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Plant Protection and Quarantine

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Grasshopper and Mormon Cricket Suppression Program for Southern Idaho

United States Department of Agriculture
Animal and Plant Health Inspection Service
Plant Protection and Quarantine
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Cover Photo: Mormon cricket migration meets US Hwy 95 (near Oregon border) causing slick road conditions in Owyhee County, 2006.

Site-Specific Environmental Assessment
Rangeland Grasshopper and Mormon Cricket Suppression Program
Idaho: ID-2020-23-1

I. Need for Proposed Action

A. Purpose and Need Statement

The proposed action is to suppress grasshopper and Mormon cricket outbreaks on federally managed rangeland in Idaho. Populations of grasshoppers and Mormon crickets occur in some areas nearly every year in Idaho. The Animal and Plant Health Inspection Service (APHIS) regularly evaluates the population levels and locations of outbreak infestations. This evaluation helps to determine if site-specific action is necessary to suppress outbreaks, to protect rangeland ecosystems, or to counter the potential for grasshoppers and Mormon crickets to spread across rangelands or into surrounding crops and communities. The term "grasshopper" used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

APHIS is proposing a program to suppress outbreak populations and is consulting with land management agencies and others in the design and implementation of the program. Specifically, APHIS is consulting with Bureau of Land Management (BLM), U.S. Forest Service (FS), U.S. Fish and Wildlife Service (USFWS), and the Idaho State Department of Agriculture (ISDA). This Environmental Assessment (EA) analyzes potential environmental consequences of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from April 1 through September 30 of the respective year in Idaho. This E.A. will be in effect for the calendar years 2020-2023. In the event, changes may be warranted, an addendum will be issued, and consultation requested.

Populations of grasshoppers and Mormon crickets that trigger the need for a suppression program are considered on a case-by-case basis. Participation in a Grasshopper or Mormon cricket suppression program is based on potential damage to crops, damage to rangeland, damage to re-vegetation projects, creation of public nuisances, and endangerment of road traffic. Benefits of treatments include protection of forage and crops, increased probability of success for rangeland re-vegetation projects, elimination of public nuisances, and prevention of hazards to road traffic. The goal of the proposed suppression program analyzed in this EA would be to reduce grasshopper populations to economically acceptable levels in order to protect rangeland ecosystems and/or private cropland adjacent to rangeland.

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code (U.S.C.) § 4321 *et. seq*.) and the NEPA procedural requirements promulgated by the Council on Environmental Quality, United States Department of Agriculture (USDA), and APHIS. A decision will be made by APHIS based on the analysis presented in this EA, the results of public involvement, and consultation with other agencies and individuals. Three alternatives are analyzed. A selection of one of the three alternatives will be made by APHIS for the Control Program for Idaho for that given year.

B. Background Discussion

Rangelands provide many goods and services, including food, fiber, recreational opportunities, and grazing land for cattle (Havstad, 2007); (Follett, 2010). Grasshoppers and Mormon crickets are part of rangeland ecosystems, serving as food for wildlife and playing an important role in nutrient cycling. However, grasshoppers and Mormon crickets have the potential to occur at high population levels (Belovsky G. A., 1996) that result in competition with livestock and other herbivores for rangeland forage and can result in damage to rangeland plant species.

In rangeland ecosystem areas of the United States, grasshopper populations can build up to economic infestation levels[1] despite even the best land management and other efforts to prevent outbreaks. At such a time, a rapid and effective response may be requested and needed to reduce the destruction of rangeland vegetation. In some cases, a response is needed to prevent grasshopper migration to cropland adjacent to rangeland.

APHIS conducts surveys for grasshopper and Mormon cricket populations on rangeland in the western United States, provides technical assistance on grasshopper/Mormon cricket management to land owners/managers, and may cooperatively suppress outbreaks when direct intervention is requested by a Federal land management agency or a State agriculture department (on behalf of a state or local government, a private group or individual). APHIS' enabling legislation provides, in relevant part, that 'on request of the administering agency or the agriculture department of an affected state, the Secretary, to protect rangeland, shall immediately treat federal, state, or private lands that are infested with grasshoppers or Mormon crickets'… (7 USC § 7717(c)(1)). APHIS' authority for cooperation in this suppression program is based on Section 417 of the Plant Protection Act of 2000 (7 USC § 7717). The need for rapid and effective response when an outbreak occurs limits the options available to APHIS. The application of an insecticide within all or part of the outbreak area is the only response available to APHIS to rapidly suppress or reduce grasshopper and Mormon cricket populations and effectively protect rangeland.

In June 2002, APHIS completed an updated Environmental Impact Statement (EIS) document concerning suppression of grasshopper and Mormon cricket populations in seventeen (17) western states (USDA APHIS, 2002) The EIS described the actions available to APHIS to reduce the destruction caused by grasshopper and Mormon cricket populations in these seventeen states: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. In November 2019, APHIS published an updated EIS (USDA APHIS, 2019) to incorporate available data and analyze the environmental risk of new program tools. The risk analysis in the 2019 EIS is incorporated by reference.

[1] The "economic infestation level" is a measurement of the economic losses caused by a particular population level of grasshoppers to the infested rangeland. This value is determined on a case-by-case basis with knowledge of many factors including, but not limited to, the following: economic use of available forage or crops; grasshopper species, age, and density present; rangeland productivity and composition; accessibility and cost of alternative forage; and weather patterns. In decision making, the level of economic infestation is balanced against the cost of treating to determine an "economic threshold" below which there would not be an overall benefit for the treatment. Short-term economic benefits accrue during the years of treatments, but additional long-term benefit may accrue and be considered in deciding the total value gained by treatment. Additional losses to rangeland habitat and cultural and personal values (e.g., aesthetics and cultural resources), although a part of decision making, are not part of the economic values in determining the necessity of treatment.

APHIS conducts annual surveys for grasshopper and Mormon cricket populations on rangeland in Idaho. APHIS also provides ongoing technical assistance of a grasshopper and Mormon cricket management to land owners and managers. In Southern Idaho, APHIS would only conduct suppression programs on federally managed lands at the request of the federal land manager. APHIS is authorized to treat state and private lands on request of Idaho State Department of Agriculture (ISDA), but the constraints under which APHIS conducts treatments have resulted in a determination by ISDA that no such request will be made.

In November 2019, APHIS and the Forest Service (FS) signed a national Memorandum of Understanding (MOU) detailing cooperative efforts between the two agencies for suppression of grasshoppers and Mormon crickets on national forest system lands (Document #19-8100-0573-MU). This MOU clarifies that APHIS will prepare and issue to the public site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the FS. The MOU further states that the responsible FS official will request, in writing, the inclusion of appropriate lands in the APHIS grasshopper suppression project when treatment on national forest land is necessary. The FS must also approve a Pesticide Use Proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document and FS approves the Pesticide Use Proposal.

In October 2015, APHIS and BLM signed a MOU detailing cooperative efforts between the two agencies on suppression of grasshoppers and Mormon crickets on BLM managed lands. This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BLM. The MOU further states that the responsible BLM official will request, in writing, the inclusion of appropriate lands in the APHIS grasshopper suppression project when treatment is necessary. The BLM must also approve a Pesticide Use Proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document, and BLM approves the Pesticide Use Proposal.

In August 2016, APHIS and the Bureau of Indian Affairs (BIA) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two agencies for suppression of grasshoppers and Mormon crickets on lands administered by the BIA. This MOU clarifies that APHIS will prepare and issue to the public, site-specific environmental documents that evaluate potential impacts associated with proposed measures to suppress economically damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA. The MOU further states that the responsible BIA official will request, in writing, the inclusion of appropriate lands in the APHIS grasshopper suppression project when treatment is necessary. The BIA must also approve a Pesticide Use Proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate decision document, and BIA approves the Pesticide Use Proposal.

APHIS and ISDA cooperate under MOU 16-8100-0403-MU to protect agricultural, horticultural, timber, and natural plant resources from losses caused by plant pests. This cooperation is conducted by APHIS by virtue of authority included in the Plant Protection Act of June 20, 2000, (7 USC 7701-7772), which defines plant pests and provides the Secretary of Agriculture authority to cooperate with states or political subdivisions thereof, farmers' associations and similar organizations, and individuals to eradicate, suppress, control, or to prevent or retard the spread of the plant pests. ISDA manages rangeland grasshopper suppression programs on state and private lands, and APHIS manages rangeland grasshopper suppression programs on federally managed lands.

C. About This Process

The EA process for grasshopper management is complicated by the fact that there is very little time between requests for treatment and the need for APHIS to take action with respect to those requests. Surveys the previous year help to determine general areas, among the millions of acres that potentially could be affected, where grasshopper infestations may occur in the spring of the following year. Survey data provides the best estimate of future grasshopper populations, yet environmental factors lead to certain forecasts where the specific treatment areas will be. Therefore, examining specific treatment areas for environmental risk analysis under NEPA is typically not possible. At the same time, the program strives to alert the public in a timely manner to its more concrete treatment plans and avoid or minimize harm to the environment in implementing those plans.

The current EIS provides a solid analytical foundation; however, it may not be enough to satisfy NEPA completely for actual treatment proposals. The program typically prepares a Draft EA tiered to the current EIS for each of the 17 Western States, or portion of a state, that may receive a request for treatment. The Draft EA analyzes aspects of environmental quality that could be affected by treatments in the area where grasshopper outbreaks are anticipated. The draft EA will be made available to the public for a 30-day comment period. When the program receives a treatment request and determines that treatment is necessary, the specific site within the state will be evaluated to determine if environmental factors were thoroughly evaluated in the draft EA. If all environmental issues were accounted for in the draft EA, the program will prepare a final EA and finding of no significant impact (FONSI). Once the FONSI has been finalized copies of those documents will be sent to any parties that submitted comments on the draft EA, and to other appropriate stakeholders. To allow the program to respond to comments in a timely manner, the Final EA and FONSI will be posted to the APHIS website. The program will also publish a notice of availability in the same manner used to advertise the availability of the draft EA.

Scoping and Input from the Public

In November 2019, APHIS began seeking public input and comment on the development of this Environmental Assessment (EA) for grasshopper and Mormon cricket suppression in Southern Idaho. Background documentation was posted to the ISDA public website to help commenters understand the proposed action.

The three alternatives proposed for comment were as follows:

Alternative 1 - No Suppression Program
Alternative 2 – Insecticide Applications at Conventional Rates
Alternative 3 - Reduced Agent Area Treatments (RAATS) with Adaptive Management Strategy

Originally, Alternative 2 & 3 were lumped together when submitted for public comment, however, it was later decided to separate each of the types of treatment into a separate alternative for simplicity. Details of the three alternatives are noted below in greater detail.

Summaries of Responses

A total of three responses were received. The Owyhee Cattlemens Association and the Idaho Cattle Association (ICA) both indicated that they supported the Alternative 3, Reduced Agent Area Treatments (RAATS) with Adaptive Management Strategy.

The Twin Falls BLM District office recommended applying the same buffers for croplands to surface waters, riparian habitats, and wetlands. BLM also suggested a map of previously treated areas and a map of excluded prohibited areas be included in the EA. They also mentioned need for Section 7 consultation of Endangered Species Act on habit for slickspot peppergrass and its pollinators. A consultation is sent to USFWS regarding any sensitive, or ESA species and avoidance measures are put in place according to their recommendations.

APHIS has considered the responses and has incorporated elements of the responses into this EA.

II. Alternatives

To engage in comprehensive NEPA risk analysis APHIS must frame potential agency decisions into distinct alternative actions. These program alternatives are then evaluated to determine the significance of environmental effects. The 2002 EIS presented three alternatives: (A) No Action; (B) Insecticide Applications at Conventional Rates and Complete Area Coverage; and (C) Reduced Agent Area Treatments (RAATs), and their potential impacts were described and analyzed in detail. The 2019 EIS was tiered to and updated the 2002 EIS. Therefore the 2019 EIS considered the environmental background or 'No Action' alternative of maintaining the program that was described in the 2002 EIS and Record of Decision. The 2019 EIS also considered an alternative where APHIS would not fund or participate in grasshopper suppression programs. The preferred alternative of the 2019 EIS allowed APHIS to update the program with new information and technologies that not were analyzed in the 2002 EIS. Copies of the complete 2002 and 2019 EIS document are available for review at 9118 West Blackeagle Drive, Boise, Idaho. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

All insecticides used by APHIS for grasshopper/Mormon cricket suppression are used in accordance with applicable product label instructions and restrictions. Representative product specimen labels can be accessed at the Crop Data Management Systems, Inc. web site at: http://www.cdms.net/LabelsMsds/LMDefault.aspx?t=. Labels for actual products used in suppression programs will vary depending on supply issues. All insecticide treatments conducted by APHIS will be implemented in accordance with APHIS' treatment guidelines, included as Appendix 1 to this EA.

A. Alternative 1: No Suppression Program

Under this alternative, APHIS would not participate in any program to suppress grasshopper or Mormon cricket infestations within Idaho. Under this alternative, APHIS may opt to provide survey information and limited technical assistance, but any suppression program would be implemented by a federal land management agency, a state agriculture department, a local government, or a private group or individual.

B. Alternative 2: Insecticide Applications at Conventional Rates

Under Alternative 2, APHIS would manage a grasshopper treatment program using techniques and tools discussed hereafter to suppress outbreaks. The insecticides available for use by APHIS include the U.S. Environmental Protection Agency (USEPA) registered chemicals carbaryl, diflubenzuron, and malathion and a new product, chlorantraniliprole. These chemicals have varied modes of action: carbaryl and malathion work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses); diflubenzuron is a chitin inhibitor; and chlorantraniliprole is an activator of ryanodine receptors. APHIS selects which insecticides and rates are appropriate for suppression of a grasshopper outbreak based on several biological, logistical, environmental, and economical criteria.

Insecticide applications at conventional rates and complete area coverage, is an approach that APHIS has used in the past but is currently uncommon. Under this alternative, carbaryl, chlorantraniliprole, diflubenzuron, or malathion would cover all treatable sites within the designated treatment block per label directions. Grasshopper treatments would be limited to within one (1) mile of agricultural cropland. Mormon cricket treatments would not be limited to within one (1) mile of agricultural cropland. This alternative would only be used in the event of extreme level of grasshopper infestation where crop or range damage is probable or in situations where high levels of Mormon crickets may create public nuisances or endangerment of road traffic and then only at the mutual agreement of APHIS and the land manager. APHIS would make a single application per year to a treatment area and the application rates under this alternative are typically at the following application rates:

- 16.0 fluid ounces (0.50 pound active ingredient (lb. a.i.)) of carbaryl spray per acre;
- 10.0 pounds (0.20 a.i.) of 2 percent carbaryl bait per acre;
- 8.0 fluid ounces (0.02 lb. a.i.) chlorantraniliprole per acre;
- 1.0 fluid ounce (0.016 lb. a.i.) of diflubenzuron per acre; or
- 8.0 fluid ounces (0.62 lb. a.i.) of malathion per acre.

Note: Although listed as an option, chlorantraniliprole will not be used in 2020. In the event it is to be considered in future years, an addendum will be made to this EA.

In accordance with USEPA regulations, these insecticides may be applied at lower rates than those listed above. Additionally, coverage may be reduced to less than the full area coverage, resulting in lesser effects to non-target organisms.

The potential generalized environmental effects of the application of carbaryl, diflubenzuron, and malathion, under this alternative, are discussed in detail in the 2002 EIS (Environmental Consequences of Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative, pg. 38–48). The potential generalized environmental effects of the application of chlorantraniliprole, under this alternative, are discussed in detail in the 2019 EIS (Environmental Consequences of Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative, pg. 36-47). A description of anticipated site-specific impacts from this alternative may be found in Part V of this document.

C. Alternative 3: Reduced Agent Area Treatments (RAATS) with Adaptive Management Strategy – (Preferred Alternative)

Under Alternative 3, the Preferred Alternative, APHIS would manage a grasshopper treatment program using techniques and tools discussed hereafter to suppress outbreaks. The insecticides available for use by APHIS include the U.S. Environmental Protection Agency (USEPA) registered chemicals carbaryl, diflubenzuron, and malathion and a new product, chlorantraniliprole. These chemicals have varied modes of action: carbaryl and malathion work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses); diflubenzuron is a chitin inhibitor; and chlorantraniliprole is an activator of ryanodine receptors. APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate as reduced agent area treatments (RAATs). The identification of grasshopper species and their life stage largely determines the choice of insecticides used among those available to the program. RAATs are the most common application method for all program insecticides, and only rarely do rangeland pest conditions warrant full coverage and higher rates.

The RAATs strategy is effective for grasshopper suppression because the insecticide controls grasshoppers within treated swaths while conserving grasshopper predators and parasites in swaths not directly treated. RAATs can decrease the rate of insecticide applied by either using lower insecticide concentrations or, more commonly, decreasing the deposition of insecticide applied by alternating one or more treatment swaths. Both options could potentially be incorporated simultaneously into RAATs. Either carbaryl, diflubenzuron, chlorantraniliprole, or malathion would be considered under this alternative, typically at the following application rates:

- 8.0 fluid ounces (0.25 lb. a.i.) of carbaryl ULV spray per acre;
- 10.0 pounds (0.20 lb. a.i.) of 2 percent carbaryl bait per acre;
- 4.0 fluid ounces (0.013 lb. a.i.) chlorantraniliprole per acre;
- 1.0 fluid ounce (0.016 lb. a.i.) of diflubenzuron per acre; or
- 4.0 fluid ounces (0.31 lb. a.i.) of malathion per acre.

Note: Although listed as an option, chlorantraniliprole will not be used in 2020. In the event it is to be considered in future years, an addendum will be made to this EA.

The width of the area not directly treated (the untreated swath) under the RAATs approach is not standardized. The proportion of land treated in a RAATs approach is a complex function of the rate of grasshopper movement, which is a function of developmental stage, population density, and weather (Narisu et al J. A., 1999) (Narisu et al L. a., 2000), as well as the properties of the insecticide (insecticides with longer residuals allow wider spacing between treated swaths). (Foster R. N., 2000) left 20 to 50% of their study plots untreated, while (Lockwood J. A., 2000) left 20 to 67% of their treatment areas untreated. Currently the grasshopper program typically leaves 50% of a spray block untreated for ground applications where the swath width is between 20 and 45 feet. For aerial applications, the skipped swath width is typically no more than 20 feet for malathion, 100 feet for carbaryl and 200 feet for chlorantraniliprole and diflubenzuron. The selection of insecticide and the use of an associated swath widths is site dependent. Rather than suppress grasshopper populations to the greatest extent possible, the goal of this alternative is to suppress grasshopper populations to a desired level. The preferred use of this option is the above listed application rate at 50% area coverage and APHIS will implement RAATS at 50% area coverage for all aerial treatments.

The potential generalized environmental effects of the application of carbaryl, diflubenzuron, and malathion, under this alternative, are discussed in detail in the 2002 EIS (Environmental Consequences of Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative, pg. 38–48). The potential generalized environmental effects of the application of chlorantraniliprole, under this alternative, are discussed in detail in the 2019 EIS (Environmental Consequences of Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative, pg. 36-47). A description of anticipated site-specific impacts from this alternative may be found in Part V of this document.

Experimental Treatments included in RAATS - (Research purposes only)

APHIS continues to refine its methods of grasshopper management to make it more economically feasible, and environmentally acceptable. These refinements can include reduced rates of currently used pesticides, improved formulations, development of more target-specific baits, development of biological pesticide suppression alternatives, and improvements to aerial (e.g., incorporating the use of Unmanned Aircraft Systems (UAS)) and ground application equipment. A division of APHIS, Science and Technology's (S&T) Phoenix Lab is located in Arizona and its Rangeland Grasshopper and Mormon Cricket Management Team (Rangeland Unit) conducts methods development and evaluations on behalf of the Program. The Rangeland Unit's primary mission is to comply with Section 7717 of the Plant Protection Act and protect the health of rangelands (wildlife habitats and where domestic livestock graze) against economically damaging cyclical outbreaks of grasshopper. The Rangeland Unit tests and develops more effective, economical, and less environmentally harmful management methods for the Program and its Federal, State, Tribal, and private stakeholders.

To achieve this mission, experimental plots ranging in area from less than one foot to 640 acres are used and often replicated. The primary purpose of these experiments is to test and develop improved methods of management for grasshoppers. This often includes testing and refining pesticide and biopesticide formulations that may be incorporated into the Program. These investigations often occur in the summer (May-August) and the locations typically vary annually. The plots often include "no treatment" (or control) areas that are monitored to compare with treated areas. Some of these plots may be monitored for additional years to gather information on the effects of utilized pesticides on non-target arthropods. Note that an Experimental Use Permit is not needed when testing non-labeled experimental pesticides if the use is limited to laboratory or greenhouse tests, or limited replicated field trials involving 10 acres or less per pest for terrestrial tests.

Studies and experimental plots are typically located on large acreages of rangelands and the Rangeland Unit often works on private land with the permission of landowners. Locations of experimental trials will be made available to the appropriate agencies in order to ensure these activities are not conducted near sensitive species or habitats. Due to the small size of the experimental plots, no adverse effects to the environment, including protected species and their critical habitats, are expected, and great care is taken to avoid sensitive areas of concern prior to initiating studies.

Methods Development Studies

Methods development studies may use planes and all-terrain vehicles (ATVs) to apply labeled pesticides using conventional applications and the Reduced Agent Area Treatments (RAATs) methodology. The experiments may include the use of an ultra-low volume sprayer system for applying biopesticides (such as native fungal pathogens). Mixtures of native pathogens and low doses of pesticides may be conducted to determine if these multiple stressor combinations enhance mortality. Aircraft will be operated by Federal Aviation Administration-licensed pilots with an aerial pesticide applicator's permit.

Rangeland Unit often uses one square foot micro plots covered by various types of cages depending on the study type and species used. These types of study plots are preferred for Mormon cricket treatments and those involving non-labeled experimental pesticides or biopesticides. Our most common application method for micro plots is simulating aerial applications via the Field Aerial Application Spray Simulation Tower Technique (FAASSTT). This system consists of a large tube enclosed on all sides except for the bottom, so micro plot treatments can be accurately applied to only the intended treatment target. Treatments are applied with the FAASSTT in micro doses via a syringe and airbrush apparatus mounted in the top. Rangeland Unit is also investigating the potential use of Unmanned Aerial Systems (UAS) for a number of purposes related to grasshopper detection and treatment. UAS will be operated by FAA-licensed pilots with an aerial pesticide applicator's permit.

Pesticides and Biopesticides Used in Studies

Pesticides likely to be involved in studies currently include:

1) Liquids: diflubenzuron (Dimilin 2L and generics: currently Unforgiven and Cavalier 2L) and chlorantraniliprole (Prevathon). Program standard application rates are: diflubenzuron - 1.0 fl. oz./acre in a total volume of 31 fl. oz./acre; chlorantraniliprole - 2.0 fl. oz./acre (RAATs) or 4.0 fl. oz./acre (conventional coverage), both in a total volume of 32 fl. oz./acre. Experimental rates often vary, but the doses are lower than standard Program rates unless otherwise noted.

2) Baits: carbaryl. Program standard application rates: 2% bait at 10 lbs./acre (2 lbs. AI/acre) or 5% bait at 4 lbs./acre (2 lbs. AI/acre).

3) LinOilEx (Formulation 103), a proprietary combination of easily available natural oils and some commonly encountered household products, created by Manfred Hartbauer, University of Graz, Austria. Note that LinOilEx (Formulation 103) is experimental; for more information, see "Potential Impacts of LinOilEx Applications" in the section "Information on Experimental Treatments."

Biopesticides likely to be involved in studies currently include:

1) *Metarhizium robertsii* (isolate DWR2009), a native fungal pathogen. Note that *Metarhizium robertsii* (isolate DWR2009) is experimental; for more information, see "Potential Impacts of *Metarhizium robertsii* Applications" in the section "Information on Experimental Treatments."

2) *Beauveria bassiana* GHA, a native fungal pathogen sold commercially and registered for use across the U.S.

At this time, we are unsure where in the 17 states we will be doing most of the following proposed experimental field studies. The final location decision is dependent upon grasshopper and/or Mormon cricket population densities, and availability of suitable sites, but we plan to most likely work in Arizona, Idaho, New Mexico, Oregon, Montana, or Washington.

Study 1: Evaluate persistence of the experimental biopesticide DWR2009 in bait form by coating wheat bran with the pathogen. A species of local abundance will be placed into replicated microplot cages and fed the baits by hand. Mortality and sporulation will be then be observed for a duration of time to determine persistence in both the field and lab.

Study 2: Evaluate efficacy of the experimental biopesticide DWR2009 in bait form by coating wheat bran with the pathogen. A species of local abundance will be placed into replicated microplot cages and fed the baits by hand. Mortality and sporulation will be then be observed for a duration of time to determine efficacy in both the field and lab.

Study 3: A stressor study to evaluate efficacy of the experimental biopesticide DWR2009 in liquid form when combined with Dimilin 2L. The FAASSTT will be utilized to apply varying dose levels of Dimilin 2L (below label rates) in order to compare efficacy, starting at the rate of 1.0 fl. oz./acre. Replicated microplots will be treated and then a species of local abundance will be placed into each cage. Mortality will be then be observed for a duration of time to determine efficacy.

Study 4: Evaluate efficacy of the experimental biopesticide DWR2009 in liquid and bait form (by coating wheat bran with the pathogen) using ultra-ultra low volume RAATs (involves a timing device and ULV nozzles) and a 10 acre plot. ATV-mounted liquid and bait spreaders will be utilized to apply DWR2009. Specimens will be periodically collected to observe mortality and sporulation for a duration of time to determine efficacy.

Study 5: Evaluate efficacy of the experimental, non-traditional pesticide LinOilEx (Formulation 103). A micro-FAASSTT (airbrush system mounted on a 5 gal bucket) will be utilized to apply varying dose levels in order to compare efficacy, starting at the base rate of 6.64 ml/cage. A species of local abundance will be placed into replicated microplot cages and sprayed directly. Mortality will be then be observed for a duration of time to determine efficacy.

III. Methodologies

These methodologies would apply to Alternative 2 and 3.

A. Land Administration

As provided by the Plant Protection Act, APHIS would conduct rangeland grasshopper and Mormon cricket suppression programs on federal lands in response to requests of the administering agency. Over the past two decades, most of the suppression programs conducted by APHIS in Idaho have been on lands administered by BLM. Smaller amounts of Forest Service lands have been treated in some years. Although APHIS is authorized to treat state and private rangeland under the Plant Protection Act, the restrictions under which USDA must operate have deterred state and private land managers from seeking cooperative programs in Idaho.

1. Bureau of Land Management

APHIS would treat grasshopper/Mormon cricket outbreaks on public lands administered by the BLM in Idaho when treatments are necessary and can be effective in minimizing private and public resource impacts. APHIS would evaluate site specific complaints and develop proposed treatment strategies consistent with the program and protection measures documented in this EA and implement specific control or suppression actions. The associated BLM field or district office will approve APHIS individual treatments.

The rangeland grasshopper suppression program for BLM-managed public lands in Southern Idaho would be implemented primarily for crop protection where private lands are within proximity to BLM-managed rangeland, and where economic damage is occurring or is expected to occur. All treatments would be designed to minimize the size of treated areas and would incorporate appropriate measures to protect resource values while maintaining treatment effectiveness. These suppression measures might be conducted either by ground or aerial applications.

2. Forest Service

APHIS would treat grasshopper/Mormon cricket outbreaks on Forest Service lands in Idaho when treatments are necessary and can be effective in minimizing private and public resource impacts. APHIS would evaluate site specific complaints and develop proposed treatment strategies consistent with the program and protection measures documented in this EA and implement specific control or suppression actions. The associated FS field office will approve APHIS individual treatments.

The rangeland grasshopper and Mormon cricket suppression program for Forest Service lands in Southern Idaho would be implemented primarily for crop protection where private lands are within proximity to Forest Service lands, and where economic damage is occurring or is expected to occur. All treatments would be designed to minimize treated areas and would incorporate appropriate measures to protect resource values while maintaining treatment effectiveness. These suppression measures might be conducted either by ground or aerial applications.

B. Documenting Rangeland Grasshopper Suppression Programs

APHIS would document complaints from public land managers, private landowners, and other persons with the protocol included in Appendix 3. APHIS would document evaluations, recommendations regarding treatments, and the conduct of treatments with the protocol included in Appendix 3. When APHIS would make a recommendation for a specific treatment block, the land manger will provide further recommendations to the proposal to include:

- Exclude any sensitive areas that APHIS had included in the proposed treatment block;
- Include additional critical areas that APHIS had not specified; or
- Modify the percentage of the treatment block which receives direct treatment.

The land manager would certify the proposed treatment, including any modifications, was consistent with the provisions of the EA.

C. Treatment Strategy

The treatment block would consist of a parcel of rangeland infested by a grasshopper outbreak. The entire treatment block would not be treated. The surface area to which insecticides would be applied within a treatment block would range from 1% to 75% of the total block. No contiguous strip greater than 300 feet wide would ever be treated.

1. Basis for Decision to Treat

Grasshopper/Mormon cricket populations which are not likely to threaten crops or other resources would not be treated. Several factors are included in the threat assessments. The first level of assessment is the overall population density. This is determined through field survey and is expressed in grasshoppers/Mormon crickets per square yard.

Although several dozen species of grasshoppers occur in Idaho, only a few are likely to cause significant damage to crop and rangeland resources. They include the Mormon cricket, *Anabrus simplex*, as well as grasshoppers such as *Camnula pellucida*, *Aulocara elliotti*, *Melanoplus sanguinipes*, *Melanoplus bivittatus*, *Melanoplus packardii*, and *Oedaleonotus enigma*.

2. Selection of Treatment

Following a decision to conduct a treatment, the pesticide would be chosen according to site-specific conditions. This involves many factors, including type and density of vegetation, species' acceptance of bait, terrain, climatic conditions, proximity to pollinators, life stage, importance of rapid reduction of density, need for residual control, costs, and logistics.

The decision of which insecticide (if any) to use in any situation depends on a variety of factors specific to any given site and situation. Each of the insecticides which might be selected for a treatment has characteristics that dictate its desirability for a treatment.

a) Diflubenzuron

Diflubenzuron only kills grasshoppers, Mormon crickets or other insects when they are in their immature stages. It will not kill adult grasshoppers or Mormon crickets. It cannot be used late in the season because fully mature grasshoppers/Mormon crickets are no longer susceptible. In a normal year, the opportunity to use diflubenzuron in Idaho can be expected to be over by about July 15th for Mormon crickets and most species of grasshoppers. Reduced insects are not observed until seven to ten days after treatment. Diflubenzuron is reported to have a residual activity against grasshoppers and Mormon crickets, lasting up to 28 days.

Because diflubenzuron is a chitin inhibitor that disrupts insects from forming their exoskeleton, organisms without a chitinous exoskeleton, such as mammals, fish, and plants, are largely unaffected by diflubenzuron. In addition, adult insects, including wild and cultivated bees, would be mostly unaffected by diflubenzuron applications (Schroeder, Sutton, & Beavers, 1980) (Emmett & Archer, 1980).

Diflubenzuron is less harmful to other insects and must normally be ingested to be effective. Therefore, diflubenzuron does not affect adult insects, piercing sucking insects and most non-phytophagous terrestrial insects. Diflubenzuron would be applied as a spray with water and crop or canola oil. It is the least costly option per acre treated.

b) Carbaryl

Carbaryl bait acts faster than diflubenzuron. It kills adult and immature grasshoppers and some other insects. It has a broader spectrum of insecticidal activity than diflubenzuron, but it also must be ingested to be lethal. It can be used effectively any time during the grasshopper or Mormon cricket season and can be applied by air or ground. It is the costliest treatment option. Carbaryl bait is applied in greater volume than any of the other treatments (up to 10 lbs. dry material per acre) and creates a greater logistical problem because of the amount of material which must be stored, transported and applied.

Carbaryl bait can be applied by air in some situations when and where liquid insecticides cannot. Although no aerial applications of any insecticide can be conducted when wind speeds exceed 10 mph, carbaryl bait can be applied when air temperatures are too high to permit effective applications of sprays. Additionally, when terrain is too rough to allow flying at the low altitude consistent with effective spray application, bait can be applied at a safe altitude. Thus, the window of opportunity to apply bait is greater than for sprays. The carbaryl bait formulations approved for use by APHIS include products which impregnate carbaryl onto wheat bran, onto rolled whole wheat, and into pellets manufactured from grape and apple pomace or outdated human food products.

c) Chlorantraniliprole

Chlorantranilprole kills adult and immature grasshoppers and some other insects. It may be used under varying weather conditions and is the least toxic late season alternative after diflubenzuron may not be used. Livestock and horses may graze on rangeland the same day that the land is treated with chlorantraniliprole. It is applied by air for grasshoppers/Mormon crickets on rangeland and is intermediate in cost between carbaryl bait and diflubenzuron. It carries a lower risk for non-target species than carbaryl or malathion sprays. The program application rate for chlorantraniliprole is much less than the label rate for private land owners.

d) Malathion

Malathion spray is a broad spectrum contact insecticide that is more effective in hot weather than cool weather. It kills adult and immature grasshoppers and Mormon crickets, and many other insects. It has immediate knock-down effect and has essentially no residual activity. It is applied by air for grasshoppers/Mormon crickets on rangeland and is intermediate in cost between carbaryl bait and diflubenzuron. It carries higher risk for non-target species than diflubenzuron or carbaryl bait.

The formulations of malathion approved for use by APHIS are Ultra Low Volume Concentrates (ULV). They are applied without an additional carrier. Malathion would only be selected when grasshopper/Mormon cricket populations are extremely high, immediate reduction of the population was required, and options for successful use of carbaryl bait, chlorantraniliprole, or diflubenzuron spray do not exist.

Comparison of treatments

Because of their different modes of action and suitability under different climatic conditions, the four pesticides can be sorted as follows:

Table 1. Weather conditions in realtion to treatment options

Grasshopper/Mormon Cricket Life Stage	Weather Conditions	Pesticide of Choice
Nymphs	Cool and wet	Chlorantranilprole, Diflubenzuron or Carbaryl
Nymphs	Hot and dry	Chlorantranilprole, Diflubenzuron, Carbaryl or Malathion
Adults	Cool and wet	Carbaryl or Chlorantranilprole,
Adults	Hot and dry	Carbaryl, Chlorantranilprole, or Malathion

Cost of applications, on a per acre basis, would vary with the method of application, insecticide used, size and shape of a treatment block, and distance from a support center. Aerial applications would be less expensive on average, than ground applications. Diflubenzuron spray would be the least expensive and carbaryl bait would be the most expensive insecticide. Larger, regular blocks would be more economical to treat than smaller, irregularly shaped blocks. Ferry and transportation costs would be greater for blocks further from an airstrip or support base.

3. Multiple Applications

No area would be treated more than once during a grasshopper/Mormon cricket season. No area which was treated for Mormon crickets during the current calendar year would be treated later for grasshoppers.

4. Methods of Application

Insecticides would be applied in swaths which have a width determined for each treatment device (aircraft, truck-mounted spreader, or ATV-mounted spreader). For instance, an Ayres Turbine Thrush aircraft can deliver a 100 foot swath, and an ATV-mounted bait spreader may deliver a swath up to 40 feet wide with carbaryl bait. Swaths delivered by aircraft are parallel to one another, and swaths delivered by ground equipment are dependent on the accessibility of the terrain. Distance between swaths allows computation of the percentage of the treatment block that receives direct treatment.

5. Discrimination Based on Vegetation Type

Because of concerns for conservation of insects as food for sage-obligate bird species, APHIS would decrease the amount of coverage on treatment blocks where more than 15% of the area is covered by shrub canopy. Federal land managers would determine if the area included in the block was covered with more than 15% shrub canopy and they would notify APHIS if the land was classified as grassland or shrub steppe. APHIS would apply Malathion to shrub steppe only if grasshopper or Mormon cricket populations exceeded 25 per sq. yard.

Because of their different types of vegetation and suitability under different treatment area conditions, the four pesticides can be sorted as follows:

Table 2. Proposed Treatments for Idaho Grasshopper and Mormon cricket Suppression

Treatment	Treatment Area Characteristics	Proposed Treatment Blocks
Diflubenzuron Spray *Applied at rate of 1.0 fluid ounce of Diflubenzuron per acre (0.016 lb. a.i. per acre).*	Grasslands	*Up to 1 mile strip of rangeland with up to 75% coverage.*
	Shrub Steppe	*Up to 1 mile strip of rangeland with up to 50% coverage.*
Carbaryl Bait *Applied at rate of 10.0 pounds of 2% Carbaryl bait per acre (0.20 lb. a.i. per acre)*	Grasslands	*Up to 1 mile strip of rangeland with up to 75% coverage.*
	Shrub steppe	*Up to 1 mile strip of rangeland with up to 50% coverage.*
Chlorantranilprole Spray *Applied at rate of 4.0 fluid ounce of Chlorantranilprole per acre (0.013 lb. a.i. per acre).*	Grasslands	*Up to 1 mile strip of rangeland with up to 50% coverage.*
	Shrub steppe	*Up to 1 mile strip of rangeland with up to 50% coverage.*
Malathion Spray *Applied at rate of 6.0 fluid ounces of Malathion per acre (0.465 lbs. a.i. per acre).*	Grasslands	*Up to 1 mile strip of rangeland with up to 50% coverage.*
	Shrub steppe	*Not used unless grasshopper population exceeds 25/sq. yd. Up to 1 mile strip of rangeland with up to 50% coverage.*

6. Protective Measures in Addition to Annual Guidelines

Appendix 1 includes protective measures which would be used in all APHIS Rangeland Grasshopper Suppression Programs nationwide. Following are additional measures which would be implemented in Idaho:

- Insecticide application rates would be reduced below USEPA maximum allowable rates.

- Treatment blocks would not receive full area coverage. 25% to >99% of each treatment block would not receive direct application of insecticide.

- Aerial applications of carbaryl bait would not be made within 500 feet of water. APHIS would perform on-site examination of proposed treatment blocks to determine the presence of water.

- Noxious weed biological control agent release sites would be considered on an individual basis in consultation with the land manager to determine if insecticide might be used and/or how much buffer space should be allowed.

- No aerial application would be made within 0.5 mile of crops enrolled in the Idaho Certified Organic Crop Program or public rangeland identified by land manager being used for grazing organic raised animals, except on the request of the organic farm manager. APHIS may decline to apply any treatments which were requested inside this buffer area. APHIS develops buffers which will assure that unintended consequences of pesticide applications are avoided. In most cases, the buffers are sized to prevent potentially toxic levels of the insecticide from reaching a sensitive site. In the case of organic crops, any detectable residue could have a deleterious impact on the certification of the crop.

APHIS would make available a mechanism whereby individuals can request that federally managed rangelands around or adjacent to their private property could be excluded from treatments for grasshoppers. The request form is available at: https://invasivespecies.idaho.gov/s/no-spray-request-2008.pdf

It is also available from APHIS in Boise. Requests for the form may be sent to USDA APHIS PPQ, 9118 West Blackeagle Drive, Boise ID 83709-1572 or faxed to 208-378-5794.

IV. Affected Environment

A. Description of Affected Environment

It is not generally possible to predict the precise locations where grasshopper/Mormon cricket outbreaks and migrations will occur in any given year. Because APHIS cannot be sure where migration and spread of the infestations will occur, it is necessary to include an expanded area in the EA. The proposed suppression program area specified in this EA includes virtually all areas in Southern Idaho which might host outbreaks that would require suppression.

The proposed grasshopper suppression area is limited to federal rangelands within one (1) mile of private agricultural lands. We estimate that there are 2,550,537 acres of federal rangeland in Southern Idaho that fit this criterion, before subtraction of excluded areas such as ACEC's (Areas of Critical Environmental Concern), Snake River Birds of Prey National Conservation Area, and buffered areas for sensitive species.

APHIS estimates that no more than 1 to 2% of this area would be included in treatment blocks and maximum area treated within a block would not exceed 75%.

Table 3. Individual county acreage figures:

COUNTY	ACRES	COUNTY	ACRES	COUNTY	ACRES
Ada	49177	Cassia	263132	Madison	10255
Adams	13212	Clark	141490	Minidoka	29318
Bannock	55486	Custer	88099	Oneida	84714
Bear Lake	31326	Elmore	211271	Owyhee	274286
Bingham	94708	Franklin	17986	Payette	7721
Blaine	121435	Fremont	44812	Power	53981
Boise	6654	Gem	15881	Teton	21714
Bonneville	69815	Gooding	66920	Twin Falls	158960
Butte	122158	Jefferson	78398	Valley	5464
Camas	21374	Jerome	82359	Washington	40282
Canyon	2887	Lemhi	24874		
Caribou	111406	Lincoln	128982		

Map of the described areas is in Appendix 2 – Potential Grasshopper Treatment Areas for Idaho

The area lies within the Interior Columbia Basin. Landforms consist primarily of valleys bordered by north-south running mountain ranges. Numerous impoundments on the Snake River and its tributaries serve multipurpose use. Irrigation systems serve agricultural areas throughout the region. Except for the Snake River (and Bear River in southeast Idaho) and its major tributaries, most streams in the area are generally intermittent. There are some small streams which are perennial. Major tributaries of the Snake River that traverse proposed program areas include:

Table 4. Major tributaries of the Snake River that traverse proposed program areas:

	Southwest Idaho	South Central Idaho	Southeast Idaho
Major Tributaries	Boise, Weiser, Bruneau, Owyhee, and Payette Rivers	Big Wood and Little Wood Rivers; Rock, Salmon Falls, and Camas Creeks	Portneuf River and Rock Creek
Predominate Mountain Ranges	Owyhee, Boise, and West Mountains	Albion Mountains and South Hills on southern edge; Soldier, Smoky and Pioneer Mountains form northern edge.	Deep Creek Mountains; Portneuf, Wasatch, and Caribou Ranges

Events during the Pleistocene shaped much of Idaho's landscape. In the southern portions of Idaho, repeated overflows of historic Lake Bonneville into the Snake River modified the Snake River Valley. In addition to volcanic flows, sedimentary deposits including glacial till, outwash and loess, and valley fill, terraces, and scour features are present over much of the area. Soils in the Snake River Plains developed from loess deposits, and this has enabled these areas to become highly productive agricultural areas. Intensive livestock production systems such as dairies, feedlots, and trout farms create demand for feed which is partially supplied locally by alfalfa, corn, and wheat fields. Potatoes, sugar beets, and grain are other primary crops produced within the area.

The most intense agricultural production sites are in the Treasure Valley and Lower Payette Valley in southwest Idaho; the Magic Valley and Camas Prairie in south central Idaho; the Snake River Plain; and in valleys and on foothills in southeast Idaho. Crops include row crops for food and feed, and very high value seed crops.

The plains and foothills are semi-arid sagebrush steppe. Average annual temperature is 40 to 55 °F. Total annual precipitation averages 5 to 20 inches; almost no rain falls during the summer months. Examples of probability of 0.50" of precipitation in a 24 hour period April 15 to August 15 (Western Regional Climate center, http://www.wrcc.dri.edu) are:

Table 5. Probability of 0.50" Precipitation/24 Hr. April 15 to August 15

Gooding, Mountain Home, Richfield, Twin Falls	0 to 2%
Caldwell, Parma, Pocatello	0 to 3%
Hailey, Idaho Falls, Malad	0 to 4%
Cambridge	0 to 5%
Silver City	0 to 9%

The rangelands are primarily shrub steppe and are utilized for cattle and sheep grazing. They provide habitat for native and introduced game, and non-game animal species. They are in an accelerated state of ecological change due to invasion by exotic plant species, changes in fire patterns, and intervention by humans.

Grassland and shrub land are present across the general area. Forest lands are present at higher elevations. Grasshopper/Mormon cricket treatments would occur only in grass and shrub lands, not in forests. BLM manages rangelands within the Boise, Twin Falls, and Idaho Falls Districts. FS manages rangelands within Boise and Payette National Forests, Sawtooth, Caribou, Targhee, Cache National Forests, and the Curlew National Grasslands, where treatments might occur.

Elevation and topography within the overall area vary considerably from 2,000 to near 10,000 feet, and from flat plains to steep mountain ranges. Treatments would occur on mountains, foothills, and flatlands, usually near cropland and hayfields. Some treatments could occur on remote blocks of rangeland where critical forage or re-vegetation projects or recreational resources are threatened by grasshoppers.

Towns or cities near the federally managed rangelands include American Falls, Arco, Boise, Burley, Dubois, Gooding, Hailey, Idaho Falls, Malad, Mountain Home, Pocatello, and Twin Falls. Special areas include: Bear Lake, Camas, City of Rocks National Reserve, Craters of the Moon National Monument, Jarbidge-Bruneau Rivers Wilderness, Deer Flat National Wildlife Refuge, Duck Valley Indian Reservation, Fort Hall Indian Reservation, Gray's Lake, Hagerman Fossil Beds National Monument, Hagerman National Fish Hatchery, Minidoka National Wildlife Refuge, Oxford Slough National Wildlife Refuge, and the Snake River Birds of Prey National Conservation Area. Idaho National Laboratory occupies a very large tract of land in southeast Idaho and provides a large employment base.

Excluded Program Areas

Areas specifically excluded from treatment are:

- All Wilderness Areas

- Rangeland areas in the watersheds which drain into the Snake River downstream from Brownlee Dam will be excluded. APHIS has completed consultation with National Oceanic and Atmospheric Administration (NOAA) Fisheries regarding measures to protect endangered salmon and steelhead. However, APHIS would not include watersheds which are involved with those species. Historically there has been less need for treatments in Northern Idaho and fewer situations where a crop protection program could be implemented. For these reasons APHIS has chosen to limit its suppression program to Southern Idaho.

- All Areas of Critical Environmental Concern unless otherwise noted below.

- Wilderness Study Areas (WSA) and Research Natural Areas (RNA) will be excluded from consideration for treatments except for those within the Owyhee Field Office of BLM which will be considered on a case-by-case basis.

- Other areas which are specifically identified in this EA in section V.B.5 because of their association with sensitive species or other sensitive sites will be excluded.

- Snake River Birds of Prey National Conservation Area, south of Boise, including the Ted Trueblood Wildlife Area, north of Grandview in Elmore County.

- Treatment in the Boise Front Area of Critical Environmental Concern (ACEC) would only be considered on a case-by-case basis. Ground treatment would be limited to existing roads and trails.

- The Sugar Valley Badlands proposed Area of Critical Environmental Concern south of Bruneau.
- The Mulford's Milkvetch proposed Area of Critical Environmental Concern near Grand View.

- The Horse Hill proposed Area of Critical Environmental Concern near Bruneau.

- The Mud Flat Oolite Area of Critical Environmental Concern and the proposed expansion to the Mud Flat Oolite ACEC, south of Grand View.

- Treatment in the Long-billed Curlew Habitat ACEC, north and east of Boise would only be considered on a case-by-case basis after July 15. Ground treatment would be limited to existing roads and trails. No application of Malathion would be permitted within the Curlew ACEC.

- Treatment in Columbian Sharp-tailed Grouse ACEC, north of Weiser would only be considered on a case-by-case basis. Ground treatment would be limited to existing roads and trails.

- Jump Creek Canyon ACEC, near Marsing and the Boulder Creek ONA/ACEC, west of Triangle in Owyhee County.

- Aerial Carbaryl bait application would be the only treatment under consideration in the proposed Biological Soil Crusts ACEC.

- APHIS will not conduct experimental treatments on BLM or Forest service lands, only private lands with the cooperation of the owner.

B. Site-Specific Considerations

1. Human Health

The suppression program would be conducted on federally managed rangelands that are not inhabited by humans. Human habitation may occur on the edges of the rangeland. Most habitation is comprised of farm or ranch houses, but some rangeland areas may have suburban developments nearby. Average population density in rural areas of Idaho is 6.8 persons per square mile (U.S. Census Bureau, 2018). Recreationists may use the rangelands for hiking, camping, bird watching, hunting, falconry or other uses. Ranchers and sheepherders may work on the rangelands daily. Individuals with allergic or hypersensitive reactions to insecticides may live near or may utilize rangelands in the proposed suppression program area.

Some rural schools may be in areas near the rangeland which might be included in treatment blocks. Children may visit areas near treatment blocks or may even enter treatment blocks before or after treatments.

2. Non-target Species

Non-target species within the suppression program area include terrestrial vertebrate and invertebrate animals, aquatic organisms, and terrestrial plants (both native and introduced).
Invertebrate organisms of special interest include bio-control agents and pollinators. Land managers and others have released and managed bio-control agents, including insects and pathogens, on many species of invasive plants within and near the suppression program area. These bio-control agents are important in decreasing the overall population, or the rate of reproduction, of some species of undesirable rangeland plants, especially exotic invasive weeds.

Pollinators, including insects and other organisms, occur within and near the suppression program area. Pollinators include managed exotic and native insect species such as honeybees, leafcutter bees, and alkali bees which are commercially valuable for agriculture. Other species of insects and other animals pollinate native and exotic plants and are necessary for the survival of some species.

Vertebrates include highly visible introduced and native mammalian species such as cattle, sheep, horses, mule deer, elk, pronghorn, coyotes and wolves, as well as smaller animals like rabbits, mice, gophers and bats. Birds comprise a large portion of the vertebrate species complex, and they also include exotic and native species. Some exotic game birds, like pheasant and partridge, have been deliberately introduced into the area, and other species such as starlings and pigeons have spread from other loci of introduction. Sage obligate bird species, typified by sage grouse, are present in much of the area. Various reptiles and amphibians are also present. Many of the herbivorous vertebrate species compete with grasshoppers/Mormon crickets for forage. Many of the vertebrate species utilize grasshoppers/Mormon crickets and other insects as a food source. There is special concern about the role of grasshoppers/Mormon crickets as a food source for sage grouse, sharp-tailed grouse, Yellow-billed Cuckoo and other bird species.

The proposed suppression area contains a vast variety of terrestrial invertebrates, primarily insects and other arthropods. They include species which compete with grasshoppers/Mormon crickets, and some which prey on grasshoppers/Mormon crickets. In turn, grasshoppers/Mormon crickets may prey opportunistically on other invertebrates.

Aquatic organisms within the suppression area include plants and vertebrate and invertebrate animals. Some species of fish utilize grasshoppers/Mormon crickets as a significant food source during some parts of the year.

A diverse complement of terrestrial plants occurs within the proposed suppression area. Many such as rush skeletonweed, purple loosestrife, spotted and diffuse knapweed, cheatgrass and leafy spurge are invasive weeds. Others, such as crested wheatgrass have been planted for rehabilitation purposes. Native plants such as sagebrush, bitterbrush, and various grasses provide forage and shelter for animal species and help stabilize the soil against erosion.

Biological soil crusts, also known as cryptogrammic, microbiotic, cryptobiotic, and microphytic crusts, occur within the proposed suppression area. Biological soil crusts are formed by living organisms and their by-products, creating a crust of soil particles bound together by organic materials. Crusts are predominantly composed of cyanobacteria (formerly blue-green algae), green and brown algae, mosses, and lichens. Liverworts, fungi and bacteria can also be important components. Crusts contribute to several functions in the environment. Because they are concentrated in the top one to four millimeters of soil, they primarily affect processes that occur at the land surface or soil-air interface. These include soil stability and erosion, atmospheric N-fixation, nutrient contributions to plants, soil-plant-water relations, infiltration, seedling germination, and plant growth.

Federally listed threatened and endangered species which might occur in or near the proposed suppression area include:

Table 6. Ferally Listed T & E Species and county locale

FEDERAL LISTED T & E SPECIES	IDAHO COUNTIES
Banbury Springs Lanx	Gooding
Bliss Rapids Snail	Elmore, Gooding, Jerome, Twin Falls
Bruneau Hot Spring Snail	Owyhee
Bull Trout	Ada, Adams, Blaine, Boise, Butte, Custer, Elmore, Gem, Owyhee, Payette, Valley, Washington
Canada Lynx	Adams, Bear Lake, Blaine, Boise, Bonneville, Butte, Camas, Caribou, Clark, Custer, Elmore, Franklin, Fremont, Jefferson, Madison, Teton, Valley
Yellow-Billed Cuckoo	Ada, Bannock, Bingham, Blaine, Boise, Bonneville, Camas, Cassia, Clark, Custer, Elmore, Fremont, Jefferson, Lincoln, Lemhi, Madison, Minidoka, Owyhee and Power
Grizzly Bear	Bonneville, Clark, Fremont, Teton
North American Wolverine (proposed)	Adams, Bannock, Bear Lake, Bingham, Blaine, Boise, Bonneville, Butte, Camas, Caribou, Clark, Elmore, Franklin, Fremont, Gem, Jefferson, Lemhi, Madison, Teton, Valley and Washington
Northern Idaho Ground Squirrel	Adams, Valley, Washington
Slickspot Peppergrass	Ada, Canyon, Elmore, Gem, Owyhee, Payette
Snake River Physa Snail	Ada, Canyon, Cassia, Elmore, Jerome, Gooding, Minidoka, Owyhee, Twin Falls
Ute Ladies'-Tresses	Bingham, Bonneville, Fremont, Jefferson, Madison

Areas where critical habitat for bull trout is designated may be within or near the proposed suppression area including parts of Ada, Adams, Blaine, Boise, Butte, Camas, Custer, Elmore, Gem, Owyhee, Payette, Valley, and Washington Counties.

Discussion of these species is included in section: V.B.8.

Many other species are accorded special status by federal land managers or by the State of Idaho. Data about these species are available from the respective land managers or at https://fishandgame.idaho.gov/ifwis/portal/species.

3. Socioeconomic Issues

Local economies in the areas near most proposed suppression areas are driven primarily by agricultural production, processing, and marketing concerns. Major employers in southern Idaho include Super Value, Inc.; Chobani; Cliff Bar, Fred Meyer, Inc.; Glanbia; Hewlett-Packard Co.; Idaho Power Co.; J.R. Simplot Co.; Micron Technology, Inc.; Potlatch Corp.; St. Alphonsus Regional Medical Center; St. Luke's Regional Medical Center; and Wal-Mart. These businesses roughly divide into those which have headquarters, factories or service centers located in the Boise metropolitan area, and those which support agricultural and natural resource enterprises or provide retail trade in the rural areas.

Livestock enterprises include rangeland grazing by cattle and sheep, feedlots for beef, and concentrated dairy operations. Local processing which adds value to livestock production systems includes meat packing houses and cheese processing plants.

Farmers in areas near proposed suppression areas grow feed for the dairies and feedlots. This includes alfalfa and corn. They also grow potatoes, sugar beets, wheat, barley, sweet corn, beans, and a variety of other crops. Potato and sugar beet processing plants add value in several of the rural communities. In some areas near the proposed suppression area, growers produce seed of flowers and various forage, feed, and vegetable crops. The seed crops are often of exceptionally high value per acre compared to crops for consumption.

Acreage in organic production has increased in the area near proposed suppression areas in recent years. There were over 119,866 acres registered in organic production in Idaho in 2017 (ISDA, 2018). This includes feed for organic dairies and various other organic crops.

Beekeepers maintain hives to produce honey and other bee products on land which is included in or located near the proposed treatment area. Seed and fruit crops rely on pollination from bees which may live or forage on or near proposed suppression areas.

The general public uses federally managed rangelands in the proposed suppression area for a variety of recreational purposes including hiking, camping, viewing wildlife, hunting, falconry, shooting, plant collecting, rock collecting, and sightseeing. Members of the general public traverse rangelands in or near the proposed suppression area on foot, horseback and other beasts of burden, all-terrain vehicles, bicycles, motorcycles, four-wheel drive vehicles, snowmobiles, aircraft, and balloons.

Artificial surfaces in or near the proposed suppression area include the walls and roofs of buildings, painted finishes on automobiles, trailers, recreational vehicles, and road signs.

Aesthetic values of the natural environment in the suppression area include the views, vistas, diversity of the biota, and the opportunity to commune with nature in isolated settings. Many stakeholders have expressed extremely strong opinions regarding the aesthetics of the natural environment.

4. Cultural Resources and Events

Cultural and historical sites include locations and artifacts associated with Native Americans, explorers, pioneers, religious groups and developers. Native American petroglyphs have been discovered in several areas within the proposed suppression area. Artifacts from knapping occur within the proposed suppression area. Elements of the Oregon and California Trails transect portions of the proposed suppression area, and monuments have been erected in several places. Museums, displays and structures associated with mining, logging, and irrigation development exist in areas near the proposed suppression area.

5. Special Considerations for Certain Populations

a) Executive Order No. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order (E.O.) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, was signed by President Clinton on February 11, 1994 (59 *Federal Register* (FR) 7269). This E.O. requires each Federal agency to make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. Consistent with this E.A., APHIS will consider the potential for disproportionately high and adverse human health or environmental effects on minority populations and low-income populations for any of its actions related to rangeland grasshopper/Mormon cricket suppression programs.

Population makeup in Idaho (U.S. Census Bureau, 2018) is 90.5% Caucasian. Hispanic, including Latino of any race, is the next most numerous groups, comprising 8.2%. Other identifiable groups include Black or African American 0.68%, American Indian and Alaska Native 1.35%, Asian 1.4%, and Native Hawaiian and Other Pacific Islander 0.16%. Of the minority groups, Hispanic and Asian appear to be the groups with most involvement in agriculture. Hispanic workers are often engaged in production and processing of crops. Sheepherding is a profession which currently engages persons of Peruvian nationality or descent. Persons of Asian descent are frequently involved in crop production and processing.

Figures for Idaho put 11.7% of the individuals in the state below the poverty level in 2018. Median household income was estimated at $55,583 in 2018 (U.S. Census Bureau, 2018).

When planning a site-specific treatment action on public lands, APHIS considers the potential for any adverse human health or environmental impacts of its actions on all populations, including minority or low-income populations before a proposed action is implemented. In doing so, APHIS program managers work closely with the land manager, and identify these areas through public meetings or public posting of recreational and high traffic areas in the proposed area of treatment.

b) Executive Order No. 13045, Protection of Children from Environmental Health Risks and Safety Risks

The increased scientific knowledge about the environmental health risks and safety risks associated with hazardous substance exposures to children and recognition of these issues in Congress and federal agencies brought about legislation and other requirements to protect the health and safety of children. On April 21, 1997, President Clinton signed E.O. 13045, Protection of Children from Environmental Health Risks and Safety Risks (62 FR 19885).

This E.O. requires each Federal agency, consistent with its mission, to identify and assess environmental health risks and safety risks that may disproportionately affect children and to ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. APHIS has developed agency guidance for its programs to follow to ensure the protection of children (USDA A. , 1999)

Children under six (6) months of age may have greater susceptibility to Carbaryl than older individuals because they have immature livers and incompletely developed acetyl cholinesterase systems (2002 EIS B-28). It has been suggested that children might pick up and eat Carbaryl bait. Infants under three (3) months of age have higher levels of methemoglobin than do older children and adults. Therefore, they may be at increased risk of methemoglobinemia if exposed to Diflubenzuron.

The low frequency, with which infants are present on rangelands, the low density of Carbaryl bait in the environment (approximately one pellet per two square feet), the difficulty of finding bait pellets on the ground, and the low application rate of Diflubenzuron, make the likelihood of exposure and toxic consequences negligible.

V. Environmental Consequences

Each alternative described in this EA potentially has adverse environmental effects. The general environmental impacts of each alternative, and of Carbaryl, Chlorantraniliprole, Diflubenzuron and Malathion, are discussed in detail in the 2002 and/or 2019 EIS. The specific impacts of the alternatives are highly dependent upon the particular action and location of infestation. The principal concerns associated with the alternatives are: (1) the potential effects of insecticides on human health (including subpopulations that might be at increased risk); and (2) impacts of insecticides on non-target organisms (including threatened and endangered species).

APHIS has written human health and ecological risk assessments (HHERAs) to assess the insecticides and use patterns that are specific to the program. The risk assessments provide an in-depth technical analysis of the potential impacts of each insecticide to human health; and non-target fish and wildlife along with its environmental fate in soil, air, and water. The assessments rely on data required by the USEPA for pesticide product registrations, as well as peer-reviewed and other published literature. The HHERAs are heavily referenced in this EA. These Environmental Documents can be found at the following website: http://www.aphis.usda.gov/plant-health/grasshopper.

A. Environmental Consequences of the Alternatives

Site-specific environmental consequences of the alternatives are discussed in this section.

1. No Suppression Program Alternative

Under this alternative, APHIS would not conduct a program to suppress grasshoppers. If APHIS does not participate in any grasshopper suppression program, Federal land management agencies, State agriculture departments, local governments, private groups or individuals, may not effectively combat outbreaks in a coordinated effort. Without the technical assistance and coordination that APHIS provides during grasshopper outbreaks, the uncoordinated programs could use insecticides that APHIS considers too environmentally harsh. Multiple treatments and excessive amount of insecticide could be applied in efforts to suppress or even locally eradicate grasshopper populations. There are approximately 100 pesticide products registered by USEPA for use on rangelands and against grasshoppers (Purdue, 2018). It is not possible to accurately predict the environmental consequences of the No Suppression Program alternative because the type and amount of insecticides that could be used in this scenario are unknown. However, the environmental impacts could be much greater than under the APHIS led suppression program alternative due to lack of treatment knowledge or coordination among the groups.

The potential environmental impacts from the No Suppression Program alternative, where other agencies and land managers do not control outbreaks, stem primarily from grasshoppers consuming vast amounts of vegetation in rangelands and surrounding areas. Grasshoppers are general feeders, eating grasses and forbs first and often moving to cultivated crops. High grasshopper density of one or several species and the resulting defoliation may reach an economic threshold where the damage caused by grasshoppers exceeds the cost of controlling the grasshoppers. Researchers determined that during typical grasshopper infestation years, approximately 20% of forage rangeland is removed, valued at a dollar adjusted amount of $900 million. This value represents 32 to 63% of the total value of rangeland across the western states (Rashford et al., 2012). Other market and non-market values such as carbon sequestration, general ecosystem services, and recreational use may also be impacted by pest outbreaks in rangeland.

Vegetation damage during serious grasshopper outbreaks may be so severe that all grasses and forbs are severly damaged; thus, plant growth is impaired for several years. Rare plants may be consumed during critical times of development such as seed production, and loss of important plant species, or seed production may lead to reduced diversity of rangeland habitats, potentially creating opportunities for the expansion of invasive and exotic weeds (Lockwood J. a., 2000) When grasshoppers consume plant cover, soil is more susceptible to the drying effects of the sun, making plant roots less capable of holding soil in place. Soil damage results in erosion and disruption of nutrient cycling, water infiltration, seed germination, and other ecological processes which are important components of rangeland ecosystems (Latchininsky et al., 2011).

When the density of grasshoppers reaches significantly high levels, grasshoppers begin to compete with livestock for food by reducing available forage (Wakeland, 1936); (Belovsky G. , 2000); (Pfadt R. , 2002); (Branson et al., 2006), (Bradshaw et al., 2018). Ranchers could offset some of the costs by leasing rangeland in another area and relocating their livestock, finding other means to feed their animals by purchasing hay or grain, or selling their livestock. Ranchers could also incur economic losses from personal attempts to control grasshopper damage. Local communities could see adverse economic impacts to the entire area. Grasshoppers that infest rangeland could move to surrounding croplands. Farmers could incur economic losses from attempts to chemically control grasshopper populations or due to the loss of their crops. The general public could see an increase in the cost of meat, crops, and their byproducts.

2. Insecticide Applications at Conventional Rates Alternative

Under Alternative 2, APHIS would participate in grasshopper programs with the option of using one of the insecticides carbaryl, chlorantraniliprole, diflubenzuron, or malathion, depending upon the various factors related to the grasshopper outbreak and the site-specific characteristics. The use of an insecticide would occur at the conventional application rates and full coverage of treatment area.

The use of an insecticide may occur at the following conventional rates:

- 16.0 fluid ounces (0.50 lb. a.i.) of carbaryl spray per acre;
- 10.0 pounds (0.20 lb. a.i.) of 2 percent carbaryl bait per acre
- 8.0 fluid ounces (0.02 lb. a.i.) chlorantraniliprole per acre;
- 1.0 fluid ounce (0.016 lb. a.i.) of diflubenzuron per acre; or
- 8.0 fluid ounces (0.62 lb. a.i.) of malathion per acre.

Note: Although listed as an option, chlorantraniliprole will not be used in 2020. In the event it is to be considered in future years, an addendum will be made to this EA.

APHIS would not apply more than a single treatment in an outbreak year to affected rangeland areas to suppress grasshoppers or Mormon crickets.

Carbaryl

Carbaryl is a member of the N-methyl carbamate class of insecticides, which affect the nervous system via cholinesterase inhibition. Inhibiting the enzyme acetylcholinesterase (AChE) causes nervous system signals to persist longer than normal. While these effects are desired in controlling insects, they can have undesirable impacts to non-target organisms that are exposed. The APHIS HHERA assessed available laboratory studies regarding the toxicity of carbaryl on fish and wildlife. In summary, the document indicates the chemical is highly toxic to insects, including native bees, honeybees, and aquatic insects; slightly to highly toxic to fish; highly to very highly toxic to most aquatic crustaceans, moderately toxic to mammals, minimally toxic to birds; moderately to highly toxic to several terrestrial arthropod predators; and slightly to highly toxic to larval amphibians (USDA, APHIS, 2018a).

The offsite movement and deposition of carbaryl after treatments is unlikely because it does not significantly vaporize from the soil, water, or treated surfaces (Dobroski et al., 1985). Temperature, pH, light, oxygen, and the presence of microorganisms and organic material are factors that contribute to how quickly carbaryl will degrade in water. Hydrolysis, the breaking of a chemical bond with water, is the primary degradation pathway for carbaryl at pH 7 and above. In natural water, carbaryl is expected to degrade faster than in laboratory settings due to the presence of microorganisms. The half-lives of carbaryl in natural waters varied between 0.3 to 4.7 days (Stanley, 1980); (Bonderenko, 2004). Degradation in the latter study was temperature dependent with shorter half-lives at higher temperatures. Aerobic aquatic metabolism of carbaryl reported half-life ranged of 4.9 to 8.3 days compared to anaerobic (without oxygen) aquatic metabolism range of 15.3 to 72 days (Thomson, 1981); (USEPA, 2003). Carbaryl is not persistent in soil due to multiple degradation pathways including hydrolysis, photolysis, and microbial metabolism. Little transport of carbaryl through runoff or leaching to groundwater is expected due to the low water solubility, moderate sorption, and rapid degradation in soils. There are no reports of carbaryl detection in groundwater, and less than 1% of granule carbaryl applied to a sloping plot was detected in runoff (Caro, 1974).

Acute and chronic risks to mammals are expected to be low to moderate based on the available toxicity data and conservative assumptions that were used to evaluate risk. There is the potential for impacts to small mammal populations that rely on terrestrial invertebrates for food. However, based on the toxicity data for terrestrial plants, minimal risks of indirect effects are expected to mammals that rely on plant material for food. Carbaryl has a reported half-life on vegetation of three to ten days, suggesting mammal exposure would be short-term. Direct risks to mammals from carbaryl bait applications is expected to be minimal based on oral, dermal, and inhalation studies (USDA, APHIS, 2018a).

A number of studies have reported no effects on bird populations in areas treated with carbaryl (Buckner, 1973); (Richmond, 1979); (McEwen et al., 1996). Some applications of formulated carbaryl were found to cause depressed AChE levels (Zinkle, 1977); (Gramlich, 1979); however, the doses were twice those proposed for the full coverage application in the grasshopper program.

While sublethal effects have been noted in fish with depressed AChE, as well as some impacts to amphibians (i.e. days to metamorphosis) and aquatic invertebrates in the field due to carbaryl, the application rates and measured aquatic residues observed in these studies are well above values that would be expected from current program operations. Indirect risks to amphibian and fish species can occur through the loss of habitat or reduction in prey, yet data suggests that carbaryl risk to aquatic plants that may serve as habitat, or food, for fish and aquatic invertebrates is very low.

Product use restrictions appear on the USEPA approved label and attempt to keep carbaryl out of waterways. Carbaryl must not be applied directly to water, or to areas where surface water is present (USEPA, 2012c). The USEPA-approved use rates and patterns and the additional mitigations imposed by the grasshopper program, such as using RAATs and application buffers, where applicable, further minimize aquatic exposure and risk.

The majority of rangeland plants require insect-mediated pollination. Native, solitary bee species are important pollinators on western rangeland (Tepedino, 1979). Potential negative effects of insecticides on pollinators are of concern because a decrease in their numbers has been associated with a decline in fruit and seed production of plants. Laboratory studies have indicated that bees are sensitive to carbaryl applications, but the studies were at rates above those proposed in the program. The reduced rates of carbaryl used in the program and the implementation of application buffers should significantly reduce exposure of carbaryl applications to pollinators. In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk. Potential negative effects of grasshopper program insecticides on bee populations may also be mitigated by the more common use of carbaryl baits than the ULV spray formulation. Studies with carbaryl bran bait have found no sublethal effects on adults or larvae bees (Peach et al., 1994) (Peach, 1995).

Carbaryl can cause cholinesterase inhibition (i.e., overstimulate the nervous system) in humans resulting in nausea, headaches, dizziness, anxiety, and mental confusion, as well as convulsions, coma, and respiratory depression at high levels of exposure (NIH, 2009a); (Beauvais, 2014). USEPA classifies carbaryl as “likely to be carcinogenic to humans” based on vascular tumors in mice (USEPA, 2007), (USEPA, 2015a), (USEPA, 2017a).

USEPA regulates the amount of pesticide residues that can remain in or on food or feed commodities as the result of a pesticide application. The agency does this by setting a tolerance, which is the maximum residue level of a pesticide, usually measured in parts per million (ppm), that can legally be present in food or feed. USEPA-registered carbaryl products used by the grasshopper program are labeled with rates and treatment intervals that are meant to protect livestock and keep chemical residues in cattle at acceptable levels (thereby protecting human health). While livestock and horses may graze on rangeland the same day that the land is sprayed, in order to keep tolerances to acceptable levels, carbaryl spray applications on rangeland are limited to half a pound active ingredient per acre per year (USEPA, 2012c). The grasshopper program would treat at or below use rates that appear on the label, as well as follow all appropriate label mitigations, which would ensure residues are below the tolerance levels.

Adverse human health effects from the proposed program ULV applications of the carbaryl spray (Sevin® XLR Plus) and bait applications of the carbaryl 5% and 2% baits formulations to control grasshoppers are not expected based on low potential for human exposure to carbaryl and the favorable environmental fate and effects data. Technical grade (approximately 100% of the insecticide product is composed of the active ingredient) carbaryl exhibits moderate acute oral toxicity in rats, low acute dermal toxicity in rabbits, and very low acute inhalation toxicity in rats. Technical carbaryl is not a primary eye or skin irritant in rabbits and is not a dermal sensitization in guinea pig (USEPA, 2007). This data can be extrapolated and applied to humans revealing low health risks associated with carbaryl.

The Sevin® XLR Plus formulation, which contains a lower percent of the active ingredient than the technical grade formulation, is less toxic via the oral route, but is a mild irritant to eyes and skin. The proposed use of carbaryl as a ULV spray or a bait, use of RAATs, and adherence to label requirements, substantially reduces the potential for exposure to humans. Program workers are the most likely human population to be exposed. APHIS does not expect adverse health risks to workers based on low potential for exposure to carbaryl when applied according to label directions and use of personal protective equipment (PPE) (e.g., long-sleeved shirt and long pants, shoes plus socks, chemical-resistant gloves, and chemical-resistant apron) (USEPA, 2012c)during loading and applications. APHIS quantified the potential health risks associated with accidental worker exposure to carbaryl during mixing, loading, and applications. The quantitative risk evaluation results indicate no concerns for adverse health risk for program workers (http://www.aphis.usda.gov/plant-health/grasshopper).

Adherence to label requirements and additional program measures designed to reduce exposure to workers and the public (e.g., mitigations to protect water sources, mitigations to limit spray drift, and restricted-entry intervals) result in low health risk to all human population segments.

Chlorantraniliprole

Chlorantraniliprole is an insecticide from a relatively new class of insecticides, anthranilic diamides. Anthranilic diamides activate the ryanodine receptor, releasing stored calcium and causing impaired regulation of muscle contraction (Cordova, 2006). The insecticide is most effective when the pest ingests treated plant material; affected insects will rapidly stop feeding, become paralyzed, and typically die within one to three days (USEPA, 2017b). USEPA has registered chlorantraniliprole as a reduced-risk pesticide. Chlorantraniliprole is a low use rate insecticide that has reduced human health and ecological risk when compared to other insecticides, including carbaryl and malathion.

Chlorantraniliprole is not expected to volatilize significantly based on the reported low vapor pressure at variable temperatures. Chlorantraniliprole is susceptible to degradation in the presence of light with an aqueous photolysis half-life of 0.31 days but is stable to hydrolysis at a pH of 7. Microbial degradation in the presence or absence of oxygen is comparable with an aerobic aquatic metabolism half-life of 125 to 231 days and an anaerobic aquatic metabolism half-life of 208 days. Solubility is low at a range of relevant pH values. Chlorantraniliprole is expected to persist in soils with laboratory determined half-lives ranging from 228 to 924 days (USEPA, 2008).

Direct effects to terrestrial plants are not expected from chlorantraniliprole because of its low application rate and lack of phytotoxicity at relevant doses. Indirect risk through the loss of pollinators from treatments is also not expected to be significant. While vegetation damage from grasshoppers will still occur, chlorantraniliprole treatments should greatly reduce grasshopper damage to rangeland vegetation, surrounding crops, and other vegetation.

Available data indicates that chlorantraniliprole residues do not persist on vegetation. Dissipation half-life values were typically less than four days on various crops (Kar et al., 2012; Malhat et al., 2012). Available aquatic plant toxicity data suggests low toxicity of chlorantraniliprole to freshwater and marine diatoms and algae, as well as aquatic macrophytes (USDA APHIS, 2018b).

The chlorantraniliprole label allow livestock and horses to graze on rangeland the same day that the land is treated. Tolerances are set for chlorantraniliprole that is allowed in cattle fat (0.5 ppm), meat (0.1 ppm), and meat byproducts (0.5 ppm) (40 CFR Parts 180.628). The grasshopper program would use application rates lower than those suggested on the label and would make only one treatment in a year, rather than the maximum number of treatments allowed on the label, ensuring approved residue levels in cattle.

The APHIS HHERA for chlorantraniliprole assessed the available literature regarding the toxicity to animals. In summary, the report indicates the chemical is of low toxicity to most terrestrial invertebrates, practically non-toxic to honeybees, low toxicity to fish, and is practically nontoxic to birds and mammals. Aquatic invertebrates are more sensitive to chlorantraniliprole when compared to fish. Chlorantraniliprole would be expected to be practically nontoxic to reptiles based on the available avian toxicity data (USDA APHIS, 2018b). The lack of toxicity in other insect groups at rates that are toxic to grasshoppers is related to the activity of chlorantraniliprole, which is primarily through ingestion.

Effects to fish and other aquatic biota from consumption of contaminated aquatic prey are not expected to be a significant pathway of exposure for chlorantraniliprole, based on the low residues and the low bioconcentration factor (BCF; ratio of the concentration of a chemical in an organism to the concentration of the chemical in the surrounding environment) values in aquatic systems. Direct impacts to aquatic plants are also not anticipated because of the estimated environmental residues and available data for five aquatic plants (USEPA, 2012b).

The direct risk to amphibians and reptiles from chlorantraniliprole is also expected to be minimal (USDA APHIS, 2018b). Based on the available effects data and the expected aquatic concentrations, direct effects are not expected on amphibian aquatic life stages. Indirect risk to amphibians is expected to be minimal because expected residues do not exceed any effect endpoint for aquatic plants, invertebrates, or fish.

Available data for terrestrial invertebrates demonstrates that chlorantraniliprole has low toxicity to most non-target invertebrates. Grasshopper nymphs appear to be much more susceptible to the impacts of chlorantraniliprole than other insect groups. Chlorantraniliprole does have activity against Lepidoptera and some Coleoptera larvae but at rates that are higher than those proposed in the grasshopper program. (Bradshaw et al., 2018) found no impacts to three beneficial arthropod taxa after treatment with chlorantraniliprole to small field plots of various grass species. No impacts were noted in sweep net samples of Araneae (spiders), Braconidae (parasitic wasp), and Coccinellidae (lady beetles). Available field studies in turf indicate that there is no risk to non-target invertebrates such as ants, ground beetles, and other ground dwelling invertebrates after treating turf at rates twice those proposed for RAATs (Larson, 2012). Available laboratory, semi-field, and field studies demonstrate low toxicity to honey and bumble bees, where no lethal or sublethal impacts have been observed at rates well above those proposed for use in the grasshopper program (USDA APHIS, 2018b).

Chlorantraniliprole has a low risk to human health based on its low mammalian toxicity and low probability of exposure to humans which is due to label requirements and other program measures designed to protect human health. Chlorantraniliprole is not acutely toxic to mammals. It has no adverse short-term effects at relevant doses. Chlorantraniliprole is not neurotoxic, immunotoxic, carcinogenic, genotoxic, nor is it a developmental toxicant (USEPA, 2012b).

Adherence to label requirements and additional program measures designed to reduce exposure to workers (e.g., PPE requirements include long-sleeved shirt and long pants and shoes plus socks) and the public (e.g., mitigations to protect water sources, mitigations to limit spray drift, and restricted-entry intervals) result in low health risk to all human population segments.

Diflubenzuron

Diflubenzuron is a restricted use pesticide (only certified applicators or persons under their direct supervision may make applications) registered with USEPA as an insect growth regulator. It specifically interferes with chitin synthesis, the formation of the insect's exoskeleton. Larvae of affected insects are unable to molt properly. While this effect is desirable in controlling certain insects, it can have undesirable impacts to non-target organisms that are exposed.

USEPA considers diflubenzuron relatively non-persistent and immobile under normal use conditions and stable to hydrolysis and photolysis. The chemical is considered unlikely to contaminate ground water or surface water (USEPA, 1997). The vapor pressure of diflubenzuron is relatively low, as is the Henry's Law Constant value, suggesting the chemical will not volatilize readily into the atmosphere from soil, plants or water. Therefore, exposure from volatilization is expected to be minimal. Due to its low solubility (0.2 mg/L) and preferential binding to organic matter, diflubenzuron seldom persists more than a few days in water (Schaefer, 1977); (Schaefer C.H., 1980). Mobility and leachability of diflubenzuron in soils is low, and residues are usually not detectable after seven days (Eisler, 2000). Aerobic aquatic half-life data in water and sediment was reported as 26.0 days (USEPA, 1997). Diflubenzuron applied to foliage remains adsorbed to leaf surfaces for several weeks with little or no absorption or translocation from plant surfaces (Eisler, R., 1992) (Eisler, 2000). Diflubenzuron treatments are expected to have minimal effects on terrestrial plants. Both laboratory and field studies demonstrate no effects using diflubenzuron over a range of application rates, and the direct risk to terrestrial plants is expected to be minimal (USDA APHIS, 2018c).

Dimilin® 2L is labeled with rates and treatment intervals that are meant to protect livestock and keep residues in cattle at acceptable levels (thereby, protecting human health). Tolerances are set for diflubenzuron that is allowed in cattle fat (0.05 ppm) and meat (0.05 ppm) (40 CFR Parts 180.377). The grasshopper program would treat at application rates indicated on product labels or lower, which should ensure approved residues levels.

APHIS' literature review found that on an acute basis, diflubenzuron is considered toxic to some aquatic invertebrates and practically non-toxic to adult honeybees. However, diflubenzuron is toxic to larval honeybees (USEPA, 2018). It is slightly nontoxic to practically nontoxic to fish and birds and has very slight acute oral toxicity to mammals, with the most sensitive endpoint from exposure being the occurrence of methemoglobinemia (a condition that impairs the ability of the blood to carry oxygen). Minimal direct risk to amphibians and reptiles is expected, although there is some uncertainty due to lack of information (APHIS, USDA, 2018c); (USEPA, 2018).

Risk is low for most non-target species based on laboratory toxicity data, USEPA approved use rates and patterns, and additional mitigations such as the use of lower rates and RAATs that further reduces risk. Risk is greatest for sensitive terrestrial and aquatic invertebrates that may be exposed to diflubenzuron residues.

In a review of mammalian field studies, Dimilin® applications at a rate of 60 to 280 g a.i./ha had no effects on the abundance and reproduction in voles, field mice, and shrews (USDA FS, 2004). These rates are approximately three to 16 times greater than the highest application rate proposed in the program. Potential indirect impacts from application of diflubenzuron on small mammals includes loss of habitat or food items. Mice on treated plots consumed fewer lepidopteran (order of insects that includes butterflies and moths) larvae compared to controls; however, the total amount of food consumed did not differ between treated and untreated plots. Body measurements, weight, and fat content in mice collected from treated and non-treated areas did not differ.

Poisoning of insectivorous birds by diflubenzuron after spraying in orchards at labeled rates is unlikely due to low toxicity (Muzzarelli, 1986). The primary concern for bird species is related to an indirect effect on insectivorous species from a decrease in insect prey. At the proposed application rates, grasshoppers have the highest risk of being impacted while other taxa have a much reduced risk because the lack of effects seen in multiple field studies on other taxa of invertebrates at use rates much higher than those proposed for the program. Shifting diets in insectivorous birds in response to prey densities is not uncommon in undisturbed areas (Rosenburg, 1982); (Cooper, 1990); (Sample, 1993).

Indirect risk to fish species can be defined as a loss of habitat or prey base that provides food and shelter for fish populations, however these impacts are not expected based on the available fish and invertebrate toxicity data (USDA, APHIS, 2018c). A review of several aquatic field studies demonstrated that when effects were observed it was at diflubenzuron levels not expected from program activities (Fischer, 1992); (USEPA, 1997); (Eisler, 2000); (USDA FS, 2004).

Diflubenzuron applications have the potential to affect chitin production in various other beneficial terrestrial invertebrates. Multiple field studies in a variety of application settings, including grasshopper control, have been conducted regarding the impacts of diflubenzuron to terrestrial invertebrates. Based on the available data, sensitivity of terrestrial invertebrates to diflubenzuron is highly variable depending on which group of insects and which life stages are being exposed. Immature grasshoppers, beetle larvae, lepidopteran larvae, and chewing herbivorous insects appear to be more susceptible to diflubenzuron than other invertebrates. Within this group, however, grasshoppers appear to be more sensitive to the proposed use rates for the program. Honeybees, parasitic wasps, predatory insects, and sucking insects show greater tolerance to diflubenzuron exposure (Murphy, 1994); (Eisler, 2000); (USDA FS, 2004).

Diflubenzuron is moderately toxic to spiders and mites (APHIS, USDA, 2018c). (Deakle, 1982) measured the effects of four diflubenzuron applications on predators of *Heliothis* spp. at a rate of 0.06 lb. a.i./ac and found no effects on several predator groups. This supported earlier studies by (Keever, 1977) that demonstrated no effects on the arthropod predator community after multiple applications of diflubenzuron in cotton fields. Grasshopper integrated pest management (IPM) field studies have shown diflubenzuron to have a minimal impact on ants, spiders, predatory beetles, and scavenger beetles. There was no significant reduction in populations of these species from seven to 76 days after treatment. Although ant populations exhibited declines of up to 50 percent, these reductions were temporary, and population recovery was described as immediate (Catangui & Walz, 1996).

Insecticide applications to rangelands have the potential to impact pollinators, and in turn, vegetation and various rangeland species that depend on pollinated vegetation. Based on the review of laboratory and field toxicity data for terrestrial invertebrates, applications of diflubenzuron are expected to have minimal risk to pollinators of terrestrial plants. The use of RAATs provide additional benefits by using reduced rates and creating untreated swaths within the spray block that will further reduce the potential risk to pollinators.

Adverse human health effects from ground or aerial ULV applications of diflubenzuron to control grasshoppers are not expected based on the low acute toxicity of diflubenzuron and low potential for human exposure. The adverse health effects of diflubenzuron to mammals and humans involves damage to hemoglobin in blood and the transport of oxygen. Diflubenzuron causes the formation of methemoglobin. Methemoglobin is a form of hemoglobin that is not able to transport oxygen (USDA FS, 2004). USEPA classifies diflubenzuron as non-carcinogenic to humans (USEPA, 2015b).

Program workers adverse health risks are not likely when diflubenzuron is applied according to label directions that reduce or eliminate exposures. Adverse health risk to the general public in treatment areas is not expected due to the low potential for exposure resulting from low population density in the treatment areas, adherence to label requirements, program measures designed to reduce exposure to the public, and low toxicity to mammals.

Malathion

Malathion is a broad-spectrum organophosphate insecticide widely used in agriculture on various food and feed crops, homeowner yards, ornamental nursery stock, building perimeters, pastures and rangeland, and regional pest eradication programs. The chemical’s mode of action is through AChE inhibition, which disrupts nervous system function. While these effects are desired in controlling insects, they can have undesirable impacts to non-target organisms that are exposed to malathion. The grasshopper program currently uses the malathion end-use product Fyfanon® ULV AG, applied as a spray by ground or air.

Volatility is not expected to be a major pathway of exposure based on the low vapor pressure and Henry’s Law constant that have been reported for malathion. The atmospheric vapor phase half-life of malathion is five hours (NIH, 2009b). Malathion's half-life in pond, lake, river, and other natural waters varied from 0.5 days to ten days, depending on pH (Guerrant, 1970), persisting longer in acidic aquatic environments. The reported half-life in water and sediment for the anaerobic aquatic metabolism study was 2.5 days at a range of pH values from 7.8 to 8.7 (USEPA, 2006). The persistence of malathion in soils depends primarily on microorganism activity, pH, and organic matter content. The persistence of malathion is decreased with microbial activity, moisture, and high pH (USEPA, 2016a)and the half-life of malathion in natural soil varies from two hours (Miles, 1991) to 11 days (Neary, 1985); (USEPA, 2006).

Malathion and associated degradates, in general, are soluble and do not adsorb strongly to soils (USEPA, 2000a). Inorganic degradation of malathion may be more important in soils that are relatively dry, alkaline, and low in organic content, such as those that predominate in the western program areas. Adsorption to organic matter and rapid degradation make it unlikely that detectable quantities of malathion would leach to groundwater (LaFluer, 1979). Malathion degradation products also have short half-lives. Malaoxon, the major malathion degradation product of toxicological concern, has half-lives less than one day in a variety of soil types (USEPA, 2016a). The half-life of malathion on foliage has been shown to range from one to six days (El-Refai, 1972); (Nigg, 1986); (Matsumara, 1985); (USDA FS, 2008).

While livestock and horses may graze on rangeland the same day that the land is treated with malathion, the products used by the grasshopper program are labeled with rates and treatment intervals that are meant to protect livestock. Tolerances are set for malathion that is allowed in cattle fat (4 ppm), meat (4 ppm), and meat byproducts (4 ppm) (40 CFR Parts 180.111). The grasshopper program would treat at application rates indicated on product labels or lower, which would ensure approved residues levels. In addition, the program would make only one application a year.

USEPA found malathion moderately toxic to birds on a chronic basis, slightly toxic to mammals through dietary exposure, and acutely toxic to aquatic species (including freshwater as well as estuarine and marine species) (USEPA, 2000b), (USEPA, 2016b). Toxicity to aquatic vertebrates such as fish and larval amphibians, and aquatic invertebrates is variable based on test species and conditions. The data available on impacts to fish from malathion suggest effects could occur at levels above those expected from program applications. Consumption of contaminated prey is not expected to be a significant pathway of exposure for aquatic species based on expected residues and malathion's BCF (USEPA, 2016a); (USDA APHIS, 2018d). Indirect effects to fish from impacts of malathion applications to aquatic plants are not expected (USDA, APHIS, 2018a).

USEPA considers malathion highly toxic to bees if exposed to direct treatment on blooming crops or weeds. The Fyfanon® ULV AG label indicates not to apply product or allow it to drift to blooming crops or weeds while bees are actively visiting the treatment area (USEPA, 2012a). Toxicity to other terrestrial invertebrates is variable based on the test organism and test conditions however malathion is considered toxic to most terrestrial invertebrates (USEPA, 2016b).

Indirect risks to mammals resulting from the loss of plants that serve as a food source would also be low due to the low phytotoxicity of malathion. The other possible indirect effect that should be considered is loss of invertebrate prey for those mammals that depend on insects and other invertebrates as a food source. Insects have a wide variety of sensitivities to malathion and a complete loss of invertebrates from a treated area is not expected because of low program rates and application techniques. In addition, the aerial and ground application buffers and untreated swaths provide refuge for invertebrates that serve as prey for insectivorous mammals and would expedite repopulation of areas that may have been treated.

APHIS expects that direct avian acute and chronic effects would be minimal for most species (USDA, APHIS, 2018a). The preferred use of RAATs during application reduces these risks by reducing residues on treated food items and reducing the probability that they will only feed on contaminated food items. In addition, malathion degrades quickly in the environment and residues on food items are not expected to persist. Indirect effects on birds from the loss of habitat and food items are not expected because of malathion's low toxicity to plants and the implementation of RAATs that would reduce the potential impacts to invertebrates that serve as prey for avian species. Several field studies did not find significant indirect effects of malathion applications on avian fecundity (Dinkins, 2002); (George T. L., 1995); (Howe, F.P., 1993); (Howe F. R., 1996); (Norelius, 1999); (Pascual, 1994).

Available toxicity data demonstrates that amphibians are less sensitive to malathion than fish. Program malathion residues are more than 560 times below the most sensitive acute toxicity value for amphibians. Sublethal effects, such as developmental delays, reduced food consumption and body weight, and teratogenesis (developmental defects that occur during embryonic or fetal growth), have been observed at levels well above those assessed from the program's use of malathion (USDA APHIS, 2018d). Program protection measures for aquatic water bodies and the available toxicity data for fish, aquatic invertebrates, and plants suggest low indirect risks related to reductions in habitat or aquatic prey items from malathion treatments.

Available data on malathion reptile toxicity suggest that, with the use of program measures, no lethal or sublethal impacts would be anticipated (USDA APHIS, 2015). Indirect risk to reptiles from the loss of food items is expected to be low due to the low application rates and implementation of preferred program measures such as RAATs (USDA APHIS, 2018d).

The risk to aquatic vertebrates and invertebrates is low for most species; however, some sensitive species that occur in shallow water habitats may be at risk. Program measures such application buffer zones, drift mitigation measures and the use of RAATs will reduce these risks.

Risks to terrestrial invertebrate populations are anticipated based on the available toxicity data for invertebrates and the broad spectrum activity of malathion (Swain, 1986); (Quinn M. R., 1991). The risk to terrestrial invertebrates can be reduced by the implementation of application buffers and the use of RAATs, which would reduce exposure and create refuge areas where malathion impacts would be reduced or eliminated. (Smith, 2006) conducted field studies to evaluate the impacts of grasshopper treatments to non-target terrestrial invertebrates and found minimal impacts when making reduced rate applications with a reduced coverage area (i.e. RAATs) for a ULV end-use product of malathion. Impacts to pollinators have the potential to be significant, based on available toxicity data for honeybees that demonstrate high contact toxicity from malathion exposures (USDA APHIS, 2018d). However, risk to pollinators is reduced because of the short residual toxicity of malathion. In addition, the incorporation of other mitigation measures in the program, such as the use of RAATs and wind speed and direction mitigations that are designed to minimize exposure, reduce the potential for population-level impacts to terrestrial invertebrates.

Adverse human health effects from ULV applications of malathion to control grasshopper are not expected based on the low mammalian acute toxicity of malathion and low potential for human exposure. Malathion inhibits AChE in the central and peripheral nervous system with clinical signs of neurotoxicity that include tremors, salivation, urogenital staining, and decreased motor activity. USEPA indicates that malathion has “suggestive evidence of carcinogenicity but not sufficient to assess human carcinogenic potential” (USEPA, 2016c).

Adverse health risks to program workers and the general public from malathion exposure are also not expected due to low potential for exposure. APHIS treatments are conducted in rangeland areas consisting of widely scattered, single, rural dwellings in ranching communities, where agriculture is a primary industry. Label requirements to reduce exposure include minimizing spray drift, avoidance of water bodies and restricted entry interval. Program measures such as applying malathion once per season, lower application rates, application buffers and other measures further reduce the potential for exposure to the public.

Human Health

The implementation of pesticide label instructions and restrictions and the APHIS treatment guidelines will reduce potential impacts from the program use of insecticides (see Appendix 1 Treatment Guidelines).

Human exposure to insecticides would occur. Exposures and effects are discussed in the 2002 EIS pg. 39-40, 50, B10-B13, B22-B25, B51-B53 and the 2019 EIS pg. 22-23 for chlorantraniliprole. Potential exposures of the general public to insecticides are infrequent and of low magnitude under this alternative. These low exposures to the public pose no risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity.

Personnel working on the suppression program would be exposed during handling, loading, and application of the insecticides. Implementation of the Treatment Guidelines (Appendix 1) would minimize public exposure and protect workers from harmful exposure. The potential for adverse effects to workers is negligible if proper safety procedures are followed, including wearing the required protective clothing. Therefore, routine safety precautions are expected to provide adequate worker health protection.

Individuals with hypersensitivity to the insecticides might be affected. APHIS would offer to compile a list of persons who wish to be listed and would either avoid treating areas near their homes or would contact them prior to treatment. Hypersensitive individuals would be advised to avoid treatment blocks.

Some stakeholders have indicated that they are opposed to any treatments on public rangelands because they believe treatments would disrupt ecosystems, cause human health problems or provide an unacceptable advantage to agricultural interests. The anxiety levels of these stakeholders may be increased by adoption of this alternative versus the No Treatment Program alternative.

Pesticide spills could expose individuals to excessive levels of insecticide. APHIS maintains spill kits and ensures that program personnel are familiar with procedures to mitigate effects associated with a spill.

Non-target Species

Fish and Aquatic Invertebrates

Insecticides have the potential to affect animals in aquatic ecosystems. Should they enter water, there is the potential to affect the aquatic invertebrate assemblage, especially amphipods. Field studies concluded that there was no biologically significant effect on aquatic resources, although invertebrate downstream drift increased for a short period after treatment due to toxic effects (Beyers, Farmer, & Sikowski, 1995). Fish are not likely to be affected at any concentrations that could be expected under this alternative.

Although the risk of contamination of water must be rated higher than under the No Suppression Program Alternative, untreated buffer areas around all water would prevent entry of toxic concentrations into the water. Insecticide concentrations in runoff waters are addressed in the EIS pg. C-6. Under worst case scenarios, runoff from a storm intensity of one inch resulted in negligible concentration of insecticide in the runoff water. Probability charts generated by Western Regional Climate Center show that storm intensities of half that magnitude are extremely rare in the proposed project area.

Qualitative assessments and field studies reported in the 2002 EIS, pg. B46-B51 indicate that, under worst case scenarios, depressions of invertebrate populations might occur, but the decreases would be temporary. No impacts would be expected on any vertebrate species.

Carbaryl is moderately toxic to most fish (Mayer & Ellersieck, 1986), very highly toxic to all aquatic insects, and highly to very highly toxic to most aquatic crustaceans. Should carbaryl enter water, there is the potential to affect the aquatic invertebrate assemblage, especially amphipods. Field studies with carbaryl concluded that there was no biologically significant effect on aquatic resources, although invertebrate downstream drift increased for a short period after treatment due to toxic effects (Beyers, Farmer, & Sikowski, 1995). Probability of exposure would be greater than under the No Action Alternative.

Chlorantraniliprole is slightly-to-practically nontoxic to fish and aquatic snails. Freshwater invertebrate populations may be reduced if exposed to chlorantraniliprole, but these decreases would be expected to be temporary given the rapid regeneration time of many aquatic invertebrates. Probability of exposure would be greater than under the No Suppression Program alternative.

Diflubenzuron is slightly-to-practically nontoxic to fish, aquatic snails, and most bivalve species. The median lethal concentration of diflubenzuron in water to the snail *Physa* sp. is greater than 125 mg/L. It is very highly toxic to most aquatic insects, crustaceans, horseshoe crabs, and barnacles. Diflubenzuron is most likely to affect immature terrestrial insects and early life stages of aquatic invertebrates (Eisler, 2000). Many of the aquatic organisms most susceptible to diflubenzuron are marine organisms that would not be exposed to rangeland treatments. Freshwater invertebrate populations would be reduced if exposed to diflubenzuron, but these decreases would be expected to be temporary given the rapid regeneration time of many aquatic invertebrates. Probability of exposure would be greater than under the No Suppression Program alternative.

The acute toxicity of Malathion varies widely from slightly toxic to some species of fish to very highly toxic to other species. Malathion is moderately to very highly toxic to most aquatic invertebrates. The median lethal concentration of malathion ranges from 0.5 g/L in the scud to 3,000 g/L in the aquatic sowbug. The median lethal concentration of malathion to insects' ranges from 0.69 g/L in the stonefly nymph to 385 g/L in snipe fly larvae. The median lethal concentration of malathion to a bivalve is 12 g/L. A No Effect Concentration was determined for mud snail to be 22,000 g/L. malathion concentrations in water, as a result of grasshopper treatments, are expected to present a low risk to aquatic organisms, especially those organisms with short generation times. Probability of exposure would be greater than under the No Suppression Program alternative.

Reptiles and Amphibians

Carbaryl is slightly-to-moderately toxic to amphibians and reptiles. The reference dose used in the 2002 EIS was 4000 mg/kg as an LD_{50} for bullfrog.

The direct risk to amphibians and reptiles from chlorantraniliprole is expected to be minimal (APHIS, 2018). Based on the available effects data and the expected aquatic concentrations, direct effects are not expected on amphibian aquatic life stages.

Diflubenzuron is slightly toxic to reptiles or amphibians. Based upon the selective nature of the toxic mode of action, the relative toxicity of diflubenzuron to these species is anticipated to be like that of mammals and birds.

The toxicity of malathion is relatively low to adult reptiles and amphibians, but malathion is highly toxic to the immature aquatic stages. Studies of adult salamanders and lizards exposed to field applications (up to 6 oz. a.i./acre) of malathion found no observable adverse effects and no AChE inhibition. The 96-hour median lethal concentration of malathion is 420 g/L for tadpoles of Fowler's toad and 200 g/L for tadpoles of the western chorus frog.

Stakeholders have expressed concern about toxicity of pesticides to frogs in Owyhee County. Amphibians are relatively resistant to diflubenzuron (Eisler, 2000). The acute oral LD_{50} of carbaryl to bullfrogs is greater than 4000 mg/kg (Hudson, Tucker, & Haegele, 1984) indicating that carbaryl is slightly toxic to amphibians. The toxicity of malathion is relatively low to adult amphibians but is highly toxic to aquatic stages (EIS pg. B-43). The EIS shows estimated daily doses and reference doses for Woodhouse's toad as follows under the full coverage alternative:

Table 7. Treatment LD_{50} reference

Treatment	Estimated Dose (mg/kg)	Reference 1/5 LD_{50}	Dose LD_{50}	Reference Species
Diflubenzuron	16.56	752	3,762	Red-winged blackbird
Carbaryl	62.95	156	780	Sharp-tailed Grouse
Chlorantraniliprole	No data	No data	No data	
Malathion	74.02	30	150	Chicken

Mammals and Birds

Carbaryl is of moderate acute oral toxicity to mammals (McEwen, Althouse, & Peterson, 1996).

The acute oral toxicity of diflubenzuron to mammals' ranges from very slight to slight. Little, if any, bioaccumulation of diflubenzuron would be expected (Opdycke, Miller, & Menzer, 1982). Because diflubenzuron is a chitin inhibitor that disrupts insects from forming their exoskeleton, organisms without a chitinous exoskeleton, such as mammals, are largely unaffected by Diflubenzuron.

The report on toxicity of chlorantraniliprole to animals indicates the chemical is of low toxicity to most terrestrial invertebrates, practically non-toxic to honeybees, low toxicity to fish, and is practically nontoxic to birds and mammals (USDA APHIS, 2018b).

The acute oral toxicity of malathion is very slight to moderate for mammals. The acute oral median lethal doses of malathion range from 250 mg/kg in rabbits to 12,500 mg/kg in rats. The acute toxicity of malathion by the dermal route is one of the lowest of the organophosphorus insecticides.

Stakeholders have expressed concern about chronic and acute toxicity of insecticides to birds on rangeland. These concerns were well founded for grasshopper and Mormon cricket control programs conducted throughout much of the 20th Century. Originally, inorganic insecticides were used with a typical bran bait formulation incorporating 8 pounds of liquid sodium arsenite into 100 pounds of bran (Cowan, 1929). For a brief span in the mid-20th century, synthetic organochlorine insecticides such as chlordane, toxaphene, dieldrin, and aldrin came into use. These insecticides would accumulate in the birds or other animals which consumed poisoned grasshoppers, eventually leading to a toxic dosage level in the insectivores or their predators. USDA discontinued their recommendation for using organochlorine insecticides on grasshoppers and Mormon crickets in 1965 (McEwen L. C., 1972).

The organochlorine insecticides were replaced with the organophosphate and carbamate insecticides. Certain ones of these are highly toxic to birds. (Blus, et al., 1989) determined that sage grouse die-offs in Southeastern Idaho could be attributed to methamidophos and dimethoate treatments to agricultural fields used by the sage grouse. Martin *et al.* (Martin, Johnson, Forsyth, & Hill, 2000) determined that Furadan treatments depressed cholinesterase levels in birds in study areas. APHIS protocols do not include insecticides that are highly toxic to birds or other terrestrial wildlife in the proposed suppression area.

Carbaryl applied at the proposed rate is unlikely to be directly toxic to upland birds, mammals, amphibians or reptiles. Carbaryl is not subject to significant bioaccumulation due to its low water solubility and low octanol-water partition coefficient (Dobroski, O'Neill, Donohue, & Curley, 1985).

Field studies have shown that carbaryl applied as either ultra-low-volume (ULV) spray or bait at conventional rates posed little risk to killdeer, vesper sparrows, or golden eagles in the treatment areas (McEwen, Althouse, & Peterson, 1996) (Adams, 94) (McEwen et al., 1996). AChE inhibition at 40 to 60 percent can affect coordination, behavior, and foraging ability in vertebrates. Multi-year studies conducted at several grasshopper/Mormon cricket treatment areas have shown AChE inhibition at levels of no more that 40 percent with most at less than 20 percent (McEwen, Althouse, & Peterson, 1996). The risk of acute or chronic toxicity to birds or mammals would be negligible under this option.

Diflubenzuron is slightly-to-very slightly toxic to birds. The primary concern for bird species is related to the effects of decreases in insect populations from insecticide applications on insectivorous species rather than to the direct toxicity to birds from diflubenzuron exposure. Diflubenzuron is most likely to affect immature terrestrial insects and early life stages of aquatic invertebrates (Eisler, 2000). While this would reduce the prey base within the treatment area for organisms that feed on insects, adult insects, including grasshoppers and Mormon crickets, would remain available as prey items.

Among birds, nestling growth rates, behavior data and survival of wild American Kestrels in diflubenzuron treated areas showed no significant differences among kestrels in treated areas and untreated areas (McEwen et al., 1996). Probability of exposure would be greater than under the No Action Alternative.

Malathion is slightly-to-moderately toxic to birds. The acute oral median lethal doses range from 150 mg/kg to chickens, to 1,485 mg/kg to mallard ducks. The 5-day dietary median lethal concentrations for wild birds all exceed 2,500 ppm. Several reproductive and developmental studies have been conducted with birds. The lowest median lethal dose to chicken embryos (eggs) was 3.99 mg per egg for 4-day embryos. The median lethal concentration for field applications of malathion to mallard duck eggs was found to be 4.7 lbs. a.i./acre. No effect on reproductive capacity of chickens was found at dietary concentrations as high as 500 ppm in feed.

Malathion is not directly toxic to vertebrates at the concentrations used for grasshopper or Mormon cricket suppression, but it may be possible that sub lethal effects to nervous system functions caused by AChE inhibition may lead directly to decreased survival. Field studies of birds within malathion treatment areas showed that, in general, the total number of birds and bird reproduction were not different from untreated areas (McEwen, Althouse, & Peterson, 1996). Malathion does not bioaccumulate (National Library of Medicine, 1990) (Tsuda, Aoki, Kojima, & Harada, 1989). However, probability of exposure would be greater than under the No Action Alternative.

Qualitative assessments and field studies reported in the 2002 EIS, pg. B36-B45, indicate that there would be negligible risk of adverse toxicological effects to most vertebrate species even when full coverage and traditional treatment rates (carbaryl @ 0.50 lb. active ingredient /acre; diflubenzuron @ 0.016 lb. active ingredient /acre; and malathion @ 0.62 lb. active ingredient /acre) are used. Possible exceptions were noted for the indicator species — grasshopper mouse, Bobwhite quail, American kestrel, and Woodhouse's toad. Individuals of these species might receive doses in excess of the calculated reference dose for 1/5 of the LD_{50} value (grasshopper mouse 60.37 mg/kg Carbaryl, Bobwhite quail 56.67 mg/kg, American kestrel 50.64 mg/kg, and Woodhouse's toad 74.02 mg/kg).

Bobwhite quail do not occur in or near the proposed treatment area, except for a few scattered locations in the Boise Valley. A species of concern, sage grouse, do occur in or near the proposed treatment area. The estimated daily dose of malathion for sage grouse under the full coverage/traditional treatment rates method would be 13.91 mg/kg. The reference dose for 1/5 of the LD_{50} value would be 30 mg/kg. Therefore, no significant adverse toxicological effect would be expected on sage grouse, even at full coverage/traditional rates of applications.

George *et al.* (George, McEwen, & Fowler, 1992) surveyed birds on 13 grasshopper/Mormon cricket treatment blocks up to 37,000 acres in size in North Dakota, Utah, Colorado, Wyoming, and Idaho. They found little evidence of differences in bird population responses to treatments with carbaryl bait, carbaryl spray, *Nosema locustae* or malathion.

Stakeholders have strongly expressed concern regarding the reduction of insects as a food source for rangeland insectivores, especially sage grouse and sharp-tailed grouse chicks. In this alternative, the application rates chosen for the insecticide is reduced from the maximum rate allowed by EPA. Because APHIS would only treat significant outbreak populations, numbers of grasshoppers or Mormon crickets surviving the treatment can provide ample nourishment for the insectivores. Additionally, Martin *et al.* (Martin, Johnson, Forsyth, & Hill, 2000) and Howe, *et al.* (Howe, et al., 2000) found that Canadian grassland and Idaho shrub steppe bird species were able to make adaptive changes when insecticidal spray reduced the numbers and changed the composition of insect prey species. Prey available to insectivores would be less under this alternative than under the No Action Alternative.

APHIS will adhere to the BLM Instruction Memorandum No. WO-2016-115 and ID-2018-014, which suggests avoiding treatments in sage-grouse habitat in March 1 – June 30 (or as appropriate to local circumstances) to provide insect availability for early development of Greater Sage-Grouse chicks.

Insects

Insecticides would affect non-target insects within the grasshopper/Mormon cricket treatment area. Field studies have shown that many affected insect populations can recover rapidly after spray or bait treatments and generally have suffered no long-term effects, including some insects that are particularly sensitive, such as bees (Catangui & Walz, 1996).

Non-target insect species which would be put at risk by treatments under this alternative include non-native biological control agents and pollinators. The level of risk would be greater than the No Suppression Program Alternative. The majority of the nonnative biological control agents in the proposed suppression area result from release programs carried out by land management agencies and others. The Nez Perce Biological Control Center in Lapwai provides database service which allows managers to report locations of bio-control releases and the status of bio-control agent populations. APHIS would consult with land managers and the Nez Perce Biological Control Center to determine the location and status of biological control agent populations and would select treatment options (including buffering areas) which minimize negative impacts on the populations.

The most widespread, managed, nonnative pollinator in the proposed suppression area is the honeybee. Honeybees are found throughout and near the proposed suppression area. APHIS would provide beekeepers with notification of the suppression program and would conduct surveys to detect bee yards in or near proposed treatment blocks. Risk to honeybees would be greater than the risk under the No Action Alternative.

Managed native pollinators include leafcutter and alkali bees. These species might be found in the proposed treatment area, but they are usually encountered in crop areas adjacent to the rangeland. APHIS would conduct surveys and would consult with private landowners to determine if managed native pollinators are near proposed treatment blocks. Risk to managed native pollinators would be higher than the risk under the No Action Alternative.

Unmanaged native pollinators include a vast array of insects and other animals. Risk to unmanaged native pollinators would be greater than the risk under the No Action Alternative.

Insect Biodiversity
There might be a temporary decrease in insect biodiversity within treatment blocks.

Carbaryl bait would affect some non-target insects that consume the bait within the treatment area. Field studies have shown that affected insect populations can recover rapidly and generally have suffered no long-term effects, including some insects that are particularly sensitive to carbaryl, such as bees (Catangui & Walz, 1996). The use of carbaryl in bait form generally has considerable environmental advantages over liquid insecticide applications: bait is easier than liquid spray applications to direct toward the target area, bait is more specific to grasshoppers, and bait affects fewer non-target organisms than sprays (Quinn M. , 1996).

Chlorantraniliprole does have activity against Lepidoptera and some Coleoptera larvae but at rates that are higher than those proposed in the grasshopper program. Semi-field data suggests that lethal and sublethal risk to pollinators such as Hymenoptera is very low and not expected to result in significant impacts. Available laboratory, semi-field, and field studies demonstrate low toxicity to honey and bumble bees, where no lethal or sublethal impacts have been observed at rates well above those proposed for use in the grasshopper program (USDA APHIS, 2018b).

Diflubenzuron is most likely to affect immature terrestrial insects and early life stages of aquatic invertebrates (Eisler, 2000). In addition, adult insects, including wild and cultivated bees, would be mostly unaffected by diflubenzuron applications (Schroeder, Sutton, & Beavers, 1980) (Emmett & Archer, 1980).

Malathion would most likely affect non-target insects within a treatment area. Large reductions in some insect populations would be expected after a malathion treatment under Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative. While the number of insects would be diminished, there would be some insects remaining. The remaining insects would be available prey items for insectivorous organisms, and those insects with short generation times may soon increase.

To maximize the protection of these organisms, APHIS would select carbaryl bait or diflubenzuron to suppress grasshopper/Mormon cricket outbreaks whenever possible. Risk to terrestrial invertebrates would be greater than the risk under the No Action Alternative.

Plants
Versus the No Suppression Program Alternative, grasshopper/Mormon cricket feeding damage would be reduced on rangeland plants, including desirable and undesirable plants, and to crops near rangeland.

Reduction of the feeding damage may be viewed as having both negative and positive impacts. Grasshoppers and Mormon crickets feed on invasive weeds such as rush skeletonweed. Limiting the damage caused to invasive weeds would be perceived by most observers as a negative impact, while limiting the damage to desirable plants would be perceived by most observers as a positive impact.

Decreasing the amount of foliage consumed by grasshoppers/Mormon crickets can make more forage available to other herbivores, which may be more highly valued by stakeholders. Livestock, game animals, and non-game animals compete with grasshoppers and Mormon crickets for forage and shelter in rangeland. This alternative would make more forage and shelter available for other species versus the No Action Alternative.

Because diflubenzuron is a chitin inhibitor that disrupts insects from forming their exoskeleton, organisms without a chitinous exoskeleton are largely unaffected by diflubenzuron.

None of the insecticides proposed for use in the program would be phytotoxic to shrubs, forbs or grasses at the rates proposed for use. There might be secondary effects on plant reproduction if the proposed treatment reduced pollinator populations in the proposed treatment area. Significant reduction in pollinators would not be expected with any of the proposed insecticides other than Malathion. Operational protocols would limit the use of Malathion.

There are no known studies indicating that insecticides may affect species composition of intact biological soil crusts (US Department of the Interior 2001).

Spills

Pesticide spills could expose wildlife to excessive levels of insecticide. APHIS maintains spill kits and ensures that program personnel are familiar with procedures to mitigate effects associated with a spill.

Socioeconomic issues

The risk that grasshopper and Mormon cricket outbreaks on rangeland would decrease the availability of forage for cattle and sheep is less than under the No Action Alternative because populations would be reduced on rangeland.

There would be reduced risk of major unchecked movement of grasshoppers/Mormon crickets into traditional or organic crops resulting in crop loss and additional expenditures for insecticidal control in the crop fields because the overall population would be reduced.

Cultural Resources and Events

The availability of grasshoppers/Mormon crickets for fish bait and other human uses would be reduced from outbreak levels to more normal levels. Persons using rangelands for recreation would respond to grasshoppers and Mormon crickets as they do under normal conditions versus under outbreak conditions.

Artificial Surfaces

Carbaryl and malathion can damage some painted surfaces. Automotive and sign finishes are susceptible to damage by carbaryl and malathion, and automobile or sign owners could suffer economic loss repairing cosmetic damage. APHIS would not apply treatments to un-abandoned vehicles in treatment blocks. APHIS would consult with land managers to ensure that Native American petroglyphs are excluded from direct treatment if they occur within treatment blocks.

The probability of damage to artificial surfaces by the treatments under this alternative is negligible.

Probability of damage to artificial surfaces by grasshoppers or Mormon crickets would be reduced versus the No Suppression Program Alternative.

3. Reduced Agent Area Treatments (RAATs) with Adaptive Management Strategy Alternative (Preferred Alternative)

Under Alternative 3, APHIS would participate in grasshopper programs with the option of using one of the insecticides carbaryl, chlorantraniliprole, diflubenzuron, or malathion, depending upon the various factors related to the grasshopper outbreak and the site-specific characteristics. The use of an insecticide would typically occur at half the conventional application rates following the RAATs strategy. APHIS would apply a single treatment to affected rangeland areas to suppress grasshopper outbreak populations by a range of 35 to 98 percent, depending upon the insecticide used.

The use of an insecticide may occur at the following rates:

- 8.0 fluid ounces (0.25 lb. a.i.) of carbaryl spray per acre;
- 10.0 pounds (0.20 lb. a.i.) of 2 percent carbaryl bait per acre
- 4.0 fluid ounces (0.02 lb. a.i.) chlorantraniliprole per acre;
- 1.0 fluid ounce (0.016 lb. a.i.) of diflubenzuron per acre; or
- 4.0 fluid ounces (0.31 lb. a.i.) of malathion per acre.

Note: Although listed as an option, chlorantraniliprole will not be used in 2020. In the event it is to be considered in future years, an addendum will be made to this EA.

APHIS would not apply more than a single treatment in an outbreak year to affected rangeland areas to suppress grasshoppers or Mormon crickets. APHIS would not apply a treatment for grasshoppers to an area which had already been treated for Mormon crickets during the current calendar year. With coverage reduced to less than 100% coverage of any and all treatment blocks, APHIS will continue to implement RAATS at 50% area coverage for all aerial treatments.

Carbaryl

Potential exposures to the general public and workers from RAATs application rates are 0.25 times for carbaryl spray and 0.20 times for carbaryl bait compared to Conventional Application Rates, and adverse effects decrease commensurately with decreased magnitude of exposure. This estimate is based on 50% surface area coverage within a treatment block and the reduced rate of insecticide. These low exposures to the public pose no risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. The potential for adverse effects to workers is negligible if proper safety procedures are followed, including wearing the required protective clothing. Routine safety precautions are expected to provide adequate protection of worker health at the lower application rates under RAATs.

Direct toxicity of carbaryl to birds, mammals, and reptiles is unlikely in swaths treated with carbaryl spray under a RAATs approach. Carbaryl bait also has minimal potential for direct effects on birds and mammals. Field studies indicated that bee populations did not decline after carbaryl bait treatments, and American kestrels were unaffected by bait applications made at a RAATs rate

(George, McEwen, & Fowler, 1992). Using alternating swaths will furthermore reduce adverse effects because organisms that are in untreated swaths will be mostly unexposed to carbaryl.

Carbaryl applied at a RAATs rate has the potential to affect invertebrates in aquatic ecosystems if the insecticide should inadvertently enter water. However, these affects would be less than effects expected under Conventional Rates and Complete Area Coverage Alternative 2. Fish are not likely to be affected at any concentrations that could be expected under Reduced Agent Area Treatments (RAATs) Alternative.

While carbaryl applied at a RAATs rate will reduce susceptible insect populations, the decrease will be less than under Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative rates. Carbaryl ULV applications applied in alternate swaths have been shown to affect terrestrial arthropods less than Malathion applied in a similar fashion.

Chlorantraniliprole

Potential exposures and adverse effects to the general public and workers from RAATs application rates are 0.30 times for chlorantraniliprole compared to Conventional Application rates. This estimate is based on 50% surface area coverage within a treatment block and the reduced rate of insecticide. These low exposures to the public pose no risk of direct toxicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. Potential worker exposures pose negligible risk of adverse health effects.

Chlorantraniliprole applied at a RAATs rates are not hazardous to terrestrial mammals, bees, birds, and other vertebrates. The effect on fish and other aquatic biota, amphibians, reptiles is not considered a risk based on low application rates and low residues. (USDA APHIS, 2018b). The indirect effects to insectivores would be negligible as significant portions of the insect fauna in the treatment area will not be affected by chlorantraniliprole.

Many of the aquatic organisms most susceptible to chlorantraniliprole are marine organisms that would not be exposed to rangeland treatments. Freshwater invertebrate populations would be reduced if exposed to chlorantraniliprole, but these decreases may be temporary given the rapid regeneration time of many aquatic invertebrates. Buffers around water would prevent significant amounts of chlorantraniliprole from entering water in or near the treatment blocks.

Potential exposures to the general public from RAATS application rates are infrequent and of low magnitude. Chlorantraniliprole is a low use rate insecticide that has reduced human health and ecological risk when compared to other insecticides. Risks to the general public in the treatment areas from the ground or aerial applications are not expected because program treatments are conducted in rural rangeland areas, where agriculture is a primary economic factor with widely scattered single rural dwellings in ranching communities with low population density.

Diflubenzuron

Potential exposures and adverse effects to the general public and workers from RAATs application rates are 0.375 times for diflubenzuron compared to Conventional Application rates. This estimate is based on 50% surface area coverage within a treatment block and the reduced rate of insecticide. These low exposures to the public pose no risk of methemoglobinemia, direct toxicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. Potential worker exposures pose negligible risk of adverse health effects.

Diflubenzuron exposures at Reduced Agent Area Treatments (RAATs) Alternative rates are not hazardous to terrestrial mammals, birds, and other vertebrates. Insects in untreated swaths would have little-to-no exposure, and adult insects in the treated swaths are not susceptible to diflubenzuron's mode of action. The indirect effects to insectivores would be negligible as significant portions of the insect fauna in the treatment area will not be affected by diflubenzuron.

Many of the aquatic organisms most susceptible to diflubenzuron are marine organisms that would not be exposed to rangeland treatments. Freshwater invertebrate populations would be reduced if exposed to diflubenzuron, but these decreases may be temporary given the rapid regeneration time of many aquatic invertebrates. Buffers around water would prevent significant amounts of diflubenzuron from entering water in or near the treatment blocks.

Malathion

Compared to potential exposures under the Conventional Rates Alternative, potential exposures under this alternative are predicted at 0.25 times for malathion spray. This estimate is based on 50% surface area coverage within a treatment block and the reduced rate of insecticide. These low exposures to the public pose no risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity.

Malathion applied at a RAATs rate will cause mortalities to susceptible insects. Organisms in untreated areas will be mostly unaffected. Field applications of malathion at a RAATs rate and applied in alternate swaths resulted in less reduction in non-target organisms than would occur in blanket treatments. Should malathion applied at RAATs rates enter water, it is most likely to affect aquatic invertebrates. However, these effects would soon be compensated for by the surviving organisms, given the rapid generation time of most aquatic invertebrates and the rapid degradation of malathion in most water bodies. Buffers around water would prevent significant amounts of malathion from entering water in or near the treatment blocks.

Experimental *Metarhizium robertsii* Applications (Research Purposes Only)

Metarhizium is a common entomopathogenic fungus genus containing several species, all of which are host-restricted to the Arthropoda, with some having greater host specificity to an insect family, or even a group of related genera. Once considered a single species based on morphology but split into a number of species based on DNA sequence data, the genus is found worldwide and is commonly used as a management alternative to chemicals (USDA, 2000); (Lomer, 2001); (Zimmerman, 2007); (Roberts, 2018); (Zhang, 2019). Two *Metarhizium*, *M. brunneum* strain F52 and *M. anisopliae* ESF1, are registered with the USEPA as insecticides and are commercially used against a range of pest insects.

No harm is expected to humans from exposure to *Metarhizium* by ingesting, inhaling, or touching products containing this active ingredient. No toxicity or adverse effects were seen when the active ingredient was tested in laboratory animals. *M. anisopliae* has undergone extensive toxicology testing for its registration in Africa and the registration of Green Guard in Australia. There has been no demonstrated adverse effect on humans from these products. There is a potential for an allergic reaction to dry conidia if a person is extensively exposed to the product and has a preexisting allergy to fungal spores. *Metarhizium* use in this program is not expected to cause adverse impacts to soil, water, or air. No adverse impacts from the use of *Metarhizium* biopesticides have been observed in almost 20 years of field trials in other countries.

From 2005 to 2017, a massive project (led by Donald W. Roberts, Utah State University, in collaboration with USDA and others, and funded by APHIS-PPQ-S&T) was undertaken to collect 38,052 soil samples from across the 17 western states, from areas that were historically known to have large populations of grasshoppers and/or Mormon crickets. The purpose of these collections was to locate a domestic alternative to the nonindigenous *M. acridum*, used around the world for management of grasshopper (usually locust) populations, particularly in Australia and sub-Sahelian Africa, but also in Mexico and Brazil. The use of such a pathogen would be highly useful to the Program as a biopesticide. Approximately 2,400 new isolates of *Metarhizium* spp., *Beauveria* spp. and other entomopathogenic fungi were found. Many of these fungi isolates were selected for lab and field trials with grasshoppers and Mormon crickets, the most promising being strain DWR2009 belonging to the species *M. robertsii* (Bischoff et al., 2009). The DWR2009 isolate is still undergoing lab and field testing for efficacy against orthopterans. This species is closely related to *M. anisopliae*, which is commonly found worldwide and discernible only on the basis of diagnostic DNA sequences (Roberts, 2018).

There is the potential for prolonged persistence in the environment of a domestic isolate from one area brought to another. Despite this possibility, potential environmental impact is minimal given the widespread and common nature of *Metarhizium* in the western United States and because the DWR2009 isolate have been chosen for their optimized effects on orthopterans (Roberts, 2018). Although entomopathogenic fungi can reduce grasshopper populations, a substantial portion of the treated population are able to resist the infection through thermoregulation. Molecular systematics analyses (by the Roberts Lab; (Bischoff, 2009); (Kepler, 2014); (Mayerhofer, 2019) revealed DWR2009 is very closely related to many other strains within *M. robertsii*, all of which are basically biologically equivalent to each other. In fact, *Metarhizium robertsii* can only be really differentiated from other species by a multiplexed PCR assay based on two gene sequences. Furthermore, it is likely that persistence effects would mirror those found to be the case for *M. anisopliae* and *M. acridum*. Both of these species need optimal temperature ranges to thrive, as well as relatively humid conditions (Zimmerman, 2007); (EA, 2010). In particular, *M. acridum* does not persist in semi-arid and arid environments, which is what rangeland habitats are, where U.S. grasshopper outbreaks occur (EA, 2010). If the DWR2009 strain derived biopesticide is spread outside of the experimental plots exceptional rates of fungal infection are not anticipated. Since *M. anisopliae* is a generalist entomopathogen, lethal effects on non-target arthropods have been reported, but are more commonly observed in laboratory experiments than in the field. Plus, such effects are dependent on how the pathogen is applied; i.e., its intended target and application method play roles in non-target effects (Zimmerman, 2007). During experiments, the Rangeland Unit will spray ultra-low volumes (on 10 acres or less) of DWR2009 on grasshopper and Mormon cricket species from aircraft, or through the FAASSTT system. The Rangeland Unit may also coat small amounts of grasshopper bait with the DWR2009.

For the following four reasons, overall environmental impact by experimental studies utilizing *Metarhizium robertsii* applications should not be significant: **1)** various strains of the pathogen are already common in rangeland habitats; **2)** "behavioral fever" enables species to often "burn out" the infection by basking, allowing infected grasshoppers and Mormon crickets to escape death by mycosis; **3)** fungal pathogens are fairly susceptible to heat and ultraviolet light, greatly reducing the environmental persistence of spores to a few days on treated foliage or ground; and **4)** at least three days of 98-100% relative humidity is required for fungal outgrowth and sporulation (reproduction) from infected cadavers (Lomer, 2001); (Zimmerman, 2007); (EA, 2010); (Roberts, 2018).

Experimental LinOilEx Applications (Research Purposes Only)
LinOilEx (Formulation 103) is a non-traditional pesticide alternative still in the early stages of development. Its mode of action appears to be topical, often inducing a "freezing" effect in treated specimens whereby they appear to have been mid-movement when they die. Previous studies by its creator using locusts and katydids showed promise in its efficacy (Abdelatti, 2019), so the Rangeland Unit decided to test it. Initial Mormon cricket microplot field studies and grasshopper lab studies are intriguing and warrant further field investigations via microplot cage experiments. The formulation is proprietary, but includes linseed oil, lecithin, wintergreen oil, and caraway oil mixed into a bicarbonate emulsion.

Target effects on locust and katydids in initial studies were high while non-target results were mixed, with one tested beetle species, as well as wheat seedlings, experiencing almost no impact. Another tested beetle species did experience relatively high mortality, but well-below target levels (Abdelatti, 2019). The mode of action appears to be topical, meaning that direct contact with the formulation is needed to induce mortality. The Rangeland Unit's initial studies demonstrated that indirect contact, by spraying vegetation, did not induce mortality. Together, these data suggest that overall environmental impact by experimental studies utilizing LinOilEx applications is expected to be relatively minimal.

Human Health
The implementation of pesticide label instructions and restrictions and the APHIS treatment guidelines will reduce potential impacts from the use of insecticides (see Appendix 1 Treatment Guidelines).

Personnel working on the suppression program would be exposed during handling, loading, and application of the insecticides. Implementation of the Treatment Guidelines (Appendix 1) would minimize public exposure and protect workers from harmful exposure. The potential for adverse effects to workers is negligible if proper safety procedures are followed, including wearing the required protective clothing. Therefore, routine safety precautions are expected to provide adequate worker health protection. Decrease in potential worker exposure under this alternative should be equivalent to the decrease for the general public.

Individuals with hypersensitivity to the insecticides might be affected. APHIS would offer to compile a list of persons who wish to be listed and would either avoid treating areas near their homes or would contact them prior to treatment. If treatments were scheduled near the domiciles of known hypersensitive individuals, they would be advised to avoid treatment blocks. Decrease in potential for exposure would probably be equivalent to the decrease for the general public.

Some stakeholders have indicated that they are opposed to any treatments on public rangelands because they believe treatments would disrupt ecosystems, cause human health problems or provide an unacceptable advantage to agricultural interests. The anxiety levels of these stakeholders may be increased by adoption of this alternative versus the No Suppression Program Alternative. Their anxiety level may be equivalent with any alternative which includes insecticide applications.

Chances of a pesticide spill would decrease approximately 50% versus the Conventional Rates Alternative.

Non-Target Species

Aquatic
Fish are not likely to be affected at any concentrations that could be expected under this Alternative. Although the risk of contamination of water must be rated higher than under the No Action Alternative, untreated buffer areas around all water would prevent entry of toxic concentrations of Carbaryl into the water. Compared to potential exposures under Conventional Rates Alternative potential exposures under this alternative are predicted at: 0.25 times for carbaryl spray, 0.20 times for carbaryl bait, 0.20 times for chlorantraniliprole, 0.375 times for diflubenzuron, and 0.25 times for malathion spray.
These estimates are based on 50% surface area coverage within a treatment block and the reduced rates of insecticide. Insecticide concentrations in runoff waters are addressed in the EIS pg. C-6. Under worst case scenarios, runoff from a storm intensity of one inch resulted in negligible concentration of insecticide in the runoff water. Probability charts generated by Western Regional Climate Center show that storm intensities of half that magnitude are extremely rare in the proposed project area.

Mammals and Birds
Insecticides applied at the proposed rates are unlikely to be directly toxic to upland birds, mammals, or reptiles. The proposed insecticides are not subject to significant bioaccumulation in animals. The risk of acute or chronic toxicity to birds or mammals would be correspondingly less under this option than under the Conventional Rates Alternative due to reduced rates and percentage area covered.

The reduction in rate and coverage leaves alternative insect fauna for foraging insectivores (Paige & Ritter, 1999). Because APHIS would only treat significant outbreak populations, numbers of grasshoppers surviving the treatment can provide ample nourishment for the insectivores. Additionally, Martin, *et al*. (Martin, Johnson, Forsyth, & Hill, 2000) and Howe, *et al.* (Howe, et al., 2000) found that Canadian grassland and Idaho shrub steppe bird species were able to make adaptive changes when insecticidal spray reduced the numbers and changed the composition of insect prey species. Prey available to insectivores should be somewhat less under this alternative than under the No Suppression Program Alternative and somewhat more than under Conventional Rates Alternative.

Insects
The level of risk to non-target insects including honeybees, managed native pollinators, and unmanaged native pollinators would be greater than the No Suppression Program Alternative and less than the Conventional Rates Alternative. APHIS would consult with land managers and the Nez Perce Biological Control Center to determine the location and status of biological control agent populations and would select treatment options (including buffering areas) which minimize negative impacts on the populations. To maximize the protection of these organisms, APHIS would select carbaryl bait or diflubenzuron whenever possible to suppress grasshopper/Mormon cricket outbreaks.

Insect biodiversity
There might be a temporary decrease in insect biodiversity within treatment blocks compared to the No Suppression Program Alternative. However, the areas left untreated within treatment blocks preserve biodiversity to a great extent.

Plants
Versus the No Suppression Program Alternative, grasshopper/Mormon cricket feeding damage would be reduced on rangeland plants, including desirable and undesirable plants, and to crops near rangeland.

Versus the Insecticide Applications at Conventional Rates and Complete Area Coverage Alternative, feeding damage would be increased on rangeland plants, including desirable and undesirable plants, and to crops near rangeland. Reduction of the feeding damage may be viewed as having both negative and positive impacts. Grasshoppers and Mormon crickets feed on invasive weeds such as rush skeletonweed. Limiting the damage caused to invasive weeds would be perceived by most observers as a negative impact, while limiting the damage to desirable plants would be perceived by most observers as a positive impact.

Decreasing the amount of foliage consumed by grasshoppers/Mormon crickets can make more forage available to other herbivores which may be more highly valued by stakeholders. Livestock and game animals and non-game compete with grasshoppers and Mormon crickets for forage and shelter in rangeland. This alternative would make more forage and shelter available for other species versus the No Action Alternative. It would make less forage and shelter available for other species versus the Conventional Rates Alternative.

There are no known studies indicating that insecticides may affect species composition of intact biological soil crusts (US Department of the Interior 2001).

Spills
The risk of pesticide spills would be decreased approximately 50% versus the Conventional Rates Alternative.

Socioeconomic Issues
The risk of grasshopper/Mormon cricket outbreaks on rangeland decreasing the availability of forage for cattle and sheep is less than under the No Action Alternative and greater than under the Conventional Rates Alternative.

Versus the No Suppression Program Alternative, there would be reduced risk of major unchecked movement of grasshoppers or Mormon crickets into traditional or organic crops. Therefore, crop losses and additional expenditures for insecticidal control in the crop fields would be reduced. The risk of unchecked movement is greater under this alternative than under the Conventional Rates Alternative.

Cultural Resources and Events
The availability of grasshoppers or Mormon crickets for fish bait and other human uses would be reduced from outbreak levels to more normal levels. Persons using rangelands for recreation would respond to grasshoppers/Mormon crickets as they do under normal conditions versus under

outbreak conditions. Availability of grasshoppers/Mormon crickets would be greater under this alternative than under the Conventional Rates Alternative.

Artificial Surfaces

APHIS would not apply insecticides to un-abandoned vehicles in treatment blocks. APHIS would consult with land managers to insure that Native American petroglyphs are excluded from direct treatment if they occur within treatment blocks.

The probability of damage to artificial surfaces by the treatments under this alternative is negligible. Probability of damage to artificial surfaces by grasshoppers or Mormon crickets would be reduced versus the No Suppression Program Alternative. The reduction in risk of damage to artificial surfaces by grasshoppers or Mormon crickets is less under this alternative than under the Conventional Rates Alternative.

B. Other Environmental Considerations

1. Cumulative Impacts, Synergistic Effects, Inert Ingredients, and Metabolites

Cumulative impact, as defined in the Council on Environmental Quality (CEQ) NEPA implementing regulations (40 CFR § 1508.7) "is the impact on the environment which results from the incremental impact of the action when added to the past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period."

Potential cumulative impacts associated with the No Suppression Program alternative where APHIS would not take part in any grasshopper suppression program include the continued increase in grasshopper populations and potential expansion of populations into neighboring range and cropland. In addition, State and private land managers could apply insecticides to manage grasshopper populations however, land managers may opt not to use RAATs, which would increase insecticides applied to the environment. Increased insecticide use from the lack of coordination and RAAT applications where suitable could increase the exposure risk to non-target species and the environment. In addition, land managers may not employ the extra program measures designed to reduce exposure to the public and the environment.

Potential cumulative impacts associated with the Preferred Alternative are not expected to be significant because the program applies an insecticide application once during a treatment. The program may treat the same general area with different insecticides but does not overlap treatments of the same specific area. The program does not mix or combine insecticides. Based on historical outbreaks in the United States, the probability of an outbreak occurring in the same area where treatment occurred in the previous year is unlikely; however, given time, populations eventually will reach economically damaging thresholds and require treatment. The insecticide application reduces the insect population down to levels that cause an acceptable level of economic damage. The duration of treatment activity, which is relatively short since it is a one-time application, and the lack of repeated treatments in the same area in the same year reduce the possibility of significant cumulative impacts.

Potential cumulative impacts resulting from the use of insecticides include insect pest resistance, synergistic chemical effects, chemical persistence and bioaccumulation in the environment. The program use of reduced insecticide application rates (i.e. ULV and RAATs) are expected to mitigate the development of insect resistance to the insecticides. Grasshopper outbreaks in the United States occur cyclically so applications do not occur to the same population over time, further eliminating the selection pressure increasing the chances of insecticide resistance.

The insecticides proposed for use in the program have a variety of agricultural and non-agricultural uses. There may be an increased use of these insecticides in an area under suppression when private, State, or Federal entities make applications to control other pests. However, most of the land where program treatments occur is uncultivated rangeland and additional treatments by landowners or managers are very uncommon making possible cumulative or synergistic chemical effects extremely unlikely.

The insecticides proposed for use in the grasshopper program are not anticipated to persist in the environment or bioaccumulate. Therefore, a grasshopper outbreak that occurs in an area previously treated for grasshoppers is unlikely to cause an accumulation of insecticides from previous program treatments.

Mosquito abatement programs might apply pesticides in or near areas under consideration for rangeland grasshopper and Mormon cricket suppression programs. If they did apply insecticides over rangeland, there would be no need for grasshopper/Mormon cricket suppression treatments because the insecticides used for mosquitoes would exert control on the grasshoppers and Mormon crickets. If mosquito abatement treatments were applied to water within or near areas under consideration for rangeland grasshopper/Mormon cricket suppression programs, there would be no cumulative effect because the grasshopper/Mormon cricket program would not apply insecticides to water.

Grasshopper/Mormon cricket suppression treatments might occur on rangelands in the Affected Environment under consideration of this EA. In that case, treatments would be conducted by APHIS. APHIS would ensure that all applications were within the limits for annual pesticide application of a single insecticide under Federal Insecticide Fungicide Rodenticide Act (FIFRA) and that no treatments were made with synergistic insecticides.

Rangeland grasshopper and/or Mormon cricket suppression programs might be made on rangeland adjacent to the Affected Environment. In that case they would be made by ISDA or by private individuals. APHIS and ISDA maintain close liaison regarding their respective grasshopper survey and suppression programs, so APHIS would be aware when ISDA had conducted or planned to conduct a suppression program. In that case, APHIS would plan any adjacent suppression programs on federally managed lands in a way that would be complimentary to the ISDA program. APHIS employees are in contact with private landowners and are generally aware when landowners have made or plan to make treatments in areas adjacent to federally managed rangelands where APHIS might conduct suppression programs. In that case, APHIS would plan any adjacent suppression programs on federally managed lands in a way that would be complimentary to the private program.

In rare cases, unknown parties have applied treatments for grasshoppers or Mormon crickets on public and private rangeland. These treatments are easy to detect because of the presence of dead grasshoppers or Mormon crickets. However, absent visible bait or the distinctive odor of an insecticide such as malathion, acephate, or furadan, APHIS cannot determine what insecticide may have been used. In those cases, APHIS would refrain from conducting suppression programs in the immediate vicinity. Applications on federally managed rangelands by unknown parties can be minimized by proactive participation in suppression programs by APHIS, which remove the concerns of the parties who would otherwise conduct clandestine treatments. APHIS can be most proactive if logistically expedient treatment methods are available. Spray treatments are more logistically expedient than bait treatments.

Federal land managers may utilize various herbicides to control weeds within the proposed suppression area. APHIS would consult with land managers to determine if herbicides or insecticides have been utilized within the past year on any proposed spray block within the proposed suppression area. APHIS would not apply any insecticide in a manner that conflicts with EPA requirements regarding multiple treatments. APHIS would not apply insecticide to an area known to have been treated within one (1) year with a pesticide known to have cumulative or synergistic effects with the insecticide selected for application by APHIS.

Carbaryl

The only studies of chemical interactions with carbaryl indicate that toxicity of organophosphates combined with Carbaryl is additive, not synergistic (2002 EIS p B-13).

Although the formulations of carbaryl in some previous spray programs had oil-based carriers (i.e., Sevin 4-oil), current programs have converted to water-based carriers (i.e., Sevin XLR Plus). Some information about inert ingredients in these formulations is available. One inert ingredient is propylene glycol or propanediol (antifreeze agent). It degrades readily to carbon dioxide and water in soil and water environments after applications, so actual exposures from the rangeland grasshopper/Mormon cricket suppression program would only be acute. The low exposures to humans would not expect to have human health effects, except to those few individuals experiencing allergic contact dermatitis. Since APHIS would use bait rather than spray formulations, there should be no contact with the skin of any humans, except program personnel. Propylene glycol is practically nontoxic to fish and daphnia. Concentrations of propylene glycol from program application rates would not be anticipated to result in adverse effects to wildlife.

Carbaryl bait is formulated by different manufacturers with several different substrates for the bait. Substrates include whole rolled wheat, wheat bran, and grape and apple pomace. For use in Idaho, APHIS normally prefers the formulation based on grape and apple pomace. N-amyl acetate or "banana oil" may be used as a flavor additive in carbaryl bait. N-amyl acetate readily volatilizes to the atmosphere. Biodegradation occurs readily in soil, but there is moderate potential for bioconcentration in aquatic organisms. Although this compound is an irritant of skin, eyes, and mucus membranes, the low potential exposures from program applications of carbaryl bait are not expected to result in any adverse effects to humans.

While N-amyl acetate may bioconcentrate in aquatic organisms, the toxicity to those species is low relative to the active ingredient (carbaryl) in the formulation. The major hydrolytic metabolites of Carbaryl are glucuronides and sulfates. Most metabolites such as naphthol are considerably less toxic than Carbaryl. There has been some concern expressed about the reaction of carbaryl with nitrite under certain circumstances. This may result in the formation of N-nitroso carbaryl which has been shown to be mutagenic and carcinogenic in laboratory tests (2002 EIS pg. B12-B13).

Chlorantranilprole
Chlorantranilprole is not reported as being synergistic. Approximately 95% of Prevathon® formulation is of other ingredients (DuPont, 2015). The safety data sheet (SDS) states that the formulation is not classified as a hazardous substance or mixture under the Occupational Safety and Health Administration Hazard Communication Standard with similar acute toxicity compared to the technical material. The rapid metabolism and degradation of this metabolite's low concentrations make it highly unlikely that there would be enough exposure to cause any of the adverse toxicological effects noted in these studies. Methylated seed oil is added to the formulation as a spray adjuvant. Methyl and ethyl esters of fatty acids produced from edible fats and oils are food grade additives by the U.S. Food and Drug Administration (CFR 172.225).

Diflubenzuron
Diflubenzuron is only reported to be synergistic with the defoliant DEF. However, diflubenzuron has potential for synergistic effects with non-pesticidal compounds such as cigarette smoke and carbon monoxide which bind with hemoglobin (2002 EIS, pg. B-16).

The primary metabolites of diflubenzuron are 4-chlorophenylurea (CPU) and 2.6-difluorobenzoic acid. The acid metabolite is further metabolized by microorganisms in one (1) to two (2) weeks in soil. The CPU degrades in soil in about five (5) weeks. The rapid metabolism and degradation of this metabolite's low concentrations make it highly unlikely that there would be enough exposure to cause any of the adverse toxicological effects noted in these studies. Various carriers and adjuvants are used with diflubenzuron to enhance the pesticide applications. These are primarily synthetic and naturals oils. These inert ingredients may include light and heavy paraffinic oils, polyethylene glycol nonylphenyl ether, alkylaryl polyether-ethanols, vegetable oil surfactants, and canola oil. Food-grade canola oil would not be expected to pose any noteworthy hazards, but some of the heavier oils could affect birds and other wildlife.

Use of formulations that use the paraffinic oils may not be appropriate in some habitats with nesting birds, particularly if endangered or threatened species are present or protection of game birds is an issue. Although the paraffinic oils have been shown to decrease egg-hatch of nesting birds, these effects have only been observed from spills or exposures higher than are anticipated from program applications. Polyethylene glycol nonylphenyl ether has generally not been of human health concern, except for a few cases of allergic contact dermatitis. This should not be an issue if proper program safety precautions are followed. This compound does not persist in natural environments and is unlikely to show bioconcentration of residues (2002 EIS pg. B15-B16).

Malathion
Malathion is synergistic with diazinon and may be potentiated by other organophosphate and carbamate insecticides. Studies with Dichlorvos and Naled showed that toxicity was additive, not synergistic (2002 EIS pg. B-20).

The main impurities of concern in malathion formulations are isoMalathion (95 times as toxic as Malathion) and Malaoxon (68 times as toxic as malathion). Isomalathion formation results from improper storage or handling of malathion formulations. Malaoxon is formed from malathion’s oxidation, which has been reported to occur in air and from volatilization from droplets on various surfaces. Following aerial malathion applications, Malaoxon and other transformation products were detectable in air and on various test surfaces for hours and, in some cases, days after the treatment. Levels of Malaoxon increased, presumably via oxidation of malathion on some test surfaces for the nine days of the study. Some petroleum-based oil occurs in some ULV formulations. The exposure of birds' eggs and humans to this oil has been shown to have no adverse effects at program application rates (2002 EIS pg. B20-B21).

Experimental treatments

The proposed experimental treatments are short-term and would take place in a very limited area. The purpose of the field tests conducted by the Rangeland Unit will help determine whether APHIS would eventually include *Metarhizium robertsii* (isolate DWR2009) based biopesticides as an option for the Program. The data generated by these studies would likely be used as part of the EPA registration process for this biopesticide. Inclusion of effective and environmentally friendly insecticides would provide the Program additional control options for grasshoppers and Mormon crickets in sensitive habitats. If successful, the use of *M. robertsii* could decrease the amount of chemical insecticides used in rangeland against grasshoppers and Mormon crickets.

2. Executive Order No. 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations

Federal agencies identify and address the disproportionately high and adverse human health or environmental effects of their proposed activities, as described in E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

No Suppression Program Alternative may cause Hispanic and Asian farm workers to be exposed to additional insecticides applied to cropland. No Action Alternative may increase costs of operation for Asian and Hispanic farm operators. The other alternatives would have no disproportionate impact on minority or low income populations.

APHIS has evaluated the proposed grasshopper program and has determined that there is no disproportionately high and adverse human health or environmental effects on minority populations or low-income populations.

3. Executive Order No. 13045, Protection of Children from Environmental Health Risks and Safety Risks

Federal agencies consider a proposed action's potential effects on children to comply with E.O. 13045, "Protection of Children from Environmental Health Risks and Safety Risks." This E.O. requires each Federal agency, consistent with its mission, to identify and assess environmental health and safety risks that may disproportionately affect children and to ensure its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks. APHIS has developed agency guidance for its programs to follow to ensure the protection of children (USDA A. , 1999).

APHIS' HHERAs evaluated the potential exposure to each insecticide used in the program and risks associated with these insecticides to residents, including children. The HHERAs for the proposed program insecticides, located at http://www.aphis.usda.gov/plant-health/grasshopper, suggest that no disproportionate risks to children, as part of the general public, are anticipated.

APHIS grasshopper insecticide treatments are conducted in rural rangeland areas, where agriculture is a primary industry. The areas consist of widely scattered, single, rural dwellings in ranching communities with low population density. Treatments are conducted primarily on open rangelands where children would not be expected to be present during treatment or to enter should there be any restricted entry period after treatment. The program also implements mitigation measures beyond label requirements to ensure that no treatments occur within the required buffer zones from structures, such as a 500-foot treatment buffer zone from schools and recreational areas. Program insecticides are not applied while school buses are operating in the treatment area. Aerial application of any chemical would not occur within 500 feet of any school or recreational facility.

4. Tribal Consultation

Executive Order 13175 "Consultation and Coordination with Indian Tribal Governments," calls for agency communication and collaboration with tribal officials when proposed Federal actions have potential tribal implications. The Archaeological Resources Protection Act of 1979 (16 U.S.C. §§ 470aa-mm), secures the protection of archaeological resources and sites on public and tribal lands.

APHIS has not conducted a treatment or anticipate treatments on any Tribal lands in Idaho. However, prior to the treatment season, program personnel may notify Tribal land managers of the potential for grasshopper and Mormon cricket outbreaks on their lands. Consultation with local Tribal representatives would then take place prior to treatment programs to inform fully the Tribes of possible actions APHIS may take on Tribal lands. Treatments typically do not occur at cultural sites, and drift from a program treatment at such locations is not expected to adversely affect natural surfaces, such as rock formations and carvings. APHIS would also confer with the appropriate Tribal authority to ensure that the timing and location of a planned program treatment does not coincide or conflict with cultural events or observances on Tribal lands.

5. Executive Order No. 13186, Responsibilities of Federal Agencies to Protect Migratory Birds

The Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703–712) established a Federal prohibition, unless permitted by regulations, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird.

APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. Impacts are minimized as a result of buffers to water, habitat, nesting areas, riparian areas, and the use of RAATs. For any given treatment, only a portion of the environment will be treated, therefore minimizing potential impacts to migratory bird populations.

6. Endangered Species Act

Section 7 of the Endangered Species Act (ESA) and its implementing regulations require Federal agencies to ensure their actions are not likely to jeopardize the continued existence of listed threatened or endangered (listed) species or result in the destruction or adverse modification of critical habitat. Numerous federally-listed species and areas of designated critical habitat occur within the 17 State program area, although not all occur within or near potential grasshopper suppression areas or within the area under consideration by through this EA.

APHIS considers whether listed species, species proposed for listing, experimental populations, or critical habitat are present in the proposed suppression area. Before treatments are conducted, APHIS contacts the U.S Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) (where applicable) to determine if listed species are present in the suppression area, and whether mitigations or protection measures must be implemented to protect listed species or critical habitat.

APHIS completed a programmatic Section 7 consultation with NMFS for use of carbaryl, malathion, and diflubenzuron to suppress grasshoppers in the 17-state program area because of the listed salmonid (*Oncorhynchus* spp.) and critical habitat. To minimize the possibility of insecticides from reaching salmonid habitat, APHIS implements the following protection measures:

- RAATs are used in all areas adjacent to salmonid habitat
- ULV sprays are used, which are between 50 and 66% of the USEPA recommended rate
- Insecticides are not aerially applied in 3,500 foot buffer zones for carbaryl or malathion or in 1,500 foot buffer zones for diflubenzuron along stream corridors
- Insecticides will not be applied when wind speeds exceed 10 miles per hour. APHIS will attempt to avoid insecticide application if the wind is blowing towards salmonid habitat
- Insecticide applications are avoided when precipitation is likely or during temperature inversions

APHIS determined that with the implementation of these measures, the grasshopper suppression program may affect, but is not likely to adversely affect listed salmonids or designated critical habitat in the program area. NMFS concurred with this determination in a letter dated April 12, 2010. APHIS will consult with NMFS at the local level if there could be co-occurrence of program chlorantraniliprole applications and listed salmonids.

APHIS submitted a programmatic biological assessment and requested consultation with USFWS on March 9, 2015 for use of carbaryl, malathion, diflubenzuron, for grasshopper suppression in the 17-state program area. With the incorporation and use of application buffers and other operational procedures APHIS anticipates that any impacts associated with the use and fate of program insecticides will be insignificant and discountable to listed species and their habitats. Based on an assessment of the potential exposure, response, and subsequent risk characterization of program operations, APHIS concludes the proposed action is not likely to adversely affect listed species or critical habitat in the program area. APHIS has requested concurrence from the USFWS on these determinations. Until this programmatic Section 7 consultation with USFWS is completed, APHIS will conduct consultations with USFWS field offices at the local level. APHIS requested concurrence from the USFWS on these determinations and a letter of concurrence was received March 31, 2020.

1995 Biological Opinion and 1998 Biological Assessment will be used as a basis for these local consultations and are incorporated into this EA by reference. They are available for public inspection at 9118 West Blackeagle Drive, Boise, Idaho. For this EA, APHIS conducted informal consultation with USFWS, Snake River Basin Office, and arrived at determinations of protective measures which were needed, in addition to those derived from earlier Biological Opinions. APHIS conferred with NOAA Fisheries - Boise, Idaho Office and determined that consultation was not required if the proposed suppression area excluded watersheds of the Salmon River and the Snake River below Brownlee Dam.

7. Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. 668–668c) prohibits anyone, without a permit issued by the Secretary of the Interior, from “taking” bald eagles, including their parts, nests, or eggs. During the breeding season, bald eagles are sensitive to a variety of human activities. Grasshopper management activities could cause disturbance of nesting eagles, depending on the duration, noise levels, extent of the area affected by the activity, prior experiences that eagles have with humans, and tolerance of the individual nesting pair. Also, disruptive activities in or near eagle foraging areas can interfere with bald eagle feeding, reducing chances of survival. USFWS has provided recommendations for avoiding disturbance at foraging areas and communal roost sites that are applicable to grasshopper management programs (USFWS, 2007).

No toxic effects are anticipated on eagles as a direct consequence of insecticide treatments. Toxic effects on the principle food source, fish, are not expected because insecticide treatments will not be conducted over rivers or lakes. Buffers protective of aquatic biota are applied to their habitats to ensure that there are no indirect effects from loss of prey.

8. Additional Species of Concern

There may be species that are of special concern to land management agencies, the public, or other groups and individuals in proposed treatment areas. For example, the sage grouse populations have declined throughout most of their entire range, with habitat loss being a major factor in their decline.

Grasshopper suppression programs reduce grasshoppers and at least some other insects in the treatment area that can be a food item for sage grouse chicks. As indicated in previous sections on impacts to birds, there is low potential that the program insecticides would be toxic to sage grouse, either by direct exposure to the insecticides or indirectly through immature sage grouse eating moribund grasshoppers.

Because grasshopper numbers are so high in an outbreak year, treatments would not likely reduce the number of grasshoppers below levels present in a normal year. Should grasshoppers be unavailable in small, localized areas, sage grouse chicks may consume other insects, which sage grouse chicks likely do in years when grasshopper numbers are naturally low. By suppressing grasshoppers, rangeland vegetation is available for use by other species, including sage grouse, and rangeland areas are less susceptible to invasive plants that may be undesirable for sage grouse habitat.

APHIS has taken into consideration and implemented additional protective measures to protect suitable habitat for federally listed Threatened, Endangered or Candidate species. Protection measures and findings of no jeopardy or no effect without buffers or other measures previously approved by USFWS are referenced by the date of the biological opinion: (USFWS dd/mm/yy). Measures developed locally by APHIS and USFWS are referenced: (USFWS yyyy).

Bull Trout, *Salvelinus confluentus* – Threatened

Bull trout have been listed as threatened under the ESA. Within the area in Idaho included in the proposal, bull trout are distributed throughout the Payette, Weiser, and Boise River systems. Bull trout naturally exhibit a patchy distribution and will not likely occupy all areas of these basins at once. Proposed or designated bull trout critical habitat may also be distributed throughout these basins and includes some habitat that is not currently known to be occupied. A very general description of bull trout distribution would include the North, Middle, and South Fork Payette Rivers; Squaw Creek; the Weiser River Watershed; the Jarbidge and Bruneau Rivers; and the Main Boise and South Fork Boise Rivers, including Anderson Ranch, Arrowrock, and Lucky Peak Reservoirs.

In all areas occupied by bull trout (including designated critical habitat), APHIS would utilize a 500 foot buffer for Carbaryl bait and maintain a 0.5 mile buffer for all aerial sprays. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives (USFWS 2003).

Banbury Springs Limpet (lanx), *Lanx sp*. - Endangered
Bliss Rapids Snail, *Taylorconcha serpenticola* - Threatened
Snake River Physa Snail, *Physa natricina* - Endangered

No photos available for these 3 species

The Banbury Springs Limpet is known to occur at three (3) sites in the Thousand Springs area near Hagerman, Idaho. It has only been found on cobble or boulder substrates in cool, clear, well-oxygenated water. All known populations have occurred in swift currents.

The Bliss Rapids Snail has primarily been found on cobble-boulder substrate in flowing reaches of the main stem Snake River and alcove springs. River populations have been found in spring-influenced habitat or near the edge of rapids. Most populations occur in the Hagerman Reach, the tailwaters of Bliss and Lower Salmon Falls dams, large alcove springs, and springs on the Fort Hall Indian Reservation upstream of American Falls Reservoir.

The Snake River Physa Snail is a main-stem Snake River specie, which occurs along stretches of the Snake River near the proposed program area.

In areas along the Snake River between C.J. Strike Reservoir and American Falls Reservoir, APHIS would utilize 500 foot buffer for Carbaryl bait and maintain a 0.5 mile buffer for all aerial sprays. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives (USFWS 2003).

Bruneau Hot Springsnail, *Pyrgulopsis bruneauensis* – Endangered

This freshwater snail occurs in a 5-mile reach of the Bruneau River and the lower one third of its tributary, Hot Creek, in Owyhee County, Idaho. The snail is native to geothermal springs and seeps, with temperatures ranging from 15.7 to 36.9 degrees Celsius. It is found in these habitats on the exposed surfaces of various substrates including rocks, sand, gravel, mud, and algal films.

Within the recovery area, as defined in the BHSS Recovery Plan, APHIS would utilize 500 foot buffer for Carbaryl bait and maintain a 0.5 mile buffer for all aerial sprays. If there are treatment needs within the buffer, APHIS will consult with USFWS on a case- by-case basis (USFWS 2003).

Canada Lynx, *Lynx canadensis* – Threatened

On March 24, 2000, the U. S. Fish and Wildlife Service listed the Canada Lynx as a Threatened species under the ESA of 1973, as amended. This took effect on April 24, 2000. The proposed treatment areas may contain habitat conditions suitable for Canada Lynx foraging, movement, and dispersal activities. In Idaho, lynx is thought to primarily occur in the higher elevation cold forest habitats, which support spruce, subalpine fir, whitebark pine, and lodgepole pine. Shrub/steppe habitats, which occur adjacent to or are intermixed with cold forest habitats in Idaho, are thought to be used to a limited extent by lynx for foraging and dispersal activities.

APHIS Rangeland Grasshopper and Mormon Cricket Program activities are not likely to influence Canada Lynx because the pesticides used and the rates at which they are used for grasshopper suppression pose very little risk to the Canada Lynx and will not affect its prey base. Furthermore, Canada Lynx are unlikely to be found in the open rangeland areas where APHIS Rangeland Grasshopper Program activities occur (USFWS 2005).

Grizzly Bear, *Ursus arctos* –Threatened

The grizzly bear has been federally listed as a Threatened species. Habitat for the bear in the project area is primarily in the Island Park area. The acreage is relatively small, but it could be important for a recovered population of bear. Any impact is highly unlikely as a result of proposed pesticides at the proposed rates of application. (USFWS 06/01/87)

Slickspot Peppergrass, *Lepidium papilliferum* –Threatened

Lepidium papilliferum is an herbaceous plant that was first collected in 1892 near Nampa, Idaho. This Idaho endemic specie is found in Ada, Canyon, Gem, Elmore, Payette, and Owyhee Counties. *Lepidium papilliferum* is a tap rooted annual or biennial plant that reaches 4 to 12 inches and displays two life cycle types. The annual life form matures, reproduces by setting seed, and dies in one growing season. The biennial life form starts growth the first year but does not produce seed and die until the second year. Insect visitation appears essential for pollination, principally by bees and some beetle species.
This plant is associated with small slickspots interspersed within the sagebrush-steppe habitat. These slickspots are also called mini-playas or nitric sites and have high clay content. Most of the slickspots range in size from less than 10 square feet to 110 square feet within communities dominated by other plants.

Threats to the continued existence of this plant include wildfire, and changes to the frequency and intensity of wildfire due to the presence of nonnative annuals such as cheatgrass. Wildfire management and rehabilitation may also have an impact, as would grazing, off road vehicle use, and development. In order to protect pollinators of this plant, APHIS will maintain a three (3) mile no-treatment buffer from proposed critical habitat. Should treatment needs arise within that buffer, APHIS will consult with the USFWS to consider options (USFWS 2003).

Ute Ladies'-Tresses, *Spiranthes diluvialis* – Threatened

Ute Ladies'-Tresses is listed as threatened under the ESA. This perennial orchid occurs in mesic or wet meadows and riparian/wetland habitats formed by springs, seeps, lakes, and streams from 1,500 to 7,000 feet in elevation. It is presently known from Colorado, Montana, Nebraska, Utah, Washington, Wyoming, and Eastern Idaho along the South Fork of the Snake River between Swan Valley and the confluence with the Henry's Fork. The South Fork populations were first discovered in 1996. A total of 24 occurrences of Ute Ladies'-Tresses are currently known from Idaho.

Surveys adjacent to the South Fork of the Snake River and other portions of the state have failed to discover additional Ute Ladies'-Tresses populations outside of the South Fork of the Snake River. The USFWS has considered the entire state of Idaho to be within the potential range of this species. Large and long-tongued bumblebees (*Bombus morrisoni* and *Bombus fervidus*) are the most important pollinators of Ute Ladies'-Tresses orchid. Along the South Fork Snake River and Henry's Fork River populations of Ute Ladies'-Tresses, APHIS would utilize a three (3) mile buffer for all aerial spray treatments (USFWS2003).

Northern Idaho Ground Squirrel, *Spermophilus brunneus* – Threatened

The Northern Idaho Ground Squirrel is smaller than most ground squirrels at about 8-9" long. Reddish-brown spots dot its coat, and the squirrel has a short, narrow tail, tan feet and ears, and a grey-brown throat. This rare squirrel needs large quantities of grass seed, stems, and other green leafy vegetation to store body energy for its eight-month hibernation from August through March. Adult males (two years old) emerge from their burrows first in early spring, usually March or early April, followed by the females and then their young.

In 1985, scientists estimated that over 5,000 ground squirrels inhabited west-central Idaho. The animals occurred in open meadows and shrub/grasslands among coniferous forests of older Ponderosa pines and Douglas fir. The major threat to the Northern Idaho Ground Squirrel is habitat loss due to conifer invasion and fire suppression. Other potential threats include agricultural land conversion, urban development, recreational activities, and naturally occurring events such as severe droughts lasting longer than three (3) years.

APHIS would utilize a .5 mile buffer for aerial sprays, and a 300 meter buffer for Carbaryl bait from known occupied habitat. However, if there are treatment needs, APHIS would consult with USFWS on a case-by-case basis to examine alternatives.

Yellow-billed Cuckoo, *Coccyzuz americanus* – Threatened

The yellow-billed cuckoo has been listed as threatened under the ESA. In Idaho, the bird is considered as a rare visitor and local breeder that occurs in scattered drainages primarily in the southern portion of the state in riparian zones. They have been most frequently and consistently reported in willow/cottonwood forests in the Snake River Valley in southeastern Idaho.

In all areas occupied by Yellow-billed cuckoo near any water, APHIS would utilize a 500 foot buffer for Carbaryl bait. For aerial applications of Diflubenzuron or Malathion, a 0.5 mile buffer would be maintained. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives (USFWS 2003).

Candidate Species and Former Candidate Species

Whitebark Pine *Pinus albicaulis* Candidate

The Whitebark Pine is a slow growing long-lived tree that often lives for 500 and sometimes more than a thousand years. It lives at alpine tree line and subalpine elevations and is considered a keystone, or foundation, specie in Western North America. Above tree line it often grows in krummholz form with stunted and shrublike growth due to cold temperatures and high winds. Significant threats to this specie include the white pine blister rust, the mountain pine beetle (*Dendroctonus ponderosae*), fire and the environmental effects of climate change.

The APHIS rangeland grasshopper program activities are not likely to influence this species as treatments would not likely occur in the alpine environment occupied by the Whitebark Pine.

Columbia Spotted Frog, *Rana luteiventris* – Former Candidate

The Columbia Spotted Frog is olive green to brown in color, with irregular black spots. They may have white, yellow or salmon coloration on the underside of the belly and legs. Tadpoles are black when small, changing to a dark then light brown as they increase in size. Spotted frogs are about one inch in body length at metamorphosis, can attain a length of four inches as adults, and can live more than ten years. They begin reproducing in their second or third year. Softball-sized egg masses are deposited in shallow, calm water in March and April, depending on weather and climate. Tadpoles hatch two to three weeks later, eventually moving from breeding sites to any connected wet areas and feeding on algae, plant material, and detritus. Tadpoles transform into small juvenile frogs between late July and November, at which time they forage on tiny insects before seeking shelter for winter hibernation.

Spotted frogs live in spring seeps, meadows, marshes, ponds, and streams, usually where there is abundant vegetation. They often migrate along riparian corridors between habitats used for spring breeding, summer foraging, and winter hibernation. Depending on climate and habitat conditions, spotted frogs may begin seeking overwinter sites as early as September. Springs, cutbanks, and willow roots provide quality habitat for hibernacula that are well-oxygenated and stable in temperature.

Prior to 1997, the Columbia Spotted Frog and the Oregon Spotted Frog were lumped into one species, *Rana pretiosa.* Additional genetic information indicated that they are two separate species. Columbia Spotted Frogs have been further divided into four populations, including the Great Basin population. The Great Basin population is found in Eastern Oregon, Southwestern Idaho, and Nevada. In Idaho, it occurs in the mid-elevations of the Owyhee uplands and in Southern Twin Falls County.

Threats to the Great Basin population of Columbia Spotted Frogs include grazing, spring development, road and trail construction, water diversion, fire in riparian corridors, pesticides, disease, and the introduction of non-native fish. Increasing habitat fragmentation due to activities that reduce riparian connectivity makes local populations vulnerable to extirpation.

APHIS would utilize a .5 mile buffer for aerial sprays, and a 500 foot buffer for Carbaryl bait from known occupied habitat. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives (USFWS 2008).

Southern Idaho Ground Squirrel, *Spermophilus brunneus endemicus* – Former Candidate

The Southern Idaho Ground Squirrel is about 8-9" long, with a short, narrow tail, tan feet and ears, and a grey-brown throat. This small-eared mammal differs from a similar subspecies, the Northern Idaho Ground Squirrel, in pelage coloration. The Southern (squirrels) have a noticeably paler coat than the Northern (squirrels), which is attributed to the lower-elevation, sagebrush/grassland habitat in which they live. The granitic sands and clays of the Weiser River Basin are thought to influence the Southern Idaho Ground Squirrel's lighter coloration, while the deeper reddish-colored Northern are found in higher-elevation areas with shallow reddish soils of basaltic origin. Research suggests that the squirrels prefer areas with a high percentage of native cover such as big sagebrush, bitterbrush and a variety of native forbs and grasses; however, some nonnative features may enhance their survival such as alfalfa fields, haystacks or fence lines.

These squirrels spend much of their time underground. Adults emerge from seasonal hibernation in late January or early February, depending on elevation and habitat conditions. As with other ground squirrels in the Northwest, the adults have a short active season above ground of 4 to 5 months. During this time, the animals feed on large quantities of grass seed, stems, and green leafy vegetation, which are required for storage of fat to survive long months of hibernation. When squirrels emerge from their burrows they begin breeding. Young are born about three weeks later and emerge from the nest burrow in about 50 days. The ground squirrels cease their above ground activity by late June or early July to return to their burrows for hibernation.

The Southern Idaho Ground Squirrel occurs within an 810-square mile area (Gem, Payette, and Washington Counties).

Threats to Southern Idaho Ground Squirrels include exotic grasses and weeds; habitat fragmentation; direct killing from shooting, trapping or poisoning; predation; competition with Columbian Ground Squirrels (*Spermophilus columbianus*); and inadequacy of existing regulatory mechanisms to protect the species or its habitat. Most of these threats occur throughout the range of the species.

APHIS would consult with USFWS on a case by case basis (USFWS 2003).

Greater Sage Grouse *Centrocerus urophasianus* – Former Candidate

Young grouse hatch in the spring at about the same time as grasshopper populations begin to mature. Insects are a critical source of protein for the young birds. Large grasshopper populations may be common in the critical habitat.

APHIS would exclude all identified habitat areas provided by land mangers shapefile and include a 1 mile border from this area. APHIS will also abide by the guidance contained in BLM Memorandum IM-2016-115 and ID-2018-014 regarding grasshopper and Mormon cricket treatments within sage grouse habitat.

Goose Creek Milkvetch, *Astragalus anserinus* – Former Candidate

This plant species occurs in the upper Goose Creek drainage of Cassia County, Idaho, Box Elder County, Utah, and Elko County, Nevada. This plant was first collected in 1982 in Box Elder County, Utah and described in 1984. It is a low growing, matted, perennial forb in the pea or legume family (Fabaceae), with grey, hairy leaves, pink-purple flowers, and brownish-red curved seed pods. This plant typically flowers from late May to early June. Pollination is assumed to be accomplished via insects, but the specific pollinators are unknown.

APHIS would maintain a three (3) mile, no aerial insecticide treatments from known populations. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives.

Species under Review by U.S. Fish and Wildlife Service or Petitioned for Listing as T&E

Bonneville Cutthroat Trout and Yellowstone Cutthroat Trout

Both the Bonneville Cutthroat Trout (top photo) and Yellowstone Cutthroat Trout (bottom photo) are currently petitioned for listing as threatened under the ESA. The Bonneville Cutthroat Trout is limited to the Bear River watershed. The Yellowstone Cutthroat Trout is believed to occupy several streams scattered across Eastern Idaho. Their current distribution is under investigation.

Mulford's Milkvetch, Woven-Spore Lichen, and Malheur Prince's Plume
These plants are currently under review by the USFWS for listing as federal candidate species.

Mulford's Milkvetch, *Astragalus mulfordiae*, is endemic to Southwest Idaho and extreme Southeast Oregon, where it grows in deep sandy soils. It is typically associated with bitterbrush, needle-and-thread grass, and Indian ricegrass. In Idaho, Mulford's Milkvetch is known from Ada, Owyhee, Payette, and Washington Counties. While no information is available regarding its pollination biology, Mulford's Milkvetch is believed to be insect pollinated. Seed dispersal is most likely by gravity and wind. Although no data are readily available, it may be consumed by grasshoppers.

Woven-Spore Lichen, *Texosporium sancti-jacobi*, grows on humus in sagebrush-steppe habitats in Southwest Idaho, Central Oregon, and Southern Washington. Several localities are also known from Southern California. Woven-Spore Lichen has been found at fourteen (14) localities in Idaho, all within Ada and Elmore Counties. Most of the sites are adjacent to or are surrounded by private land. Nothing is known of its reproductive or dispersal mechanisms. Although no data are readily available, it may be consumed by grasshoppers.

The USFWS initiated a status review for Malheur Prince's Plume, *Stanleya confertiflora*, in 2000. This showy, three foot tall biennial plant species is known from six widely scattered localities in Gooding, Owyhee, and Washington Counties in southwest Idaho. It grows only on sparsely vegetated clay soils. Approximately fifteen populations of Malheur Prince's Plume are known from southeast Oregon in Harney and Malheur Counties. A variety of bees and beetles have been observed visiting the flowers, but no pollination studies have been conducted. Although no data are readily available, it may be consumed by grasshoppers.

North American Wolverine, *Gulo gulo luscus*- Proposed Threatened

The Wolverine is a proposed threatened species and listed in Idaho as a protected non-game species (Idaho Department of Fish and Game 2010, p. 4). Habitat for the wolverine is located primarily in the high altitude remote areas of mountainous areas. Any impact is highly unlikely as a result of proposed pesticides at the proposed rates of application. These areas would most likely never be considered for treatment under current criteria.

9. Fires and Human Health Hazards

Various compounds are released in smoke during wildland fires, including carbon monoxide (CO), carbon dioxide, nitrous oxides, sulfur dioxide, hydrogen chloride, aerosols, polynuclear aromatic hydrocarbons contained within fine particulate matter (a byproduct of the combustion of organic matter such as wood), aldehydes, and most notably formaldehyde produced from the incomplete combustion of burning biomass (Reisen, 2009) (Burling, 2010), (Broyles, 2013). Particulate matter, CO, benzene, acrolein, and formaldehyde have been identified as compounds of concern in wildland fire smoke (Reinhardt, 2004).

Many of the naturally occurring products associated with combustion from wildfires may also be present as a result of combustion of program insecticides that are applied to rangeland. These combustion byproducts will be at lower quantities due to the short half-lives of most of the program insecticides and their low use rates. Other minor combustion products specific to each insecticide may also be present as a result of combustion from a rangeland fire but these are typically less toxic based on available human health data (HHERA) (http://www.aphis.usda.gov/plant-health/grasshopper). The safety data sheet for each insecticide identifies these combustion products for each insecticide as well as recommendations for PPE. The PPE is like what typically is used in fighting wildfires. Material applied in the field will be at a much lower concentration than what would occur in a fire involving a concentrated formulation. Therefore, the PPE worn by rangeland firefighters would also be protective of any additional exposure resulting from the burning of residual insecticides.

10. Cultural and Historical Resources

Federal actions must seek to avoid, minimize, and mitigate potential negative impacts to cultural and historic resources as part of compliance with the National Historic Preservation Act (NHPA), the Archaeological Resources Protection Act of 1979, and NEPA. Section 106 of the NHPA requires Federal agencies to provide the Advisory Council on Historic Preservation with an opportunity to comment on their findings.

APHIS consults with the land manager on all proposed treatments and inquires of any issues regarding impacts to cultural and historical resources in addition to all other items of concern. APHIS implements any recommendations and avoidances provided by the land manager.

11. Environmental Monitoring

Monitoring involves the evaluation of various aspects of the Rangeland Grasshopper and Mormon Cricket Suppression Programs. There are three aspects of the programs that may be monitored. The first is the efficacy of the treatment. APHIS will determine how effective the application of an insecticide has been in suppressing the grasshopper/Mormon cricket population within a treatment area. Pesticides used are sampled, and laboratory analyzed to verify active ingredient concentrations.

The second aspect included in monitoring is safety. This includes ensuring the safety of the program personnel through medical monitoring of employee cholinesterase levels.

The third aspect of monitoring is environmental monitoring. APHIS Directive 5640.1 commits APHIS to a policy of monitoring the effects of federal programs on the environment. Environmental monitoring includes such activities as checking to make sure the insecticides are applied in accordance with the labels, and that sensitive sites and organisms are protected.

The environmental monitoring recommended for grasshopper and Mormon cricket suppression programs involves monitoring sensitive sites such as bodies of water, endangered or threatened species habitat, other sensitive wildlife species habitat, and any sites for which the public has expressed concern or where humans might congregate (e.g., schools, parks, hospitals). APHIS does conduct post-treatment assessments to determine if any non-target impacts may be attributed to the treatments. Observers monitor wildlife, including migratory birds, to determine if any mortality or unusual behaviors are exhibited.

Table Key

Special Species Status

C	Candidate Species for possible listing under the Endangered Species Act
E	Listed Endangered under the Endangered Species Act
P	Proposed for listing under the Endangered Species Act
T	Listed Threatened under the Endangered Species Act
X	Experimental, Non-essential Population
FC	Former Candidate

Determinations

NE	No Effect
NJ	Not Likely to Jeopardize the Population
NLAA	Not Likely to Adversely Affect

Table 8 – Proposed Protection Measures/Determinations

Threatened and Endangered Species Idaho Grasshopper/Mormon Cricket Suppression Program	
Yellow-Billed Cuckoo (T) NLAA Yellow Billed Cuckoo Proposed Critical Habitat (PCH)	A 500 foot buffer from the edge of the riparian zone in potential cottonwood/willow habitat will be maintained. Areas identified as Proposed Critical Habitat will also be buffered 500 feet. APHIS would use a .5 mile buffer for all aerial sprays and a 500 foot buffer for Carbaryl bait. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives (USFWS 2003).
Bull Trout (T) NLAA	In all areas proposed as critical habitat for Bull trout, APHIS would utilize a .5 mile buffer for all aerial sprays and a 500 foot buffer for Carbaryl bait. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives. (USFWS 2003)
Ute Ladies' Tresses (T) NLAA	Along the South Fork snake River and Henry's Fork River populations of Ute Ladies' Tresses, APHIS would utilize a 3-mile buffer for all aerial spray treatments. (USFWS 2003)
Bliss Rapids Snail (T) Snake River Physa Snail (E) Banbury Springs Lanx (E) NLAA	Along the Snake River and associated springs, APHIS would utilize a .5 mile buffer for all aerial sprays and a 500 foot buffer for Carbaryl bait. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives. (USFWS 2003)
Bruneau Hot Springsnail (E) NLAA	Within the recovery area as defined in the final BHSS Recovery Plan, APHIS would utilize a .5 mile buffer for all aerial sprays and a 500 foot buffer for Carbaryl bait. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives. (USFWS 2003).

Grizzly Bear (T) (NLAA) North American Wolverine (Proposed T) (NLAA)	Any impact unlikely as a result of proposed pesticides at proposed rates of application. These areas would most likely never be considered for treatment under current criteria. (USFWS 06/01/87)
Canada Lynx (T) (NLAA)	APHIS Grasshopper and Mormon Cricket Program activities are not likely to influence Canada Lynx because the pesticides used and the rates at which they are used for Mormon cricket suppression pose very little risk to the Canada Lynx and will not affect its prey base. Furthermore, Canada Lynx are unlikely to be found in the open rangeland areas where APHIS Mormon Cricket Program activities occur. (USFWS 2005)
Northern Idaho Ground Squirrel (T) NLAA	APHIS will continue to avoid all treatments in known areas highlighted by the USGS and IDFG distribution maps and contact the Service to address site-specific concerns of potential treatment areas located in the counties where the NIGS is listed to occur. No treatment to be proposed in any area where this species in known to be present. Consult on case-by-case basis in emergency situations.
Slickspot Peppergrass (T) NLAA Proposed Critical Habitat (PCH)	APHIS will maintain a 3 mile buffer to protect pollinators. If there are treatment needs within this buffer, APHIS will consult with the Service to consider options. Should treatment needs arise within that buffer, APHIS will consult with the USFWS to consider options (USFWS 2003).

Table 9 – Proposed Protection Measures/Determinations

Candidate and Former Candidate Species Idaho Grasshopper/Mormon Cricket Suppression Program	
Columbia Spotted Frog (FC) NLAA	To protect the Columbia Spotted Frog, APHIS will utilize a .5 mile buffer for aerial sprays, and a 500 foot buffer for Carbaryl bait from known occupied habitat and incorporate a 50 foot buffer near any water. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives (USFWS 2008).
Greater Sage Grouse (FC) NLAA	APHIS will abide by the protective measures in the June 24, 2016 BLM Instruction Memorandum No. 2016-115 and IB ID-2018-014. APHIS will also exclude and buffer any areas identified as occupied by maps provided by the land manager.
Whitebark Pine (C) NLAA	The Rangeland Grasshopper and Mormon Cricket Suppression Program is focused on rangelands and treatments unlikely to occur in the alpine habitat of the Whitebark pine.
Southern Idaho Ground Squirrel (FC) NLAA	APHIS would consult with USFWS before treating occupied Southern Idaho Ground Squirrel habitat.
Goose Creek Milkvetch (C) NLAA	APHIS would maintain a 3 mile no aerial spray buffer from known populations of Goose Creek Milkvetch or Packard's Milkvetch. If there are treatment needs within the buffer area, APHIS would consult with USFWS on a case-by-case basis to examine alternatives.

Table 10 – Proposed Protection Measures/Determinations

State Sensitive Species Idaho Grasshopper/Mormon Cricket Suppression Program	
Idaho Dunes Tiger Beetle Bruneau Dunes Tiger Beetle	To protect the Idaho Dunes Tiger Beetle, APHIS will provide a .5 mile aerial buffer and 300 feet ground bait buffer as stipulated in the 1996 Conservation Strategy for the Idaho Dunes Tiger Beetle. These measures will also be applied to protect the Bruneau Dunes Tiger Beetle.
Raptor Shrimp (Branchineta raptor)	To protect Raptor Shrimp, APHIS would not treat within one mile of occupied Playa habitat.
Point headed Grasshopper	To protect the Point headed Grasshopper (Acrolophitus pulchellus), APHIS will consult with the BLM and FS to identify occupied habitat and will avoid pesticide applications in those areas.

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Melina Sullivan, National Operations Manager, Grasshopper and Mormon Cricket Suppression Program, USDA APHIS-PPQ, 2150 Centre Ave., Bldg B., Fort Collins, CO 80526

Safford, Dan, Idaho State Department of Agriculture, 2270 Old Penitentiary Rd., P.O. Box 790, Boise, ID 83709

VIII. Listing of Acronyms and Abbreviations

a.i.	Active Ingredient
ACEC	Area of Critical Environmental Concern
AChE	Acetylcholinesterase
APHIS	Animal and Plant Health Inspection Service
ATV	All-Terrain Vehicle
BHSS	Bruneau Hot Springsnail
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
DRNA	Designated Research Natural Areas
E.O.	Executive Order
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
et al.	and others
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FONSI	Finding of No Significant Impact
FR	Federal Register
FS	(U.S.) Forest Service
g/L	Grams per Liter
GHIPM	Grasshopper Integrated Pest Management
IPM	Integrated Pest Management
ISDA	Idaho State Department of Agriculture
LD_{50}	Median Lethal Dose
Mg/kg	Milligrams per kilogram
MOU	Memorandum of Understanding
MRAAT	Modified Reduced Agent Area Treatment
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
ONA	Outstanding Natural Area
ppm	Parts per million
PPQ	Plant Protection and Quarantine
RAAT	Reduced Agent Area Treatment
T&E	Threatened and Endangered
ULV	Ultra-low-volume
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
WSA	Wilderness Study Area

Appendix 1

APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program
Treatment Guidelines

The objectives of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program are to: 1) conduct surveys in 17 Western States; 2) provide technical assistance to land managers; and 3) when funds permit, suppress economically damaging grasshopper and Mormon cricket outbreaks on federal, tribal, state, and/or private rangeland. The Plant Protection Act of 2000 provides APHIS the authority to take these actions.

General Guidelines for Grasshopper / Mormon Cricket Treatments

1. All treatments must be in accordance with:
   a. the Plant Protection Act of 2000;
   b. applicable environmental laws and policies such as: the National Environmental Policy Act, the Endangered Species Act, the Federal Insecticide, Fungicide, and Rodenticide Act, and the Clean Water Act (including National Pollutant Discharge Elimination System requirements – if applicable);
   c. applicable state laws;
   d. APHIS Directives pertaining to the proposed action; and
   e. Memoranda of Understanding with other Federal agencies.

2. Subject to the availability of funds, on request of the administering agency or the agriculture department of an affected State, APHIS, to protect rangeland, shall immediately treat Federal, State, or private lands that are infested with grasshoppers or Mormon crickets at levels of economic infestation, unless APHIS determines that delaying treatment will not cause greater economic damage to adjacent owners of rangeland. In carrying out this section, APHIS shall work in conjunction with other Federal, State, Tribal, and private prevention, control, or suppression efforts to protect rangeland.

3. Prior to the treatment season, conduct meetings or provide guidance that allows for public participation in the decision making process. In addition notify Federal, State and Tribal land managers and private landowners of the potential for grasshopper and Mormon cricket outbreaks on their lands. Request that the land manager/land owner advise APHIS of any sensitive sites that may exist in the proposed treatment areas.

4. Consultation with local Tribal representatives will take place prior to treatment programs to fully inform the Tribes of possible actions APHIS may take on tribal lands.

5. On APHIS run suppression programs, the Federal government will bear the cost of treatment up to 100 percent on Federal, Tribal, and Trust land; 50 percent of the cost on State land; and 33 percent of cost on private land. There is an additional 16.15% charged to any funds received by APHIS for federal involvement with suppression treatments.

6. Land managers are responsible for the overall management of rangeland under their control to prevent or reduce the severity of grasshopper and Mormon cricket outbreaks. Land managers are encouraged to have implemented Integrated Pest Management Systems prior to requesting a

treatment. In the absence of available funding or in the place of APHIS funding, the federal land management agency, tribal authority or other parties may opt to reimburse APHIS for suppression treatments. Interagency agreements or reimbursement agreements must be completed prior to the start of treatments which will be charged thereto.

7. There are situations where APHIS may be requested to treat rangeland that also includes areas where crops are being grown (typically less than 10 percent of the treatment area). In those situations, the crop owner pays the entire treatment costs on the croplands. Note: the insecticide being considered must be labeled for that crop as well as rangeland.

8. In some cases, rangeland treatments may be conducted by other federal agencies (e.g., Forest Service, Bureau of Land Management, or Bureau of Indian Affairs) or by non-federal entities (e.g., Grazing Association or County Pest District). APHIS may choose to assist these groups in a variety of ways, such as:
   a. loaning equipment; (an agreement may be required);
   b. contributing in-kind services such as surveys to determine insect species, instars, and infestation levels;
   c. monitoring for effectiveness of the treatment; and
   d. giving technical advice.

9. In areas considered for treatment, State-registered beekeepers and organic producers shall be notified in advance of proposed treatments. If necessary, non-treated buffer zones can be established.

Operational Procedures

1. Follow all applicable Federal, State, Tribal and local laws and regulations in conducting grasshopper and Mormon cricket suppression treatments.

2. Notify residents within treatment areas, or their designated representatives, prior to proposed operations. Advise them of control method to be used, proposed method of application, and precautions to be taken.

3. One of the following insecticides that are labeled for rangeland use can be used for a suppression treatment of grasshoppers and Mormon crickets:
   a. Carbaryl, either as solid bait or ultra-low volume (ULV) spray
   b. Chlorantraniliprole spray
   c. Diflubenzuron ULV spray
   d. Malathion ULV spray.

4. Do not apply insecticides directly to water bodies (defined herein as reservoirs, lakes, ponds, pools left by seasonal streams, springs, wetlands, and perennial streams and rivers).

   Provide the following buffers for water bodies:
   - 500-foot buffer with aerial liquid insecticide
   - 200 foot buffer with ground liquid insecticide
   - 200-foot buffer with aerial bait
   - 50-foot buffer with ground bait.

5. Instruct program personnel in the safe use of equipment, materials, and procedures; supervise to ensure procedures are properly followed.

6. Conduct mixing, loading, and unloading in an approved area where an accidental spill would not contaminate a water body.

7. Each suppression program will have a Treatment Manager on site. Each State will have at least one Contracting Officer's Representative (COR) available to assist the Contract Officer (CO) in GH/MC suppression programs.

   NOTE: A Treatment Manager is an individual that the COR has delegated authority to oversee the actual suppression treatment; someone who is on the treatment site and overseeing / coordinating the treatment and communicating with the COR. No specific training is required, but knowledge of the Aerial Application Manual and treatment experience is critical; attendance to the Aerial Applicators Workshop is beneficial.

8. Each suppression program will conduct environmental monitoring as outlined in the current year's Environmental Monitoring Plan.

   APHIS will assess and monitor rangeland treatments for the efficacy of the treatment, to verify that a suppression treatment has properly been implemented, and to assure that any environmentally sensitive sites are protected.

9. APHIS reporting requirements associated with grasshopper/Mormon cricket suppression treatments can be found in the APHIS Grasshopper Program Guidebook: http://www.aphis.usda.gov/import_export/plants/manuals/domestic/downloads/grasshopper.pdf

SPECIFIC PROCEDURES FOR AERIAL APPLICATIONS

1. APHIS Aerial treatment contracts will adhere to the current year's Statement of Work (SOW).

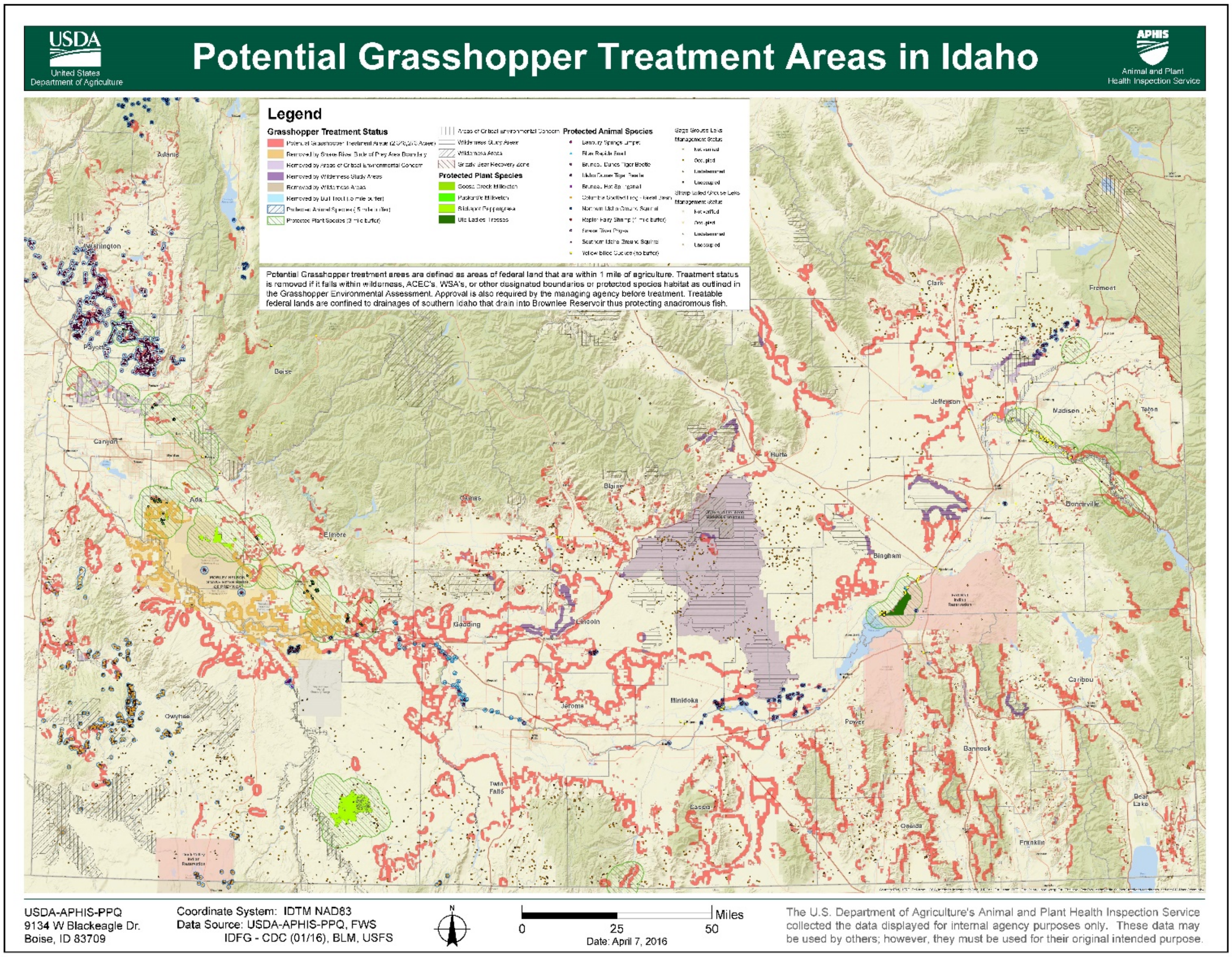
2. Minimize the potential for drift and volatilization by not using ULV sprays when the following conditions exist in the spray area:
   a. Wind velocity exceeds 10 miles per hour (unless state law requires lower wind speed);
   b. Rain is falling or is imminent;
   c. Dew is present over large areas within the treatment block;
   d. There is air turbulence that could affect the spray deposition; and
   e. Temperature inversions (ground temperature higher than air temperature) develop.

3. Weather conditions will be monitored during application, and treatment will be suspended when conditions could jeopardize the correct spray placement or pilot safety.

4. Application aircraft will fly at a median altitude of 1 to 1.5 times the aircraft's wingspan.

5. Whenever possible, plan aerial ferrying and turnaround routes to avoid flights over congested areas, water bodies, and other sensitive areas that are not to be treated.

Appendix 2


USDA
United States Department of Agriculture
Potential Grasshopper Treatment Areas in Idaho
APHIS
Animal and Plant Health Inspection Service
Legend
Grasshopper Treatment Status
Removed by Areas of Critical Environmental Concern
Removed by Wilderness Study Areas
Areas of Critical Environmental Concern
Wilderness Study Areas
Wilderness Areas
Grizzly Bear Recovery Zone
Protected Plant Species
Protected Animal Species
Potential Grasshopper treatment areas are defined as areas of federal land that are within 1 mile of agriculture. Treatment status is removed if it falls within wilderness, ACEC's, WSA's, or other designated boundaries or protected species habitat as outlined in the Grasshopper Environmental Assessment. Approval is also required by the managing agency before treatment. Treatable federal lands are confined to drainages of southern Idaho that drain into Brownlee Reservoir thus protecting anadromous fish.
USDA-APHIS-PPQ
9134 W Blackeagle Dr.
Boise, ID 83709
Coordinate System: IDTM NAD83
Data Source: USDA-APHIS-PPQ, FWS
IDFG - CDC (01/16), BLM, USFS
N
0
25
50
Miles
Date: April 7, 2016
The U.S. Department of Agriculture's Animal and Plant Health Inspection Service collected the data displayed for internal agency purposes only. These data may be used by others; however, they must be used for their original intended purpose.

Appendix 3

Protocol for Documenting Requests, Evaluations, Recommendations, Reviews, Treatments and Monitoring of Federal Rangeland Grasshopper and Mormon Cricket Suppression Program in Idaho

1. Private landowners and/or public land managers who wish to request evaluations for grasshopper suppression should complete Form 1 (*Request for Evaluation of Need for Suppression of Grasshoppers or Mormon Crickets in Idaho*) and e-mail to USDA in Boise or Twin Falls. The form is available on the ISDA website at: http://invasivespecies.idaho.gov/grasshopper-mormon-cricket-control-program/ Private landowners may also call federal land management or state offices to request the submission of this form. Requests which involve state or private land will be referred to Idaho State Department of Agriculture.

2. The USDA APHIS PPQ Grasshopper Program Staff will supervise temporary personnel across Southern Idaho. Grasshopper scouts will conduct evaluations in response to requests, as well as in areas that are historically susceptible to grasshopper infestations. The grasshopper scouts will complete Form 2 (*Survey Evaluation of Idaho Request #___ for Suppression of Grasshoppers or Mormon Crickets).* Scouts will submit these reports to USDA in Boise or Twin Falls.

3. Experienced USDA managers will review the scouts' evaluations and determine if follow-up analysis is required. The USDA Grasshopper Coordinator will complete Form 3 (*USDA APHIS PPQ Recommendation per Idaho Request #___ for Suppression of Grasshoppers or Mormon Crickets).* USDA will forward this form, as well as Forms 1 and 2 to the appropriate federal land manager.

4. Land managers will receive the above-mentioned forms and will determine whether APHIS's recommendation is consistent with the program defined and analyzed in the environmental documentation. The land manager will determine if additional safeguards are required for treatments. Land managers will complete Form 4 (*Federal Land Manager Consistency Review of Idaho Request #___ for Suppression of Grasshoppers or Mormon Crickets).* They will forward these forms to USDA.

5. If treatments are consistent with the description and analysis in the environmental documentation and if additional safeguards do not appear to preclude the treatment from being effective, USDA will apply or contract for application of the treatment. USDA will supervise contractors and evaluate the efficacy of treatments. USDA will keep daily treatment records and will complete Form 5 (*Summary of Treatment(s) on Request #___ for Suppression of Grasshoppers or Mormon Crickets).* USDA will provide this form to the appropriate federal land manager.

6. Following treatments, USDA will conduct post-treatment monitoring for program effectiveness and unintended outcomes. USDA will complete Form 6 (*Post-Treatment* M*onitoring of Treatments on Request #___ for Suppression of Grasshoppers or Mormon Crickets).* USDA will provide this document to US Fish and Wildlife Service and to the appropriate federal land manager.

Appendix 4

Responses to Draft Environmental Assessment Public Comments Received

APHIS received four public responses to publication of the draft EA. General comments were received supporting and opposing efforts by APHIS to suppress grasshopper and Mormon cricket populations in Idaho. Public comments were received from two federal land managers; Bureau of Land Management and Forest Service, and two stakeholder groups; Center for Biological Diversity and Xerces Society. Comments similar in nature were grouped under one response. Comments that were editorial in nature or requested additional citations are not addressed in the appendix but were incorporated into the final EA, where appropriate. Chlorantraniliprole will not be used in the Idaho suppression program for grasshopper and Mormon cricket in 2020. If chlorantraniliprole is considered in the future, a supplemental EA will be drafted for public comment.

Comment 1. Lack of Specificity in the EA Undermines Claim of No Significant Effect
The size and exact configuration of a treatment block cannot be forecast prior to the emergence of grasshoppers and Mormon crickets. The program procedures and mitigation measures are adequately described in the draft EA and supporting documents regarding the purpose and need for suppression treatments, potential treatment options, the affected environment, and why the possible environmental consequences are not significant were also made available. The level of treatment details and specificity desired is not available during the preparation of the environmental risk analysis. The only justification provided for a need for this detail was a hypothetical to repeat the agency's risk analysis at a finer scale and therefore make small changes to the program action area or methods. This contention that the more limited program area or methods would be the result of more informed analysis by third parties ignores the role program operational procedures and protection measures play in the development of actual site-specific treatment plans. The programmatic environmental protection procedures are incorporated into the expedited planning process because of the short time between when a grasshopper or Mormon cricket infestation reaches economically damaging levels and when treatments can effectively limit that damage.

In most circumstances, APHIS is not able to accurately predict specific treatment areas because it can take weeks, or even months, before grasshopper and Mormon cricket populations increase to economically damaging levels. The need for rapid and effective response when an outbreak occurs limits the options available to APHIS to inform the public other than those stakeholders who could be directly affected by the actual application. APHIS typically does not have 14 days between planning a treatment and the actual application because of the rapid population growth and damage to rangeland from grasshopper and Mormon cricket infestations.

APHIS has provided the public an opportunity to review and comment on the Draft EA. Treatments can occur anywhere within the proposed action area in accordance with the published environmental protection measures (e.g. distance buffers from water resources) described in the EA. The EA provides sufficient detail to justify the risk analysis provided therein.

Comment 2. The EA needs the current 2015 sage grouse conformance references
APHIS will abide by the protective measures in the June 24, 2016 BLM Instruction Memorandum No. 2016-115 and IB ID-2018-014. APHIS will also exclude and buffer any areas identified as occupied by maps provided by the land manager.

Comment 3. It is unclear how analyses of projected economic injury levels and ultimately, treatment decisions, might be determined in the absence of site-specific data.
APHIS utilizes and provides links to extensive resources for determining when a grasshopper or Mormon cricket outbreak is exceeding IPM thresholds including, "a level of economic infestation." The Purpose and Needs section of the EA and supporting documents adequately define the multiple factors that must be evaluated before APHIS decides a treatment is warranted. Establishing a treatment threshold based on the number of grasshoppers ignores a variety of factors that must be considered by program managers before treatments. Some examples include how voracious the individual species are that compose a grasshopper infestation and the hardiness of rangeland vegetation within a proposed treatment block.

Comment 4. The EA should include citations regarding *Lepidium papilliferum.*
The reference for *Lepidium papilliferum* is included on page 62.

Comment 5. The EA understates the risks of the insecticides diflubenzuron and chlorantraniliprole for exposed bees and other invertebrates and makes no mention of recent jeopardy calls for malathion and carbaryl on more than 1,000 species nationwide.
No intent is implied to minimize the risk of any pesticide use. Chlorantraniliprole will not be used in 2020. APHIS prepared and published separate Final Human Health and Ecological Risk Assessments for all the pesticides used by the Grasshopper Programs (November 2019). Great efforts are implemented to reduce the risk to all non-target species.
APHIS agrees that chitin synthesis is a critical function for terrestrial and aquatic invertebrates. APHIS, in its risk assessments prepared for each Program insecticide summarized available acute and chronic toxicity data. This would include studies of short duration such as 48 to 96 hours as well as much longer-term studies that would evaluate continuous exposures during critical life stages and development. For several studies where exposure durations are 21 to 28 days, exposure is typically continuous at each test concentration and the studies do not account for degradation. Diflubenzuron persistence varies depending on site conditions. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. While dissipation half-lives may extend up to 78 days, they have also been shown to be much less under other use patterns. APHIS recognizes that diflubenzuron may pose a risk to larval or immature stages of invertebrates. The EA was updated to reference information in the EIS that diflubenzuron is toxic to larval invertebrates, including bees, and that sensitivity varies based on the species tested.
APHIS relied on available laboratory and field collected data for each Program insecticide to summarize risks to terrestrial invertebrates. In evaluating studies, APHIS also evaluated likely routes of exposure for Program treatments. Xerces cited estimates of exposure using the EPA tier one screening model (BeeRex) to estimate risk. BeeRex is a tier one screening level model used by EPA to assess potential risk to pollinators. Nectar and pollen values in BeeRex are based on residues that would be expected to occur from direct pesticide applications to long grass which is a food source for mammals and birds that EPA uses to in its T-REX model. These assumptions may overestimate expected residues of diflubenzuron in pollen and nectar. Available data for diflubenzuron pollen residues in crops shows a low frequency of occurrence and at low concentrations. The concentration in pollen will depend on application rates and timing of application relative to flower bloom, however, diflubenzuron Program applications are lower than labeled use rates for grasshoppers and most other crops. A limitation of BeeRex is it does not account for pesticide degradation that would normally occur in Program treatments. The APHIS grasshopper program is proposing one suppression treatment per season minimizing the potential for chronic exposure and risk. Estimates of risk quotients using BeeRex are used to determine if there is a presumption of risk that requires additional evaluation. APHIS also relies

on available field data to further characterize the risks of Program insecticides to terrestrial and aquatic invertebrates, where available. Field collected data for aquatic and terrestrial invertebrates were summarized in the available risk assessments for each Program insecticide.

APHIS recognizes EPA and the Services are continuing to develop updated national level consultations and APHIS currently consults at the state level for the grasshopper and Mormon cricket program.

Comment 6. At what quantities would alternative 2 be considered e.g. density of grasshoppers per sq. meter, or potentially the amount of leaf surface damage?
This alternative would only be used in the event of extreme level of grasshopper infestation where crop or range damage is probable or in situations where high levels of Mormon crickets may create public nuisances or endangerment of road traffic, and then only at the mutual agreement of APHIS and the land manager. In general, APHIS considers populations in excess of 8 grasshoppers per square yard the economic injury threshold, and populations in excess of 15 per square yard an "outbreak"

Comment 7. APHIS relies too heavily on broad assertions that untreated swaths will mitigate risk. Untreated swaths are presented as mitigation for pollinators and refugia for beneficial insects, but drift is likely to expose beneficials in untreated swaths at unacceptable levels.
APHIS assumes that the reduced amount of pesticide that would occur using untreated swaths over a given treatment block will result in reduced risk to nontarget organisms by reducing exposure. The swath width can vary based on site specific conditions; however, the end result is reduced pesticide exposure over a treatment area. Past research has determined there are typically minimal drift effects on non-target arthropods within untreated swaths. Combined with the program's use of lower-than-label rates of insecticides makes untreated swaths effective refugia.
The droplet size discussed in the draft EA is the preferred median diameter used by the Program for drift analysis. APHIS recognizes the range of droplet sizes can vary under a ULV application. The volume mean diameter (VMD) used in the ecological risk assessment for diflubenzuron is the preferred median diameter used by the Program. On page 11 of the EA, the preferred option spells out reduced coverage "may" be combined with the reduced rate; however, the rate of application is unable to be determined until the treatment proposal is created. Clarification was made in our Final EA to reflect our proposed intent with preferred alternative 3 to reflect the use of 50% RAATS coverage regardless of swath width. Unfortunately, the swath width cannot be determined until the type of equipment the contracted applicator may be using is determined, this width varies and is outlined in APHIS Statement of Work (SOW), but is typically 75-100 feet, with the latter being the most common.

Comment 8. It is unrealistic to assume that APHIS can comply with mitigation measures designed to protect bees on pesticide labels.
APHIS complies with all applicable Federal and State pesticide label language when making pesticide treatments. The general guidelines provided in the EA to address protective measures for bodies of water without threatened and endangered species are included in our EA in tables 1-3. The buffers for threatened, endangered, and other sensitive species are addressed during the FWS Section 7 consultations. Although the EA includes the use of Chlorantraniliprole as a pesticide option, Idaho will not use it in 2020.

Efforts are made to identify and notify all commercial beekeepers within the vicinity of a proposed treatment 48 hours prior to treatment. APHIS also adheres to all recommendations of the land manager regarding exclusions that may contain sensitive insect species, including all pollinators or plant species.

GPS shapefiles for potential spray blocks are initially shared with land managers. Land managers then return shapefiles with any additional excluded areas. Once finalized the shapefiles are sent to contracted pilots, who then return shapefiles post treatment indicating details such as flight lines where treated/not-treated, ferry lines, etc. 2020 will be the first year APHIS is also able to track electronically where ground treatments have been applied.

Comment 9. Specific concerns regarding protections for Mulfords milkvetch, Malheur princes plume, tiger beetle, other special status plants, intermittent streams, programmatic agreements with the land manager, pollinators, cultural and tribal resources, "limited" designation for motorized vehicle travel, application timing, etc.

APHIS only conducts suppression treatments at the request of the land manager. A land manager has intimate knowledge of the area under treatment consideration. As surveys are completed, when warranted, APHIS and the land manager have ongoing discussions of potential treatment areas. There is information exchanged that include such things as buffers for water, threatened and endangered species and sensitive species. APHIS adopts any additional restrictions provided by the land manager. The responsible land manager makes the final determination as to what area to include or exclude from APHIS treatments.

Comment 10. Listed species within the project area appear to lack adequate consultation.
Local FWS Section 7 consultations were entered into prior to the draft EA. Idaho received concurrence letter from USFWS on March 31, 2020 on proposed efforts. The final EA will refer to this concurrence. Protective measures which have been agreed upon with FWS and addressed in the letter of concurrence are adhered too.

Comment 11. Vulnerable and listed pollinator species are provided no real protections under the EA, despite affirmative federal obligations for federal agencies put into place several years ago.
APHIS also adheres to all recommendations of the land manager regarding exclusions that may contain sensitive insect species, including all pollinators or plant species.

Comment was made to APHIS use of the State of Idaho's (Fish and Game) weblink list of special status species and the lack of indication of how it would *"conserve or protect these species, some of which are highly imperiled but not listed under the federal Endangered Species Act*." However, this link was simply used for reference purposes only that in determining status of certain species of concern (source). It was never implied or intended to include all species listed on the site.

APHIS includes many of the proposed measures to minimize risks to non-target organisms and human health. These are summarized in the recent EIS. For example, treatment buffers are applied to all water bodies and to areas where the public may potentially be exposed to program applications. APHIS also minimizes aerial insecticide use, where possible. However, site conditions may dictate the need for aerial treatments. APHIS minimizes use of liquid carbaryl and malathion which is reflected in the historical use for both insecticides. Diflubenzuron has been the preferred insecticide for making Program suppression treatments. In addition, APHIS has incorporated the use of RAATS in the Program to reduce insecticide use providing reduced risk while meeting the goal of suppression. APHIS continues to research and develop new techniques for management of grasshopper and Mormon cricket populations.

Comment 12. Does APHIS conduct treatments on lands managed by Department of Defense or Idaho National Laboratory? Does this EA cover them?
APHIS does not conduct treatments on any DoD nor INL managed lands.

Comment 13. Freshwater mussels are at risk across the country and need attention. The EAs are silent on buffers around stock tanks.
APHIS agrees that freshwater mussels should be protected, as well as other aquatic organisms, and uses ground and aerial application treatment buffers adjacent to all aquatic habitats. In addition, APHIS uses reduced rates of Program insecticides compared to current labeled rates. These mitigation measures are beyond label requirements for protection of aquatic habitats. The intent of these buffers is to reduce off-site drift and runoff of Program insecticides to aquatic habitats.

Stock tanks, stock ponds, and other anthropogenic sources of water are buffered in the same manner as any other natural source of water in or around the treatment area. All anthropogenic sources of water, if they cannot be drained, covered, or removed will be buffered in concurrence with our standard water buffer mitigations.

APHIS maintains a minimum half mile buffer for aerial sprays near any water source where sensitive species are identified and conducts environmental monitoring related to program treatments. Monitoring is typically done adjacent to any sensitive habitats, including aquatic habitats, to determine pesticide residues. These data can be used to determine risk to non-target organisms based on available toxicity data.

Comment 14. Land Manager should be notified regarding any locations that experimental treatments are conducted on.
APHIS will not conduct any experimental treatments on federally managed lands. If experimental treatments were needed, APHIS would notify the appropriate land managers.

Comment 15. APHIS needs to invest in longer-term strategic thinking regarding grasshopper management on Western rangelands.
APHIS supports the use of IPM to prevent grasshopper outbreaks on or near Federal lands. IPM for grasshoppers includes chemical control, biological control, rangeland population dynamics, and decision support tools. These actions are and should continue to be considered by agencies as part of proper land management. However, most IPM actions are not managed by APHIS and are outside the scope of this document.
APHIS has funded the investigation of various integrated pest management (IPM) strategies for the grasshopper program. Congress established the Grasshopper Integrated Pest Management (GIPM) to study the feasibility of using IPM for managing grasshoppers. The major objectives of the APHIS GIPM program were to: 1) manage grasshopper populations in study areas, 2) compare the effectiveness of an IPM program for rangeland grasshoppers with the effectiveness of a standard chemical control program on a regional scale, 3) determine the effectiveness of early sampling in detecting developing grasshopper infestations, 4) quantify short- and long-term responses of grasshopper populations to treatments, and 5) develop and evaluate new grasshopper suppression techniques that have minimal effects on non-target species (Quinn, 2000).
APHIS issued the GIPM User Handbook describing biological control, chemical control, environmental monitoring and evaluating, modeling and population dynamics, rangeland management, decision support tools, and future directions.

Federal and State land management agencies, State agriculture departments, and private groups or individuals may carry out a variety of preventative IPM strategies that may reduce the potential for grasshopper outbreaks. Some of these activities include grazing management practices, cultural and mechanical methods, and prescribe-burning of rangeland areas. These techniques have been tried with varying success in rangeland management, and some have been associated with the prevention, control, or suppression of harmful grasshopper populations on rangeland.

Regardless of the various IPM strategies taken, the primary focus of the risk analysis contained in the EA is on the potential impacts from chemical treatments needed during an outbreak of economic importance. While APHIS provides technical expertise regarding grasshopper management actions, the responsibility for implementing most land management practices lies with other Federal (i.e., BLM, and USDA's FS), State, and private land managers.

Comment 16. Special status lands

APHIS acknowledges the concurrence received regarding its protection of special status lands such as Wilderness areas and proposed Areas of Critical Environmental Concern.

Comment 17. Public notice of site-specific EA

APHIS has made NEPA documents publicly available since 2003 at the Idaho State Department of Agriculture (ISDA) website http://invasivespecies.idaho.gov/ghmc-information in addition to the draft 2020 EA posted to the APHIS website. The postings have included public notice of scoping, EISs, draft EAs, final EAs and FONSIs.

Scoping is the process APHIS uses through which the agency and the public identify alternatives and issues to be considered during the development of a grasshopper or Mormon cricket suppression program. The scoping period for public comments concluded December 20, 2019 and was helpful in the preparation of the draft EA. The process can occur formally and informally through meetings, conversations, or written comments from individuals and groups. Prior to the treatment season, APHIS informally consulted with Federal and State land managers and USFWS on February 12, 2020.

APHIS further involves the public in the scoping process by the publication of notices of availability for EAs and FONSIs. When a state level EA is written, a notice is published in the Legals section of the local newspaper, advertising the availability of the EA during an open comment period. The notices published in local newspapers was conducted in accordance with APHIS' NEPA Implementation Procedures, 372.8 (b)(3) *"Notification of the availability of environmental assessments and findings of no significant impact for proposed activities will be published in the FEDERAL REGISTER, unless it is determined that the effects of the action are primarily of regional or local concern. Where the effects of the action are primarily of regional or local concern, notice will normally be provided through publication in a local or area newspaper of general circulation and/or the procedures implementing Executive Order 12372, "Intergovernmental Review of Federal Programs."*

APHIS works to inform all interested parties about open EA's for comment. When an interested party asks to be informed, APHIS ensures their contact information is added to the list of interested stakeholders. Interested parties are then also notified individually to inform them of the availability of an EA for comment. Any omission of an interested party is not intentional.

Comment 18. Appreciation for better explaining, analyzing and providing operational support for its actions than other states. Specifically, forms 1-6, the map in Appendix 2, details regarding choice of insecticide and mitigation measures for sage-obligate bird species.

APHIS acknowledges the comments received and strives to make the process and rationale as transparent as possible.

FORM #1, REQUEST FOR EVALUATION OF NEED FOR SUPPRESSION OF GRASSHOPPERS OR MORMON CRICKETS IN IDAHO

□ FEDERAL LAND: Email to USDA- Boise, to Daniel.obester@usda.gov or USDA-Twin Falls to Bradley.a.newbry@usda.gov. Or mail to USDA APHIS PPQ, 9118 W. Blackeagle Dr. Boise, ID 83709

□ IDAHO STATE LAND OR PRIVATE LAND: Email to ISDA Boise: grasshoppers@isda.idaho.gov, or mail to ISDA, Div. of Plant Industries, P.O. Box 790, Boise, ID 83701

ISDA: Does the property meet the following criteria?
A minimum of 5 acres and is agricultural use (rangeland, pasture, crops): □ Yes □ No

Check one or both: □ Grasshopper Complaint □ Mormon Cricket Complaint

Party requesting control: ____Date of Request: _____/_____/______

Principal Contact (if other than party requesting control): ____

Address (include city and zip): ____

Phone(s): __________________________________Fax: ____

County(ies) where rangeland or crop is located: ____

Owner(s) or land manager(s) of rangeland or crop where control is requested: _____________________________

____

Estimated acreage infested: Private: _____ State of Idaho: _____ BLM: _____ Forest Service: _____

Description: (GPS or Township, Range, Sections) of area where assistance is requested.

GPS: Latitude	Township – Range - Section
GPS: Longitude	

Describe nature of problem (examples: pasture, rangeland, or crops threatened, etc.) _______________________

____

Are you aware of environmentally sensitive issues such as: water (streams, reservoirs, (and) canals), bees, or endangered species critical habitat in the area where you are requesting assistance? _______________________
If so, please explain

____

____

FOR USE BY PPQ/ISDA Case #: __________ Date received: ___/___/_____Time received: _____ Received by __________________________________	Referred to: ________________________ Referred by: ________________________ At date/time: ___/___/___ __________

FORM 2 - USDA APHIS PPQ EVALUATION PER IDAHO REQUEST # ____________

SUPPRESSION OF GRASSHOPPERS OR MORMON CRICKETS

Will be completed by Mormon Cricket Field Scout under supervision of USDA APHIS PPQ upon receipt of a request for evaluation from a land manager and will be submitted to USDA APHIS PPQ Manager.

Date Evaluated: ____________________, 20____

Person Performing Evaluation: ____

Was complainant contacted during the visit? Yes___ No ____ (Phone: ____________________)

Density per sq. yard: _________________ Predominant instar(s): _______________

Species of grasshoppers or Mormon cricket identified:

____

____

Approximate acres of rangeland infested:

Federal: _______________ State: _______________ Private: ________________

Is water present in area or bordering area? ________________________________

Narrative report including sensitive issues (bees, water, endangered species, organic farms, etc.):

____

____

____

____

____

Attach map showing infested areas and sensitive sites.

****

FOR USE BY PPQ/ISDA

Date and Time: ____

Referred To: _______________________________By: ____________________________

Distribution of copies: ____

****

PPQ FORM 2 - EVALUATION (I:\PLP - PLANT PEST (Programs)\Grasshopper\TEMPLATES_GH & MC)

FORM 3. USDA APHIS PPQ RECOMMENDATION PER IDAHO REQUEST # ______________ FOR SUPPRESSION OF GRASSHOPPERS OR MORMON CRICKETS

To be completed by USDA APHIS PPQ Grasshopper Coordinator upon receipt of evaluation from Field Scout. Will be forwarded to Federal Land Manager specified in request for evaluation (and person who initiated request if other than land manager).

I have reviewed the evaluation of complaint #_______________________________________

Regarding an infestation on ______________________ in _________________ County, Idaho.
I recommend the following course of action:

____

____

____

____

____

____

____

____

____

____

____

Signature ____ Date: _____________________

Name and title of responsible USDA APHIS PPQ or ISDA Grasshopper Coordinator

****

FOR USE BY PPQ/ISDA
Date and Time Received: ______________________By: ____________________________
Referred To: _______________________________By: ____________________________
At Date/Time: ___________________

****

PPQ FORM 3 - RECCOMMENDATION (I:\PLP - PLANT PEST (Programs)\Grasshopper\TEMPLATES_GH & MC)

**FORM 4 - LAND MANAGER CONSISTENCY REVIEW OF IDAHO REQUEST # _________
FOR SUPPRESSION OF GRASSHOPPERS OR MORMON CRICKETS**

To be completed by Land Manager after review of Recommendation from USDA APHIS PPQ
Email completed form to USDA to Bradley.a.newbry@usda.gov and Daniel.obester@usda.gov

The Environment Assessment, "Site Specific Environmental Assessment, Grasshopper and Mormon Cricket Suppression Program for Southern Idaho, EA Number: _______________" and associated Finding of No Significant Impact (FONSI) have been carefully reviewed. Request for Evaluation for Control, Evaluation of Request and Recommendation for Action #___________ have also been carefully reviewed. The recommendation is (Check one):

Consistent ☐ **Not Consistent** ☐

with control actions on rangeland specified by those documents. Any treatment will be implemented by APHIS in accordance with the operational procedures, design features, and mitigating measures described and adopted in the above-referenced documents.

In addition, the following measures are required, as well as those referenced above:
____
____
____

Due to the following extenuating circumstances, treatment should not occur:
____
____
____

Signature____ Date: ______________________

____
Name, Title, and Organization of Responsible Official

Additional forms required by land management agency should be attached.
****
FOR USE BY LAND MANAGER
Date and Time: ____
Referred To: ________________________________By: ____________________________
Distribution of copies: ____
****
PPQ FORM 4 – CONSISTENCY REVIEW (I:\PLP - PLANT PEST (Programs)\Grasshopper\TEMPLATES_GH & MC)

FORM 5 - TREATMENT(S) ON REQUEST # _________________ for suppression of Grasshoppers or Mormon Crickets

To be completed by USDA APHIS PPQ at the time of treatment

Date(s) treatment occurred: ____

Contractor or employee(s) who applied treatment:
____
____
____
____

Acres treated: ______________________________ Acres protected: _____________________

Type and amount of pesticide applied:
Carbaryl bait ____________________ total lbs. (Formulation: 2% bait ___ 5% bait___)
Carbaryl ULV liquid __________________ total oz.
Diflubenzuron ____________________ total oz.
Malathion ____________________ total oz.

Comments:

____
____
____
____
____
____
____
____

____ _______________
Name of official managing control activity Date

****
FOR USE BY PPQ
Date and time: _______________________________
Referred to: ________________________________ By: _______________________
****

PPQ FORM 5 - TREATMENT (I:\PLP - PLANT PEST (Programs)\Grasshopper\TEMPLATES_GH & MC)

FORM 6 - POST TREATMENT MONITORING OF TREATMENTS(S) ON REQUEST # __________
FOR SUPPRESSION OF GRASSHOPPERS or MORMON CRICKETS

To be completed by USDA APHIS PPQ at the time of monitoring.

LOCATION OF POST-TREATMENT EVALUATION:

Date(s) of treatments:

Date of evaluation:

Target pest density per sq. yd.:

Predominant species:

Predominant instar(s):

Other monitoring observations:

____

Name of person conducting post-treatment monitoring

****
FOR USE BY PPQ
Date and time: ____
Referred to: ______________________________ By: _________________________________
****

FORM 6 - POST TREATMENT (I:\PLP - PLANT PEST (Programs)\Grasshopper\TEMPLATES_GH & MC)