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TO: Gary Brown, USDA, APHIS, PPQ

Comments to USDA APHIS PPQ on 2009 EA for potential grasshopper suppression programs to be conducted on rangeland in Klamath County (EA: OR-09-02)

The Xerces Society is an international, nonprofit organization that protects wildlife through the conservation of invertebrates and their habitat. For over three decades, the Society has been at the forefront of invertebrate conservation, harnessing the knowledge of scientists and the enthusiasm of citizens to implement conservation programs. The Xerces Society has the support of over 4,000 members, including approximately 400 members in Oregon.

We appreciate the opportunity to comment on this EA. Please add The Xerces Society to all future correspondence concerning your Rangeland Grasshopper and Mormon Cricket Suppression Program.

Summary
The USDA APHIS PPQ's Klamath County Grasshopper and Mormon Cricket Suppression Program Proposed 2009 Action authorizes the use of insecticides (diflubenzuron, carbaryl, and malathion) in the spring and summer of 2009.

The Xerces Society for Invertebrate Conservation opposes the proposed 2009 treatment by USDA APHIS PPQ and ODA for native grasshoppers on the Klamath Marsh National Wildlife Refuge and nearby private rangeland. In general we oppose this action because we dispute the use of public dollars to poison native insects, and believe that the suppression of this natural phenomenon will have potential far-reaching impacts on the entire food chain in the area – grasshoppers and non-target insects that will be affected by the treatments are important food sources for birds. The Klamath Marsh National Wildlife Refuge is a critical stop on the flyway for migratory birds. We dispute the Finding of No Significant Impact that USDA APHIS PPQ and ODA have reached in their 2009 EA for possible grasshopper suppression programs to be conducted on rangeland in Klamath County (EA: OR-09-02).

We also are concerned about the potential impact of this action on Leona's little blue butterfly (*Philotiella leona*). Areas that may be treated for grasshoppers are dangerously close to habitat of the rare and endangered Leona's little blue butterfly and all insecticides used by APHIS-PPQ and ODA to control native grasshoppers are also highly toxic to butterflies. Such an action presents a serious threat to an already vulnerable butterfly.

Leona's little blue butterfly
Leona's little blue butterfly (*Philotiella leona)* is a tiny blue butterfly that is endemic to a six square mile area of the Antelope Desert in Klamath County, Oregon near the town of Chinchalo (see Appendix A for a map of the species' global distribution). This butterfly is in danger of extinction due to its high degree of endemism and the multiple threats it faces. The Xerces Society has determined that the greatest threat to the survival of this species is the use of pesticides for grasshopper and forest pest control on and around its habitat. The global population for this species is estimated at 1,000-2,000 individuals (Ross 2008).

Leona's little blue habitat is approximately five miles west of Klamath Marsh National Wildlife Refuge, and is less than one mile west of privately owned rangelands that are likely to be sprayed for native grasshoppers (private land close to Leona's little blue habitat is owned by Scott Runel and John Mosby). See Appendix B for a map of Leona's little blue butterfly habitat overlaid on the Klamath County portion of the *2008 Oregon Grasshopper and Mormon Cricket Map, Oregon Department of Agriculture (ODA) in cooperation with USDA-APHIS-PPQ.*

Insecticides that may be used in rangeland areas in Klamath County, Oregon to control native grasshoppers include: diflubenzuron (Dimilin, an Insect Growth Regulator), carbaryl (carbamate), and malathion (organophosphate). Broad-spectrum insecticides used for grasshopper control in rangelands negatively impact non-target insects (Alston & Tepedino 2000), including butterflies. All pesticides that can be used to control native grasshoppers are highly toxic to all life stages of this butterfly, with the exception of diflubenzuron, which is primarily toxic to the larval stage of Leona's little blue butterfly.

<u>Diflubenzuron</u>
Dimilin is the trade name for the pesticide diflubenzuron. Dimilin acts as an insect growth inhibitor by arresting chitin synthesis, i.e., the formation of an insect's exoskeleton. Dimilin is lethal to lepidoptera caterpillars at extremely small quantities (Martinat 1987). Dimilin, applied by ATV, is the most commonly used insecticide for treatment of native grasshoppers on Klamath Marsh National Wildlife Refuge (Personal Communication, Gary Brown, April 2009). Dimilin has been shown to last weeks on foliage. Dimilin caused 100% mortality of Douglas-fir tussock moth larvae up to seven weeks following application (Robertson and Boelter 1979). Another study found residue on foliage 21 days after application (Martinat 1987). Sample et al. (1993) found that after Dimilin spraying, the number of lepidoptera larvae was reduced at treated sites. Leona's little blue butterfly can be found in all life stages (egg, larvae, pupae and adult) during the time period that Dimilin is generally applied for grasshoppers (June) and during the three-week post treatment period that Dimilin can remain active (into July). In general, Leona's little blue eggs are laid in late June and early July. Eggs take approximately one week to hatch into larvae. Larvae are active and feed on spurry buckwheat (*Eriogonum spergulinum*) until mid-July or early August, at which point the caterpillars pupate. This butterfly overwinters in the pupal life stage. Adults emerge in mid-late June, mate and begin laying eggs. (Personal communication, Dave McCorkle, April 2009).

Carbaryl

Carbaryl is a carbamate insecticide. It inhibits the action of the enzyme acetyl cholinesterase (AChE) that is an essential component of insect, bird, fish, and mammal nervous systems. Carbaryl has "very high" toxicity levels for terrestrial invertebrates (including butterflies), aquatic invertebrates, and fish (Cox 1993). By inhibiting the function of Acetylcholinesterase (AChE) in the system, carbaryl causes loss of normal muscle control, and ultimately death.

Malathion

Malathion is an organophosphate insecticide. It is one of a class of pesticides that are chemically related to nerve gases used in World War II. Like carbaryl, malathion attacks the nervous system by inhibiting AChE. Malathion can also inhibit liver enzymes that effect biological membrane function (Brenner 1992). Malathion has been associated with numerous health problems, including acute toxicity, subchronic and chronic toxicity, cancer, genetic defects, birth defects, reproductive problems, immune system suppression, and vision impairment (Brenner 1992). Malathion is a broad spectrum insecticide that is highly toxic to insects, including butterflies, as well as snails, worms, and microcrustaceans (Brenner 1992).

Drift of pesticides over Leona's little blue butterfly habitat

Even when not sprayed directly over butterfly habitat, insecticides may drift and cause mortality. Drift is the movement of spray droplets or pesticide vapor out of the intended spray area. Whenever pesticides are applied by ground application or by air, the potential exists for off-target movement or drift. Several factors affect how much and where a pesticide will drift, most importantly droplet size and weather. Smaller droplets remain suspended in the air much longer than larger droplets and can thus drift over longer distances. Wind speed and direction, relative humidity, air temperature, and atmospheric stability are weather factors that influence spray drift. During windy conditions, significant amounts of pesticide can drift outside the spray area. Even small amounts of a pesticide can drift great distances under stable weather conditions. This long range drift is often related to the occurrence of a temperature inversion, an atmospheric phenomenon generally associated with stable weather conditions when wind is calm and skies are clear. In these conditions, the air near the surface is cooler than the air above it, resulting in small spray droplets being suspended for longer periods and consequently able to move laterally very long distances in very light wind.

A study from Penn State (1993) assessing drift of malathion when used to control boll weevil found that it can drift up to one kilometer (5/8 mile)—the greatest distance measured—from the point of application. According to the study, the highest amount of drift at one kilometer occurred when atmospheric conditions were stable, meaning vertical air mass movements were dampened. Two other field studies summarized in the 1997 EPA Registration Eligibility Decision for diflubenzuron (Dimilin) found that it drifted at least 1,200 feet. In Butte County, California, MCPA, dimethyl amine spray drifted 400 meters (1,300 feet) and in Tulare County, California, carbaryl drifted 550 meters (1,787 feet) (Majewski and Capel 1995). A study of carbaryl applications in orchards in Vermont found that aerially applied carbaryl repeatedly drifted to the most distant sampling point (about 500 yards) under all wind and atmospheric stability conditions tested.

Studies show consistently that pesticide drift can be found one kilometer (5/8 mile) from the edge of the spray site and sometimes much farther. In Arkansas, drift of the herbicide propanil was concentrated enough at one kilometer to be injurious to crop plants (Barnes et al. 1987). Ghassemi *et al* (1982) analyzed six different field studies of insecticide drift using a curve fitting method to estimate the "worst case" and "best case" estimates of deposition over distances up to ten kilometers (6.21 miles). Even the best case scenario plotted drift over two kilometers (1.25 miles) and the worse case scenario found that 4.5% of the applied dose of pesticide would drift one kilometer (5/8 mile), 1.7% to two kilometers (1 1/4 miles), 0.38% to five kilometers (3.1 miles), and 0.1% to ten kilometers (6.21 miles). In one of the studies analyzed, carbaryl was found at over 1% of the applied dose over seven kilometers (4.3 miles) from the spray edge.

In summary, 1) All insecticides used against native grasshoppers are highly toxic to Leona's little blue butterfly; 2)The areas likely to be treated are within one mile of Leona's little blue habitat; 3) Drift from pesticide application has been shown to occur up to many miles from the point of application; 4) The global distribution of this highly endemic butterfly includes only a six-mile area in the Antelope Desert; and 5) Exposure of Leona's little blue butterfly to any of the insecticides proposed for use against grasshoppers in Klamath County, Oregon could lead to the extinction of this butterfly.

Impact of pesticides on native bee pollinators and other invertebrates

Invertebrates eclipse all other forms of life on Earth, not only in sheer numbers, diversity, and biomass, but also in their importance to functioning ecosystems. The sheer number and mass of invertebrates reflects their enormous ecological impact. Admittedly, some have a negative impact on humans, either by harming us directly (as disease agents) or attacking food crops, tree plantations, and livestock. Even so, all adverse effects combined are insignificant compared to invertebrates' beneficial actions. Invertebrates are a part of nearly every food chain, either directly as food for other insects, fishes, amphibians, reptiles, birds, mammals, and other arthropods (Gilbert 1980), or indirectly as agents in the endless recycling of nutrients in the soil. Insects, worms, and mites are extremely important in helping microbes break down dung and dead plant and animal matter. Invertebrates are thought to decompose 99% of human and animal waste (Pimentel 1980). The perpetuation of food webs is often dependent on critical species performing essential services such as pollination or seed dispersal (Dodson 1975). There are dozens more examples of how invertebrates benefit ecosystems and humans as natural biological control, and as potential cures for human disease.

The pesticides that may be used in this project are not only lethal to Mormon crickets and native grasshoppers; they are also lethal to most beneficial insects and other invertebrates. In areas that had been sprayed with malathion in California to eradicate the Mediterranean fruit fly there was a large increase in populations of whiteflies, aphids, mites, olive scale, black scale, brown soft scale, Florida red scale, and the gall midge. The increases of these insect populations were due to the effect of malathion on the parasitoids and other natural enemies of these pests. In many cases malathion has been found to be more toxic to the natural enemies than it is to the pest species themselves. The use of malathion to eradicate one pest may in turn upset the balance of many other natural host – parasitoid systems. Malathion can also impact soil organisms and impact decomposition.

Native bees are a group of beneficial insects that are often not considered in management decisions. Bees are considered the most important group of pollinators in temperate regions (Cane 2001). The importance of protecting the pollinators of rare plants during spraying programs is already recognized (Sipes and Tepedino 1995), but it is not just rare plants that require pollinators. If malathion and carbaryl spray are used in the control program proposed for Mormon cricket and grasshoppers, it could have a negative impact on the native bee fauna—and other pollinator insects—which in turn can affect the ability of many rangeland plants to reproduce.

Native bees are often more affected by pesticides than other insects, since they receive direct exposure to the nest, as well as exposure while foraging for nectar and pollen (Delaplane and Mayer 2000). Most bee poisonings occur from contact between treated vegetation and the bee. Native bees will be nesting in all suitable locations within the Mormon cricket and grasshopper control area. Approximately 70 percent of native bees nest in the ground, burrowing into areas of bare or partially vegetated soil (O'Toole and Raw 1999, Michener 2000). Most of the remaining 30 percent nest in abandoned beetle galleries in snags or soft-centered and hollow twigs and plant stems. Bumble bees nest in cavities in the ground or under grass tussocks. Unlike managed honey bee hives, it is not possible to protect nest sites or prevent native bees from leaving their nests for foraging during or immediately after spraying operations. Leaving a buffer zone around honey bee and leafcutter bee hives will not have any benefit for native bees, unless they happen to be nesting in the same area.

Cost benefit analysis

We believe the costs of this project may be greater than the resource is worth. Even in agricultural areas with higher monetary value than open rangeland, control campaigns were sometimes conducted at an expense greater than the value of the crop (MacVean 1991). To judge the economic impact of crickets or grasshoppers on rangelands, an estimate of forage consumption is needed. The monetary value of forage lost in a given area can then be compared to the costs of controlling the insects to provide a cost/benefit ratio. The loss of the forage and current value of the federal rangeland should be compared with the cost of treatment.

Monitoring

APHIS should monitor sites before and after spraying to determine if there is an impact on water quality or non-target species.

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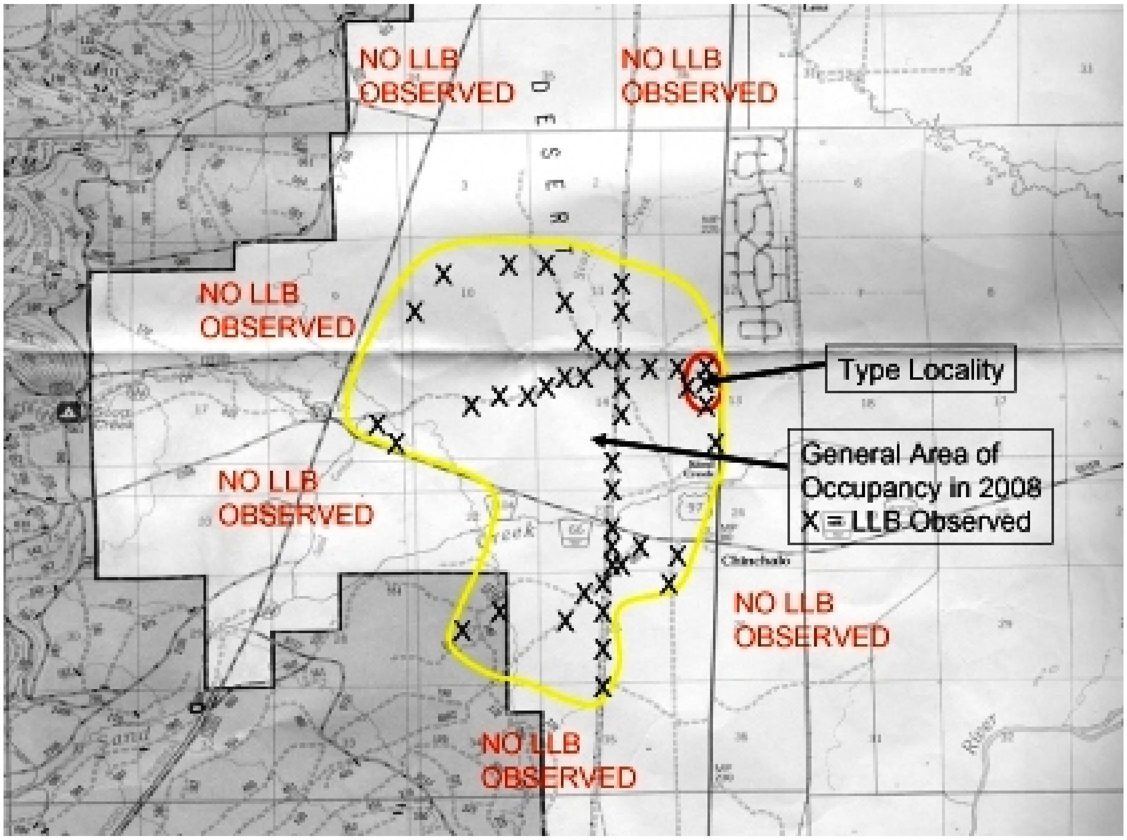
Appendix A. Map of Leona's little blue (LLB) range from 2008 surveys report (Ross 2008).



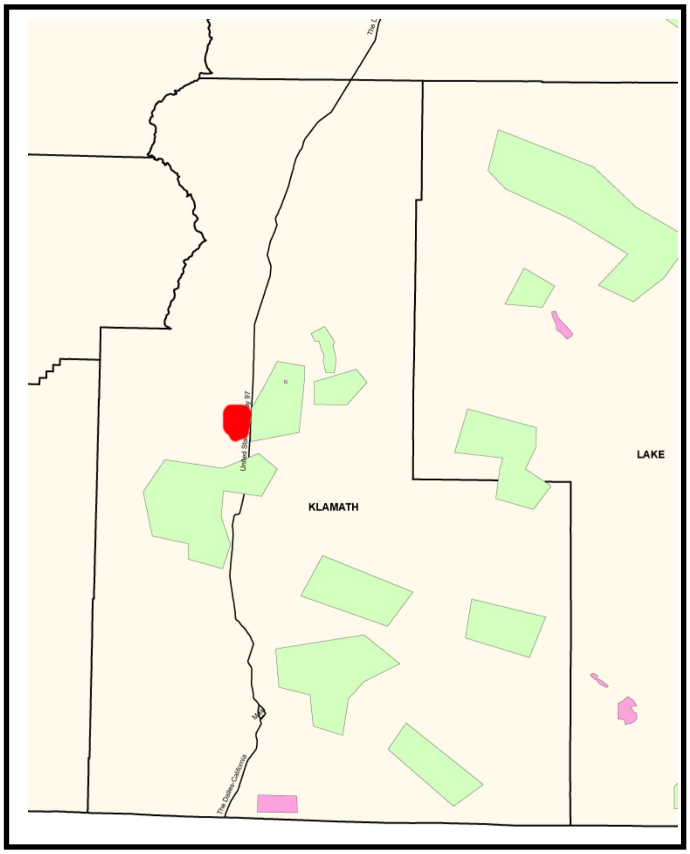
Appendix B. Map of Leona's little blue butterfly habitat (red) overlaid on grasshopper infestation areas in Klamath County from *2008 Oregon Grasshopper and Mormon Cricket Map, Oregon Department of Agriculture (ODA) in cooperation with USDA-APHIS-PPQ*

Legend

Red = approximate global distribution of Leona's little blue butterfly

Green = 0-7 grasshoppers per yard in 2008 APHIS surveys (non-economic infestation)

Pink = >8 grasshoppers per yard in 2008 APHIS surveys (economic infestation)



Appendix C. Photo of Leona's little blue butterfly by Dave McCorkle.