (Exhibit 56.) The likely

52

mechanism for this reaction is illustrated by recent studies that demonstrate how endocrine disrupting chemicals can artificially induce increases in corticosteroids, thereby causing immune suppression. (Exhibit 57.) This process may suppress the production of antimicrobial peptides in amphibian skin, which are believed to play a key role in the amphibians' innate immune system (Exhibit 58; *see also* Exhibits 36, 59, 60), and which have been shown to have effective activity against viruses and fungal pathogens, including the chytrid fungus, *Batrachochytrium dendrobatidis*. (Exhibits 39 & 61.)

52 cont.

Despite this compelling evidence of the damaging effects of certain active ingredients on amphibians, the Draft PEIS "did not assess risks to amphibians from herbicide treatments." (Draft PEIS, at p. 4-111.) Rather, the BLM appears to rely on the conclusion of the USEPA, which found the data "inconclusive regarding the risks to amphibians from atrazine." (*Ibid.*) That the USEPA found the data inconclusive, however, does not absolve the BLM from considering, as a policy matter, the potential effects of compounded herbicide use in environments inhabited by amphibians.

53

3. The Draft PEIS fails to consider the current and historic use of herbicide and pesticide active ingredients throughout California.

54

The NEPA "requires an agency to consider the environmental impact that 'results from the incremental impact of the action when added to other past, present and reasonably foreseeable actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions.' [Citations.] An EIS must include a 'useful analysis of the cumulative impacts of past, present and future projects' in sufficient detail to be 'useful to the decisionmaker in deciding whether, or how, to alter the program to lessen cumulative impacts.' [Citations.]" *NRDC v. United States Forest Serv.*, 421 F.3d 797, 815 (9th Cir. 2005). Therefore, an "EIS must at a minimum provide a 'catalog of past projects' and a 'discussion of how those projects (and differences between the projects) have harmed the environment." (*Id.* at pp. 815-816.)

55

The Draft PEIS fails to adequately catalog the current and historic use of herbicides and pesticides in California. Nowhere, for example, does the PEIS discuss the amount of accumulated herbicides and pesticides in any of California's ecosystems, though this information is readily available. (See *ante*, Exhibit 13 ["in 1998, 5.9 million kilograms of active ingredients pesticides . . . were sprayed" in the San Joaquin Valley"]; Exhibit 10 [anywhere from 64,000 to 2.4 million pounds of atrazine annually pollute the Nation's water resources].) Instead, the Draft PEIS addresses only the past effects of "human-caused disturbance factors, including natural resource extraction, recreation, dams and diversions, road construction, agriculture, urbanization, and fire exclusion." (Draft PEIS, at p. 4-203; see also pp. 4-207 to 4-208 [same past effects discussed for fish and other aquatic organisms].) Strangely, the Draft PEIS fails even to discuss historic herbicide use in the discussion of past effects on vegetation. (Draft PEIS, at pp. 4-205 to 4-206.) Here, again, the Draft PEIS focuses instead on non-chemical effects, such as introduction of invasive, non-native

56

As discussed above, numerous herbicide and pesticide active ingredients have historically been and are currently used in California. Some of these active ingredients are the same as those proposed by the BLM, including, for example, hexazinone, 2,4-D, triclopyr, and glysophate. In fact, under the preferred alternative, 2,4-D and glysophate are two of the four active ingredients that will "comprise the majority of herbicide use." (Draft PEIS, at p. 4-46.) Obviously, the addition to California's already toxic environment of these herbicides by the BLM will only exacerbate a presently existing problem and pose further and greater risks to the listed species living in or near these contaminated ecosystems.

57

California's ecosystems are also contaminated by a number of other active ingredients that are not proposed for use by the BLM. Nevertheless, the synergistic effects of these active ingredients must be assessed in order to project the real potential for cumulative impacts of the BLM's vegetation management program. (See Exhibits 23, 24, 25 [studies assessing the potential of different herbicides to interact cumulatively and/or synergistically in both the aquatic and terrestrial environments].)

58

Unfortunately, the Draft PEIS is wholly deficient in assessing these potential cumulative impacts. Rather than approaching the problem from the perspective of contributing additional toxins to an already severely impacted environment, the BLM views the possible effects of its herbicide use in isolation. Indeed, for each impact assessment, whether it is for potential impacts to water quality, wetland and riparian areas, vegetation, fish and aquatic invertebrates, or wildlife resources, the Draft PEIS does not discuss in any significant detail the current levels of herbicide and pesticide use in California, the historic use of herbicides and pesticides in California, or the synergistic effects of multiple active-ingredient herbicide and pesticide use in California.

59

Although the Draft PEIS addresses only "large, regional-scale trends and issues" (Draft PEIS, at p. 4-1), its failure to adequately analyze the cumulative impact of its vegetation management proposal, including the extensive use of herbicides, is significant at this stage. Where, as here, "several foreseeable similar projects in a geographical region have a cumulative impact, they should be evaluated in a single EIS." (*NRDC*, *supra*, 421 F.3d at p. 815.) " '[C]onsideration of cumulative impacts after [agency action] has already been approved is insufficient to fulfill the mandate of NEPA. . . . [NEPA's] purpose requires that the NEPA process be integrated with agency planning "at the earliest possible time," and the purpose cannot be fully served if consideration of the cumulative effects of successive, interdependent steps is delayed until the first step has already been taken.' " (*Ibid.*)

60

Here, the Draft PEIS calls for a survey of the "project site" for special status species before any treatment occurs. (Draft PEIS, at p. 2-16.) This local-level requirement, however, fails to account for herbicide drift, which, as the above-referenced studies show, carries the active ingredients to ecosystems outside of the target site. Accordingly, the Draft PEIS is deficient in assessing the true impact to special status species from the use of herbicides on BLM land. This requirement also fails

61

61 cont.

to ecosystems outside of the target site. Accordingly, the Draft PEIS is deficient in assessing the true impact to special status species from the use of herbicides on BLM land. This requirement also fails to account for impacts on populations of species that cannot be identified except at larger "landscape" scales.

62

Moreover, the alternatives discussed all propose herbicide use on BLM lands within California. Given the extent to which California has already been affected by persistent herbicide and pesticide contamination, it seems reasonable to conclude that herbicide and pesticide use within California constitutes a "regional-scale trend." Therefore, as a policy issue, the proposed addition of herbicides that would result from the BLM's vegetation management plan must be assessed as an aggravation of the already existing problem in California. This Draft PEIS is deficient in addressing this problem, and its cumulative impact analysis suffers as a result.

III. CONCLUSION

63

In reviewing these comments, please keep in mind that both federal courts in the Ninth Circuit and the California state court have held that an agency may not curtail its assessment of the environmental effects of applying herbicides by relying on the registration of these chemicals by the Environmental Protection Agency (*see, Save Our Ecosystems v. Clark* (9th Cir. 1984) 747 F.2d 1240, 1247 ("[t]he EPA registration process for herbicides under FIFRA is inadequate to address environmental concerns under NEPA [National Environmental Policy Act] ... .") or in California, by the Department of Pesticide Regulation (*Californians for Alternatives to Toxics v. Department of Food & Agriculture* (2005) 2005 Cal. App. LEXIS 2060, 26-27)

64

The Draft PEIS fails to adequately describe the program in sufficient detail to allow meaningful public comment. Further, the Draft PEIS fails to account for the potential damaging effects of it proposed herbicide use to special status species inhabiting oak woodlands in California. Finally, the analysis of the cumulative effects of the BLM's proposed use of herbicides is deficient. Accordingly, the California Oak Foundation objects to the adequacy of the Draft PEIS and requests that the concerns expressed in this comment letter be specifically addressed in any future environmental documents. The California Oak Foundation also objects to the approval of this program as currently described.

Thank you for your attention to this.

Very truly yours,

Thomas N. Lippe
Attorney for California Oak Foundation

List of Exhibits

1. California's Hardwood Resources: Preliminary Report of the Hardwood Task Force, State Board of Forestry, Dec. 1983.

2. Bolsinger, Charles L., The Hardwoods of California's Timberlands, Woodlands, and Savannas, Resour. Bull., PNW-RB-148, U.S. Dept. of Agriculture, Forest Service.

3. Map of Oak Woodlands Habitat, Point Reyes Bird Observatory, found at <http://www.prbo.org/calpif/htmldocs/mapdocs/oak/2002/oakhab2002.html>

4. Meyer, Kenneth E. et al., Status of the Hardwood Resource of California: A Report to the Board of Forestry, Sept. 1986.

5. Guidelines for Managing California's Hardwood Rangelands, Univ. of California, 1996.

6. Garrison, Barrett A., The Wildlife Values of California's Hardwood Rangelands and How Wildlife May Be Impacted by Firewood Harvesting, Cal. Dept. of Fish and Game, July 1993.

7. Memo from John Patton, Director Planning & Development to Santa Barbara County Board of Supervisors, re: Briefing on Tree Removal in Rural Areas; Options for Tree Protection, Jan. 14, 1998.

8. Merenlender, Adina M., *Mapping Vineyard Expansion Provides Information on Agriculture and the Environment*, California Agriculture, vol. 54, no. 9, 2000.

9. McPherson, Brice A. et al., Oak Mortality Syndrome: Sudden Death of Oaks and Tanoaks, Tree Notes, vol. 26, Aug. 2000.

10. Yoon, Carol Kaesuk, Puzzling Disease Devastating California Oaks, N.Y. Times, Aug. 13, 2000.

11. *Joint Policy on Hardwoods*, Cal. Fish and Game Commission & State Board of Forestry, 1994.

12. *California Public Lands*, BLM, found at < http://www.ca.blm.gov//pdfs/caso_pdfs/ CA-publiclands.pdf.>

13. Chart, *Special Status Species in Oak Woodland Habitat*, Source: 50 C.F.R. 17.11; Draft PEIS, Exhibit H; Draft BA; Exhibit 5.

14. 2000 Annual Pesticide Use Report: Preliminary Data Indexed by Commodity, Department of Pesticide Regulation.

15. Registration Eligibility Decision: Hexazinone, U.S. EPA, Office of Prevention, Pesticide and Toxic Substances, EPA-738-F-94-019, Sept. 1994.

16. Atrazine Environmental Risk Assessment Available for Comment, U.S. EPA, Office of Pesticides Program, found at <http://www.epa.gov/oppfead1/cb/csb_page/updates/atrazassess.htm> updated, Oct. 9, 2001.

17. Atrazine, Simazine and Cyanazine, Notice of Initiation of Special Review, U.S. EPA, Federal Register, Vol. 59, no. 225, Nov. 23, 1994.

18. Hayes, Tyrone B. et al., Hermaphroditic, Demasculinized Frogs Following Exposure to the Herbicide Atrazine at Ecologically Relevant Low Doses, Univ. of California.

19. Gómez, L. et al., 2,4-D Treatment in Tench (*Tinca tinca* L.): Pathological Processes on the Excretory Kidney, 62 Bull. Environ. Contam. Toxicol., 1999.

20. Sparling, Donald W. et al., Pesticides and Amphibian Population Declines in California, USA, Environ. Toxicol. & Chem., vol. 20, no. 7, Dec. 2000.

21. Clements, Chris et al., Genotoxicity of Select Herbicides in *Rana catesbeiana* Tadpoles Using the Alkaline Single-Cell Gel DNA Electrophoresis (Comet) Assay, 29 Environment and Molecular Mutagenesis, 1997.

22. Wan, M. T. et al., Acute Toxicity to Juvenile Pacific Salmonids and Rainbow Trout of Butoxyethyl Esters of 2,4-D, 2,4-DP and Their Formulated Product: Weedone CB and its Carrrier, Contamination and Toxicology, 2000.

23. Wan, M. T. et al., Effects of Different Dilution Water Types on the Acute Toxicity to Juvenile Pacific Salmonids and Rainbow Trout of Glyphosate and its Formulated Products, 43 Bull. Environ. Contam. Toxicol., 1989.

24. Wan, M. T. et al., Acute Toxicity to Juvenile Pacific Salmonids of Garlon 3A™, Garlon 4™, Triclopyr, Triclopyr Ester, and Their Transformation Products: 3, 5, 6-Trichloro-2-pyridinol and 2-Methoxy-3,5,6-trichloropyridine, 39 Bull. Environ. Contam. Toxicol., 1987.

25. Servizi, J. A.. et al., Acute Toxicity of Garlon 4™ and Roundup® Herbicides to Salmon, *Daphnia*, and Trout, 39 Bull. Environ. Contam. Toxicol., 1987.

26. Mitchell, David G. et al., Acute Toxicity of Roundup® and Rodeo® Herbicides to Rainbow Trout, Chinook, and Coho Salmon, 39 Bull. Environ. Contam. Toxicol., 1987.

27. McBride, J. R. et al., Stress Response of Juvenile Sockeye Salmon (*Oncorhynchus nerka*) to the Butoxyethanol Ester of 2,4-Dichlorophenoxyacetic Acid, 27 Bull. Environ. Contam. Toxicol., 1981.

28. Edwards, W. M. et al., A Watershed Study of Glyphosate Transport in Runoff, 9 J. Environ. Qual., 1980.

29. Porter, Warren P. et al., Endocrine, Immune, and Behavioral Effects of Aldicarb (carbamate), Atrazine (triazine), and Nitrate (fertilizer) Mixtures at Groundwater Concentrations, 15 Toxicol. & Indus. Health, 1999.

30. Davidson, Carlos et al., Declines of the California Red-Legged Frog: Climate, UV-B, Habitat, and Pesticides Hypothesis, 11 Ecol. Applications, 2001.

31. Carey, Cynthia & Corrie J. Bryant, Possible Interrelations Among Environmental Toxicants, Amphibian Development, and Decline of Amphibian Populations, 103 Envrion. Health Perspect (Suppl. 4), 1995.

32. Berrill, Michael et al., Effects of Low Concentrations of Forest-Use Pesticides on Frog Embryos and Tadpoles, 13 Environ. Toxicol. Chem., 1994.

33. Bishop, Christine A., The Effects of Pesticides On Amphibians and the Implications for Determining Causes of Declines on Amphibian Populations.

34. Calumpang, S. M. F. et al., Toxicity of Chlorpyrifos, Fenubucarb, Monocrotophos, and Methyl Parathion to Fish and Frogs After a Simulated Overflow of Paddy Water, 58 Bull. Environ. Contam. Toxicol., 1997.

35. Excerpts from the Sierra Nevada Forest Plan Amendment: Final Environmental Impact Statement, U.S. Dept. of Agriculture, Forest Service, Pacific Southwest Division, Jan. 2001.

36. List and Amounts of Pesticides Used in Various Counties During 2000.

37. Turner, Bonnie et al., A Field Study of Frog and Dry Deposition as Sources of Inadvertent Pesticide Residues on Row Crops, Environ. Hazards Assessment Program, Nov. 1989.

38. Zabik, John M. & James N. Seiber, Atmospheric Transport of Organphosphate Pesticides from California's Central Valley to the Sierra Nevada Mountains, 22 J. Environ. Qual., 1993.

39. Aston, Linda S. & James N. Seiber, Fate of Summertime Airborne Organophosphate Pesticide Residues in the Sierra Nevada Mountains, 26 J. Environ. Qual., 1997.

40. McConnell, Laura L. et al., Wet Deposition of Current-Use Pesticides in the Sierra Nevada Mountain Range, California, USA, 17 Environ. Toxicol. Chem., 1998.

41. LeNoir, James S. et al., Summertime Transport of Current-Use Pesticides from California's Central Valley to the Sierra Nevada Mountain Range, USA, 18 Environ. Toxicol. Chem., 1999.

42. 1998 California Section 303(d) List and TMDL Priority Schedule, Cal. EPA, Central Valley Regional Water Quality Control Board.

43. Kegley, Susan et al., Disrupting the Balance: Ecological Impacts of Pesticides in California, Pesticide Action Network, 1999.

44. Foe, Christopher, Insecticide Concentrations and Invertebrate Bioassay Mortality in Agricultural Return Water from the San Joaquin Basin, Cal. EPA, Central Valley Regional Water Quality Control Board, Dec. 1995.

45. Fox, J. Phyllis & Elaine Archibald, Aquatic Toxicity and Pesticides in Surface Waters of the Central Valley, Cal. Urban Water Agencies, Sept. 1997.

46. Kratzer, Charles R. et al., Diazinon and Chlorpyrifos Loads in the San Joaquin River Basin, California, January and February 2000, USGS, 2002.

47. Burns, Jerry, et al., Bay Protection Program Toxic Hot Spot Cleanup Plans for Diazinon in Orchard Dormant Spray, Diazinon and Chlorpyrifos in Urban Stormwater, Chlorpyrifos in Irrigation Return Flow, Cal. EPA, Central Valley Regional Water Quality Control Board, Oct. 2002.

48. Menconi, Mary & Angela Paul, Hazzard Assessment of the Insecticide Chlorpyrifos to Aquatic Organisms in the Sacramento-San Joaquin River System, Cal. Dept. of Fish and Game, Environ. Services Div., Admin. Rpt 94-1, 1994.

49. Cox, Caroline, Chlorpyrifos, Part 3: Ecological Effects, 15 J. Pesticide Reform, 1995.

50. Abstract from Panshin, Sandra Y. et al., Occurrence and Distribution of Dissolved Pesticides in the San Joaquin River Basin, California River, California, U.S. Geo. Survey Water Resources Invest. 98-4032.

51. Foe, Christopher et al., Toxicity Identification Evaluations of Orchard Dormant Spray Runoff (Draft), Cal. EPA, Central Valley Regional Water Quality Control Board, 1998.

52. Kuivila, Kathryn M. & Christopher G. Foe, Concentrations, Transport and Biological Effects of Dormant Spray Pesticides in the San Francisco Estuary, California, 14 Environ. Toxicol. Chem., 1995.

53. "The Quality of Our Nation's Waters: Nutrients and Pesticides," USGS Fact Sheet 116-99m May 1999.

54. Munn, Mark D. & Robert J. Gilliom, Pesticide Toxicity Index for Freshwater Aquatic Organisms, U.S. Geo. Survey, Water-Resour. Invest. Rpt., 01-4077, 2001.

55. Kuivila, Kathryn M., Studies Relating Pesticide Concentrations to Potential Effects on Aquatic Organisms in the San Francisco Bay-Estuary, California, U.S. Geo. Survey, Toxic Sub. Hydrology Program, 1999.

56. Taylor, Sharon K. et al., Effects of Malathion on Disease Susceptibility in Woodhouse's Toads, 35 J. of Wildlife Diseases, 1999.

57. Rollins-Smith, Louise A., Neuroendocrine-Immune System Interactions in Amphibians: Implications for Understanding Global Amphibian Declines, 23 Immunologic Research, 2001.

58. Goraya, Jadvinder et al., Peptides with Antimicrobial Activity from Four Different Families Isolated from the Skins of the North American Frogs (*Rana luteiventris, Rana berlandieri* and *Rana pipiens*), 267 Eur. J. Biochem., 2000.

59. Carey, Cynthia, Infectious Disease and Worldwide Declines in Amphibian Populations, with Comments on Emerging Diseases in Coral Reef Organisms and in Humans, 108 Environ. Health Perspectives, March 2000.

60. Rollins-Smith, Louise A. et al., Antimicrobial Peptide Defenses Against Pathogens Associated with Global Amphibian Declines, 26 Develop. Comp. Immun., 2002.

61. Chinchar, V. G. et al., Inactivation of Frog Virus 3 and Channel Catfish Virus by Esculentin-2P and Ranatuerin2-P, Two Antimicrobial Peptides Isolated from Frog Skin, 268 Virology 351-357, 2001.

F:\BLM VEG\Corr\c001c final comment letter to Draft PEIS.wpd