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Draft Environmental Assessment for Rangeland Grasshopper & Mormon Cricket Suppression Program

OREGON

Baker, Crook, Deschutes, Gilliam, Grant, Harney, Jefferson, Klamath, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler Counties

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Prepared by:
United States Department of Agriculture (USDA)
Animal and Plant Health Inspection Service (APHIS)
Plant Protection and Quarantine (PPQ)
6035 NE 78th Court
Portland, Oregon 97218

Available at Above Address or:
www.aphis.usda.gov/plant-health/grasshopper

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Acronyms and Abbreviations

ac	acre
a.i.	active ingredient
AChE	acetylcholinesterase
APHIS	Animal and Plant Health Inspection Service
BCF	bioconcentration factor
BLM	Bureau of Land Management
CEQ	Council of Environmental Quality
CFR	Code of Federal Regulations
EA	environmental assessment
e.g.	example given (Latin, exempli gratia, “for the sake of example”)
EIS	environmental impact statement
E.O.	Executive Order
FONSI	finding of no significant impact
FR	Federal Register
FS	Forest Service
g	gram
ha	hectare
HHERA	human health and ecological risk assessments
i.e.	in explanation (Latin, id est “in other words.”)
IPM	integrated pest management
lb	pound
MBTA	Migratory Bird Treaty Act
MOU	memorandum of understanding
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NIH	National Institute of Health
ppm	parts per million
PPE	personal protective equipment
PPQ	Plant Protection and Quarantine
RAATs	reduced agent area treatments
S&T	Science and Technology
ULV	ultra-low volume
U.S.C.	United States Code
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Services

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Draft Site-Specific Environmental Assessment for Rangeland Grasshopper and Mormon Cricket Mitigation Program

In Baker, Crook, Deschutes, Gilliam, Grant, Harney, Jefferson, Klamath, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and Wheeler, Eastern Oregon Counties

I. Need for Proposed Action

A. Purpose and Need Statement

Infestations of grasshoppers or Mormon crickets may occur in the seventeen eastern Oregon counties listed above. The Animal and Plant Health Inspection Service (APHIS) may, upon request by land managers, conduct treatments to suppress grasshopper infestations as part of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program. The term 'grasshopper' used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

The goal of proposed grasshopper suppression actions as analyzed in this EA is to generally reduce grasshopper populations and their feeding impacts to acceptable levels. Populations of grasshoppers that may justify suppression work by APHIS in Oregon are considered on a case-by-case basis and require land-manager requests in writing. The work is also subject the availability of funding and the appropriateness of timing to likely achieve an ecologically effective result.

Benefits of control may include protection of rangeland ecosystem resources and adjacent cropland against damaging grasshopper impacts for the current year, as well as reducing the potential for continued elevated damage in future years. When grasshopper numbers become extreme, their feeding on available vegetation can lead to denuded areas, thus eliminating seed production and increasing soil erosion. Forage and habitat for other herbivores including wildlife and livestock can also be reduced, and rare plants may be adversely impacted by severe grasshopper feeding. Additionally, controlling grasshopper

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outbreaks may prevent grasshoppers from becoming migratory and invading adjacent areas.

This EA analyzes potential effects of the preferred proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from May through July of 2021 in the seventeen eastern Oregon counties listed above.

This EA is prepared in accordance with the requirements under the National Environmental Policy Act of 1969 (NEPA) (42 United States Code § 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. A selection of one of the program alternatives will be made by APHIS for the current year Program in Oregon.

B. Background Discussion

Rangelands provide goods and services, including food, fiber, recreational opportunities, and grazing land for cattle (Havstad et al., 2007; Follett and Reed, 2010). Grasshoppers 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 et al., 1996) that result in competition with other herbivores for rangeland forage and can result in depletion of other rangeland species. In rangeland ecosystem areas of the United States, grasshopper populations can build up to economic infestation levels despite even the best land management practices and individual land-manager suppression efforts, justifying a treatment program as described in this assessment.

Economic infestation level refers to both a measurement of the damage that is caused by a population of pest species unto a natural resource in quantitative terms and a qualitative descriptor of any population that has reached an economically significant and threatening level. For rangeland grasshoppers, an economic infestation level can be measured quantitatively on a case-by-case basis with knowledge of factors including: the economic value of available forage (as measured by productivity and composition), crops or other

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imperiled resources; the damage potential of the grasshoppers present (as determined by species complex, age, and density); and accessibility and cost of alternatives to the damaged resources. Short-term economic benefits accrue during the year of treatment, but additional multi-year benefits may also be likely to accrue and can be considered as part of the total value gained by treatment (i.e further loss prevented). In decision making, these factors are combined to estimate if an overall 'economic threshold' has been reached that can begin to justify treatment. (If the cost of treatment is estimated to be *equal to or less than* the predicted cost of taking no action. Finally, though less common than the above considerations, potential losses that are more challenging to quantify in economic terms may also be considered as part of the decision-making processes. Examples of this may include perceived or physical damage to recreational opportunities and cultural resources, or the creation of significant nuisances or hazards to public safety.

When economic infestation levels occur, a rapid and effective response may be requested to reduce the destruction of rangeland vegetation. In some cases, a response may be requested to prevent migratory grasshopper populations from invading adjacent areas. In most circumstances, APHIS is not able to accurately predict treatment areas and treatment strategies months or even weeks before grasshopper populations reach economic infestation 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. The emergency response aspect is why site-specific treatment details cannot be known, analyzed, and published in advance.

Over the past half-century of grasshopper survey in Oregon, patterns of reoccurring economic infestation levels have been mapped to show where future outbreaks are likely to re-occur (see figure 1 below), though outbreaks in a given year are not necessarily limited to the areas with the most frequent historical outbreaks. Program treatments by APHIS are far more limited than indicated by these historic outbreak areas, being almost always focused to limited areas where public concern is high and the available decision making factors (see 'site-specific data' in next paragraph) show a clear need for action that will justify the public expense and comport with all legal environmental requirement.

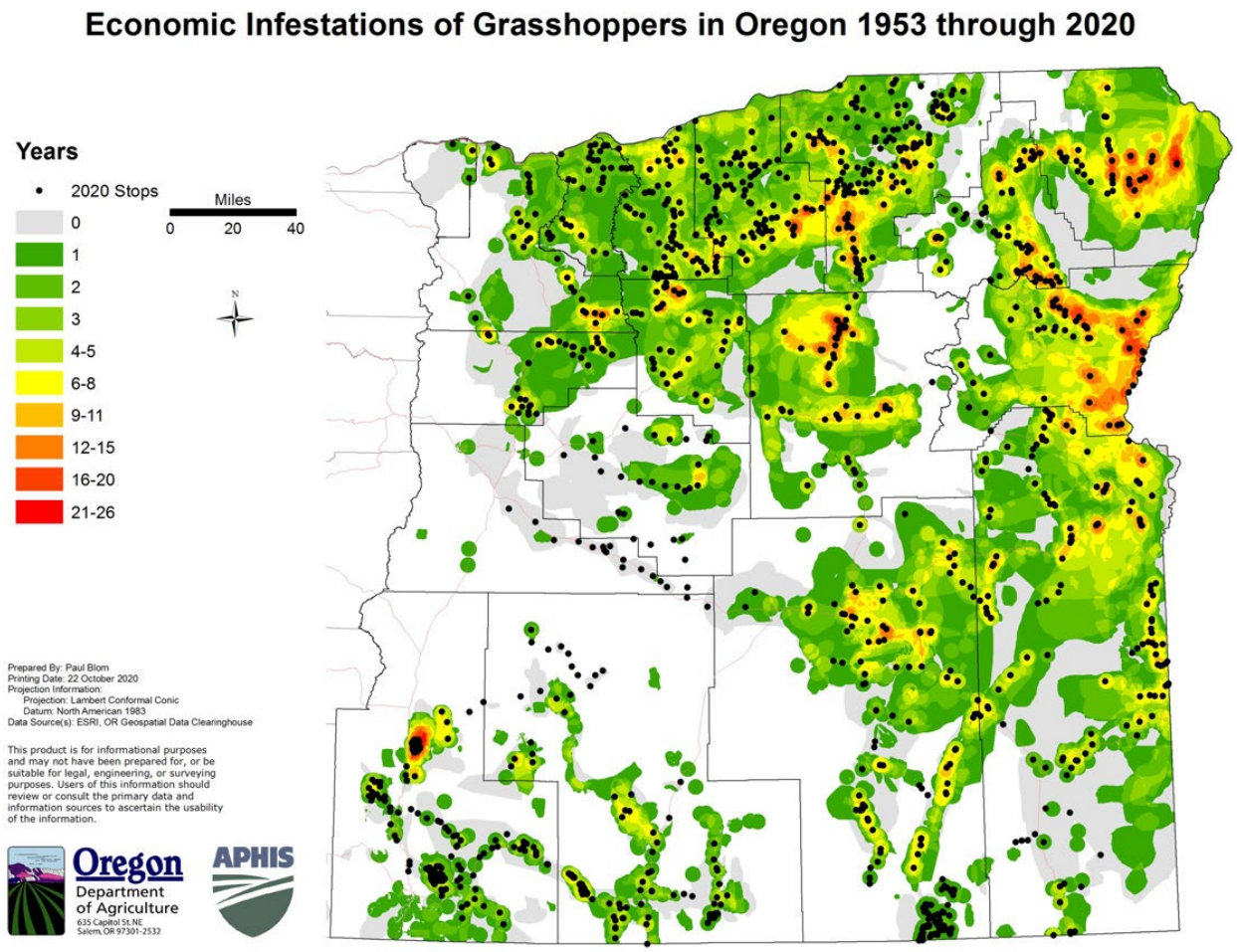

Figure 1: Number of Economically Infested Years for Grasshoppers in Oregon 1953 – 2020 Overlaid with 2020 survey locations indicated by black dots (1:2300k)

Historically, for the purposes of monitoring grasshopper populations across the Western US, a threshold of 8 grasshoppers per square yard or greater is considered an acceptable, if not fully definitive, economic infestation level. For the purposes of determining if a treatment is justified (i.e. an economic threshold is reached), many other factors must be considered, as well as a consensus by the parties involved in requesting and actuating the work. Much higher density levels are frequently encountered in high risk areas, and this density specific data is mapped and provided to the public in both weekly and annual reports in Oregon as part of a cooperative program with the Oregon Department of Agriculture (ODA). These reports can more precisely indicate where treatment activity may be warranted, including Program treatments. But density alone, no matter how high, in addition to fluctuating from year to year due to many difficult to forecast factors, is only

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one of the major considerations that need to be assessed in determining if a particular infestation has truly reached an economic threshold to justify treatment, as summarized in the USDA Agricultural Research Service (ARS) publication, Grasshopper Integrated Pest Management (IPM) User Handbook, "Recognizing and Managing Potential Outbreak Conditions" (Section IV.8, page 2):

> Broader Ecological and Economic Considerations
>
> In developing control strategies for grasshoppers, managers must base their decisions on more than the density of grasshoppers. The observed grasshopper density must be considered in a broader ecological and economic context:
>
> •the available forage base provided by plants and the potential reduction of this base by current and future grasshopper densities;
>
> • the economic value of the forage base lost to grasshoppers;
>
> • the economic cost of controlling grasshoppers; and
>
> • the ecological mechanisms that may be controlling grasshopper numbers, and how control efforts might change these mechanisms and future grasshopper densities.
>
> The Grasshopper Integrated Pest Management (GHIPM) Project has demonstrated that reference to a single grasshopper density… as constituting outbreak conditions is no longer adequate: density must be assessed in its ecological and economic context.

The full USDA-ARS IPM handbook is at: www.ars.usda.gov/pa/nparl/pmru/IPMHandbook.

Final site-specific data used to make treatment decisions are gathered during spring nymph surveys. Emergent trends may also be supported by the observation history know to the land manager(s) as well as trends documented in previous years of survey and various environmental data. Site-specific data include: grasshopper densities, species complexes, dominant species status, developmental phenology, terrain, soil types, general range conditions, local weather patterns (wind, temp., precipitation), slope and aspect of hatching beds, animal unit months (AUM's) present in grazing allotments, forage damage estimates, number of potential AUM's consumed by grasshopper populations, potential AUM's managed for allotment and value of the AUM, estimated cost of replacement feed for livestock, rotational time frame for grazing allotments, number of livestock in grazing allotment, and recent history of site enrichment projects that may be imperiled (e.g. re-seeding, post-fire rehabilitation, or other land-manager enhancement work). These are all

factors that may be considered when determining if an economic threshold has been reached for proposed Program sites.

APHIS surveys grasshopper populations on rangeland in the Western United States, provides technical assistance on grasshopper biology to land managers, and may cooperatively suppress grasshoppers when direct intervention is requested by a Federal land management agency or a State agriculture department (on behalf of a State or local government, or 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 U.S.C. § 7717(c)(1)). 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 response available to APHIS to rapidly suppress or reduce grasshopper populations and effectively protect rangeland.

In June 2002, APHIS completed an environmental impact statement (EIS) document concerning suppression of grasshopper populations in 17 Western States (Rangeland Grasshopper and Mormon Cricket Suppression Program, Environmental Impact Statement, June 21, 2002). The EIS described the actions available to APHIS to reduce the damage caused by grasshopper populations in Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, and Wyoming. During November 2019, APHIS published an updated EIS to incorporate the available data and analyze the environmental risk of new program tools. The risk analysis in the 2019 EIS is incorporated by reference.

In October 2015, APHIS and the Bureau of Land Management (BLM) signed a memorandum of understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on BLM lands (Document #15-8100-0870-MU, October 15, 2015). 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 populations. The

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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 suppression project when treatment on BLM land is necessary. The BLM must also prepare a Pesticide Use Proposal (Form FS-2100-2) 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 prepares and approves the Pesticide Use Proposal.

APHIS supports the use of IPM principles in the management of grasshoppers. APHIS provides technical assistance to land managers including the use of IPM. However, implementation of on-the-ground IPM activities is limited to land management agencies and Tribes, as well as private landowners, themselves. In addition, APHIS' authority under the Plant Protection Act is to treat Federal, State and private lands for grasshopper populations. APHIS' technical assistance occurs under each of the three alternatives proposed in the EIS.

In addition to providing technical assistance, APHIS completed the Grasshopper Integrated Pest Management (GIPM) project. One of the goals of the GIPM is to develop new methods of suppressing grasshopper populations that will reduce non-target effects. One of the methods that has been developed to reduce the amount of pesticide used in suppression activities and is a component of IPM is Reduced Agent Area Treatments (RAATs), which is the preferred proposed action described in this EA. APHIS continues to evaluate new suppression tools and methods for grasshopper populations, including biological control, and as stated in the EIS, will implement those methods once proven effective and approved for use in the United States.

C. About This Process

The NEPA 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 act swiftly with respect to those requests. Surveys help to determine general areas, among the millions of acres where harmful grasshopper infestations may occur in the spring of the

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following year. Survey data provides the best estimate of future grasshopper populations, while short-term climate or environmental factors change where the specific treatments will be needed. 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.

Public involvement under the CEQ Regulations for Implementing the Procedural Provisions of NEPA distinguishes federal actions with effects of national concern from those with effects primarily of local concern (40 CFR 1506.6). The grasshopper suppression program EIS was published in the Federal Register (APHIS-2016-0045), and met all applicable notice and comment requirements for a federal action with effects of national concern. This process provided individuals and national groups the ability to participate in the development of alternatives and provide comment. Our subsequent state-based actions have the potential for effects of local concern, and we publish them according to the provisions that apply to federal actions with effects primarily of local concern. This includes the USDA APHIS NEPA Implementation Procedures, which allows for EAs and findings of no significant impact (FONSIs) where the effects of an action are primarily of regional or local concern, to normally provide notice of publication in a local or area newspaper of general circulation (7 CFR 372.7(b)(3)). These notices provide potentially locally affected individuals an additional opportunity to provide input into the decision-making process. Some states, including Oregon, also provide additional opportunities for local public involvement, such as public meetings. In addition, when an interested party asks to be informed APHIS ensures their contact information is added to the list of interested stakeholders.

APHIS uses the scoping process to enlist land managers and the public to identify alternatives and issues to be considered during the development of a grasshopper or Mormon cricket suppression program. Scoping was helpful in the preparation of the draft EAs. The process can occur formally and informally through meetings, conversations, or written comments from individuals and groups.

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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 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.

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 documents are available for review at the USDA APHIS PPQ office, 6035 NE 78th Court Portland, Oregon 97218. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program website www.aphis.usda.gov/plant-health/grasshopper.

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All insecticides used by APHIS for grasshopper 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, Incorporated web site at www.cdms.net/manuf/manuf.asp. 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 and operational procedures, included as Appendix 1 to this Draft EA.

This Draft EA analyzes the significance of environmental effects that could result from the alternatives described below. These alternatives differ from those described in the 2019 EIS because grasshopper treatments are not likely to occur in most of the geographical area covered in the NEPA documents for this program and therefore the environmental baseline should describe a no treatment scenario.

A. No Suppression Program Alternative

Under Alternative A, the No Action alternative, APHIS would not conduct a program to suppress grasshopper infestations with Oregon. Under this alternative, APHIS may opt to provide limited technical assistance, but any suppression program would be implemented without direct assistance or oversight by APHIS.

B. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy (Preferred Alternative)

Under Alternative B, 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. These chemicals have varied modes of action. Carbaryl and malathion work by inhibiting acetylcholinesterase (enzymes involved in nerve impulses) and diflubenzuron inhibits the formation of chitin by insects. In Oregon at this time, APHIS is only considering the use of liquid formulations of diflubenzuron or solid bait formulations of carbaryl for grasshopper programs conducted by APHIS. Malathion and liquid formulations of carbaryl are not

currently being considered for use in Oregon for the Program and will therefore not be discussed further in this document.

APHIS would make a single application per year to a treatment area and could apply insecticide at an APHIS rate conventionally used for grasshopper suppression treatments, or more typically as reduced agent area treatments (RAATs). APHIS selects which insecticides and rates are appropriate for suppression of a grasshopper outbreak based on several biological, logistical, environmental, and economical criteria. 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.

Typically, the decision to use diflubenzuron, the pesticide most used by the program, is determined by the life stage of the dominant species within the outbreak population, since diflubenzuron can produce 90 to 97% grasshopper mortality in immature populations, but is not considered effective for mitigating mature grasshoppers. If the window for the use of diflubenzuron closes, as may occur due to treatment delays, then carbaryl bait is the only remaining control option being considered for use in Oregon by APHIS at this time. Certain species are more susceptible to carbaryl bait, but other species have been found not to be attracted to carbaryl bait, which can limit the effectiveness of this option.

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

- 10.0 pounds (0.20 lb a.i.) of 2 percent carbaryl bait per acre
- 0.75 or 1.0 fluid ounce (0.012 lb a.i.) of diflubenzuron per acre (sub-label rates)

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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., 1999, 2000), as well as the properties of the insecticide (insecticides with longer residuals allow wider spacing between treated swaths). Foster et al. (2000) left 20 to 50% of their study plots untreated, while Lockwood et al. (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 200 feet for 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 method is to suppress grasshopper populations to less than the economic infestation level.

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, pesticide would cover all treatable sites within the designated treatment block per label directions. The application rates under this alternative are typically at the following application rates:

- 10.0 pounds (0.50 lb a.i.) of 5 percent carbaryl bait per acre
- 1.0 fluid ounce (0.016 lb a.i.) of diflubenzuron per acre (still a sub-label rate)

The potential generalized environmental effects of the application of carbaryl bait, diflubenzuron, and other pesticides are discussed in detail in the 2019 EIS. A description of anticipated site-specific impacts from this alternative may be found in Part IV of this document.

C. Experimental Treatments

APHIS-PPQ continues to refine its methods of grasshopper management in order to improve the abilities of the Rangeland Grasshopper and Mormon Cricket Suppression Program (herein referred to as the Program) to make it more economically feasible, and environmentally acceptable. These refinements can include reduced rates of currently used

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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-PPQ, 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 grasshoppers. 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.

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1. 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 Aircraft 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.

2. Pesticides and Biopesticides Used in Studies

Pesticides likely to be involved in studies currently include those approved for Program use:

Liquids: Diflubenzuron (e.g., Dimilin 2L and generics: currently Unforgiven and Cavalier 2L). Program standard application rates are: diflubenzuron - 1.0 fl. oz./acre in a total volume of 31 fl. oz./acre. Experimental rates often vary, but the doses are lower than standard Program rates unless otherwise noted.

Baits: Carbaryl at 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).

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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:

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."

Beauveria bassiana GHA: a native fungal pathogen sold commercially and registered for use across the U.S.

3. Description of Possible Studies

At this time, it is not decided where in the 17 states most of the following proposed experimental field studies will occur. The final location decision is dependent upon grasshopper and/or Mormon cricket population densities, and availability of suitable sites.

Possible Study 1: Building on experimental field season research undertaken in 2020, we plan to further evaluate the efficacy of aerial treatments of Program insecticides using UAS. This study plans to use replicated 10 acre plots. Mortality will be then be observed for a duration of time to determine efficacy. Possible variants of this study (all of which will adhere to FAA regulations) may include night flights and treating with multiple UAS simultaneously (swarming).

Possible Study 2: 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.

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Possible Study 3: 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.

Possible Study 4: 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.

Possible Study 5: 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.

Possible Study 6: 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. Affected Environment

A. Description of Affected Environment

The proposed suppression program area included in this EA encompasses rangeland in the Oregon counties of Baker, Crook, Deschutes, Gilliam, Grant, Harney, Jefferson, Klamath, Lake, Malheur, Morrow, Sherman, Umatilla, Union, Wallowa, Wasco, and, Wheeler (see Appendix 1, Map 1). These 17 counties comprise most of the eastern two thirds of Oregon. The total area is approximately 67,000 square miles (42,880,000 acres).

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Generally, it is not possible to predict the precise locations where grasshopper outbreaks will occur in any given year (see further information in section I. Need for Proposed Action, part B. Background Discussion). Although this assessment covers all the rangeland in the 17 counties, APHIS's attention to the affected environment will concentrate on the areas of historical grasshopper outbreaks, as delineated by trends indicated in previous years of survey work, as well as land-manager requests for mitigating support.

This area can be divided into six 'level three' ecoregions based on similarities in geography, climate, and plant and animal communities (Meacham et. al. 2001). The main feature that these ecoregions share is the dry climate created by rain shadow effect of the Cascade Range.

Figure 2 - Ecoregions of Eastern Oregon

<u>Eastern Cascades Slopes and Foothills</u>: This zone is characterized by vegetation that creates a transition from the higher elevation, moister forests of the Cascades on the West to the lower elevation, drier areas dominated by shrubs and grassland on the east. Open forests of ponderosa and lodgepole pine predominate in this ecoregion. The vegetation is drought

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adapted and susceptible to wildfire. Volcanic cones and buttes are common in much of the region.

Columbia Plateau: This is an arid sagebrush steppe and grassland, surrounded by wetter, mostly forested, mountainous ecoregions. This region is underlain by a thick layer of lava rock. Particularly in the region's eastern portion, where precipitation is greater, deep wind-deposited loess soils have been extensively cultivated for wheat.

Blue Mountains: This ecoregion is a complex of mountain ranges that are lower and more open than the neighboring Cascades and northern Rocky Mountains. Like the Cascades but unlike the Rockies, the Blue Mountains region is mostly volcanic in origin. Only its highest ranges, particularly the Wallowa and Elkhorn mountains, consist of intrusive rocks that rise above the dissected lava surface of the region. Much of this ecoregion is grazed by cattle, unlike the Cascades and northern Rockies.

Snake River Plain: This area is lower and less rugged than the surrounding basin and range ecoregions. A large percentage of the alluvial valleys bordering the Snake River are used for irrigated agriculture. Cattle feedlots and dairies are also common here. Except for the scattered barren lava fields, the remainder of the plains and low hills has natural sagebrush steppe vegetation which is used for cattle grazing.

Central Basin and Range: This ecoregion is composed of north-south trending fault block ranges and intervening drier basins. In the higher mountains, woodland, mountain brush and scattered open forest are found. Lower elevation basins, slopes and alluvial fans are shrub and grass covered, shrub-covered, or barren. The potential natural vegetation is, in order of decreasing elevation and ruggedness: scattered western spruce-fir forest, juniper woodland, sagebrush and salt brush-greasewood. The region is internally drained by ephemeral streams. In general, this region is warmer and drier than the Northern Basin and Range and has more shrub land and less grassland than the Snake River Plain. The land is primarily used for cattle grazing.

Northern Basin and Range: This ecoregion consists of dissected lava plains, rolling hills, alluvial fans, valleys, and scattered mountains. Mountains are more common in the eastern part. Overall, it is higher and cooler than the Snake River Plain, drier and more suited to

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agriculture than the Columbia Plateau and has fewer ranges than the Central Basin and Range. Sagebrush steppe is extensive here. Juniper dominated woodland occurs on the rugged stony uplands. Much of the region is used for rangeland. Generally, all but the eastern third of the Oregon part of this ecoregion is internally drained.

Within the potential treatment area, average January temperatures range from 24.2° F in Wallowa County to 37.4° F in Jefferson County, with 30.9° F the average for the region. Average July temperatures range from 63° F in Wallowa County to 75.6° F in Malheur County, with 69.0° F the average for the region. Annual precipitation ranges from 18.79″ in Union County to a low of 9.15″ in Sherman. The average annual precipitation for the entire region is 11.54″ (Bradbury 2001).

The region contains several watersheds or drainages, most flow into the Columbia River or its major tributary the Snake River. Major drainages are the Deschutes, John Day, and Umatilla which flow north into the Columbia. Along the eastern edge of Oregon the Grande Ronde, Imnaha, Powder, Malheur, and Owyhee River systems flow into the Snake. Major lakes in these drainages include Wallowa Lake, Paulina Lake, East Lake, and Ladd Marsh. Many manmade reservoirs have been constructed for irrigation, flood control, and power generation. Major reservoirs in the area include Lakes Bonneville, Celilo, Umatilla, and Wallula on the Columbia, Brownlee, Oxbow, and Hells Canyon on the Snake. Smaller reservoirs include Owyhee, Warm Springs, Prineville, Wickiup, and Billy Chinook.

Most of the southeastern part of the region lies within the Great Basin hydrologic region. In this arid area, large through-flowing rivers have not developed, and each watershed drains to its lowest point, where water is lost to evaporation and groundwater recharge. Here small rivers feed closed basins and marshes including Malheur Lake, Harney Lake, the Warner lakes, Summer Lake, Silver Lake, Lake Abert, Alvord Lake, Paulina Marsh and Sycan Marsh. Goose Lake in Lake County drains into the Sacramento River drainage, and to the Pacific, only in very wet years (Meacham et. al. 2001).

The Klamath River Basin watershed or drainage covers most of Klamath County. It drains directly into the Pacific Ocean. Major sub-drainages in this system are the Lost River, Williamson River, Sprague River, Upper Klamath Lake, and Upper Klamath River. Many

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manmade reservoirs have been constructed for irrigation, flood control, and power generation. Gerber is a large reservoir in Klamath County. Smaller reservoirs include J.C. Boyle, Willow Valley, and Whiteline. Crater Lake occupies the caldera of Mount Mazama and is the deepest Lake in North America. It contains the largest volume of water of any lake in Oregon. Several other high mountain lakes occur in Klamath County such as Odell, Crescent, Davis, and Lake of the Woods. Klamath Lake has the largest surface area of any lake in Oregon. Other lower elevation bodies of water in the county include Agency Lake, Swan Lake, Aspen Lake, and the Klamath Marsh.

The area contains many smaller bodies of water, including springs. Springs are often unconnected to stream systems or other water bodies. Due to lack of connectivity, biota found at spring can be endemic.

Grassland, shrub land, and woodlands are present across the general area. Grasshopper treatments would occur only in rangelands (grass and shrub lands, not in forests). Some of the rangelands are utilized for livestock grazing, but rangelands also provide habitat for native and introduced game and non-game animal species.

Elevation and topography within the overall area vary considerably, from below 500 feet along the Columbia River to mountains over 9000 feet. Treatments would occur primarily on flatlands, foothills, and areas adjacent to cropland. Some treatments may occur on areas of rangeland where critical forage or revegetation projects are threatened. The rangeland of the Columbia Plateau is mostly between 1000-2000 feet elevation, while the rangeland of the Northern Basin and Range averages 3500-4500 feet. Most suppression treatments would occur at elevations below 6000 feet.

80 to 100 species of grasshoppers may occur within the proposed suppression area. Of these, no more than ten species have been known to reach outbreak status and threaten crops and/or valuable range resources in Oregon during the past five decades. Widespread grasshopper outbreaks are typically comprised primarily of the Melanoplini tribe (spur-throated grasshoppers), though localized outbreaks in the 1990s and 2000s have included many *Camnula pellucida* (clear-winged grasshopper).

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B. Site-Specific Considerations

1. Human Health

In 2016, the estimated population of the 17 counties within the potential treatment area was over 510,000 (www.census.gov). The suppression program would be conducted on rangelands that are not normally inhabited by humans. Agriculture is a primary economic factor for the area and human habitation is widely scattered throughout the region, mainly on the edges of the rangeland. Most habitation is comprised of single-family farm or ranch houses, but some rangeland areas may have suburban developments or "ranchettes" nearby. Average population density in rural areas of eastern Oregon is about 4.2 persons per square mile. Schools are located in most of the cities and towns, and no impact to these facilities is expected since treatments are conducted in rural rangelands.

Human health may be affected by the proposed actions. However, potential exposures to the general public from traditional application rates are infrequent and of low magnitude. These low exposures to the public pose essentially no risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. Program use of carbaryl and diflubenzuron has occurred in many past programs, and no adverse health effects have been reported.

Children and persons with sensitivity to chemicals are those most likely to experience any negative effects. These individuals will be advised to avoid treatment areas at the time of application until the insecticide has time to dry on the treated vegetation.

Recreationists may use the rangelands for hiking, biking, camping, bird watching, hunting, falconry or other uses. In the event a rural school house, inhabited dwelling, or recreational facility is encountered, mitigation measures in the Treatment Guidelines will be implemented, and no adverse impacts are expected.

Those most at risk during operations would be persons actually mixing or applying chemicals. These individuals will be advised to avoid treatment areas at the time of application until the insecticide has time to dry on the treated vegetation.

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2. Nontarget Species

Grasslands, open forest, shrub/brush lands, and their associated wetlands are the most likely to be involved in a grasshopper control program. These lands host a variety of wildlife species including terrestrial vertebrate and invertebrate animals (including grasshopper species which are not threatening valuable resources), aquatic organisms, and terrestrial plants (both native and introduced).

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

Invertebrate organisms of special interest include biocontrol insects and pollinators. Land managers and others have released and managed biocontrol agents including insects and pathogens on many species of invasive plants within and near the suppression program area. These biocontrol 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 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 animals pollinate native and exotic plants and are necessary for the survival of some species. Two species that the Grasshopper Suppression Program has received comments on in the past are the Leona's little blue butterfly (*Philotiella leona*) and the monarch butterfly (*Danaus plexippus*). The Leona's little blue butterfly is only found in Klamath County near the Klamath Marsh, but the monarch butterfly is found throughout North and Central America. The suppression area covers an area considered to by spring and summer breeding areas for the monarch butterfly (xerces.org).

Vertebrates occurring in the area include highly visible introduced and native mammalian species such as cattle, sheep, horses, mule deer, elk, pronghorn, and coyotes as well as smaller animals like rabbits, mice, gophers, and bats. Birds comprise a large portion of the

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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 Southern part of this area. Various reptiles and amphibians are also present. Many of the herbivorous vertebrate species compete with some species of grasshoppers for forage, while other species utilize grasshoppers and other insects as a food source. There is special concern about the role of grasshoppers as a food source for sage grouse, sharp-tail grouse, and other bird species.

A diverse complement of terrestrial plants occurs within the proposed suppression area. Many are considered as non-native, invasive weeds including annual grasses (e.g. cheat grass, venenata), annual forbs (e.g. diffuse knapweed, Scotch thistle, yellow starthistle), perennial forbs (e.g. Canada thistle, Russian thistle, leafy spurge, white top), and woody plants (e.g. Russian olive, tamarisk). A full complement of native plants (e.g. sagebrush, bitterbrush, numerous grasses and forbs) have coevolved with and provide habitat for native and domesticated animal species, while providing broad ecological services, such as stabilizing soil against erosion.

Biological soil crusts, also known as cryptogamic, 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 various functions in the environment. Because they are concentrated in the top 1 to 4 mm 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.

3. Socioeconomic Issues

Agriculture is an important part of the area's economy and landscape. More than half the area is used for cropland or rangeland (Meacham et. al. 2001). Croplands are

concentrated on the Columbia Plateau with other small, scattered pockets of mainly irrigated cropland in arable valleys. Crop growers in areas adjacent to possible suppression areas grow feed for dairies and feedlots as well as high value crop such as potatoes, sugar beets, wheat, barley, oats, hay, grass seed, and a variety of other crops. Grain production is concentrated on the Columbia Plateau. Morrow and Umatilla counties especially produce alfalfa, corn, and potatoes. Central Oregon counties produce a variety of vegetable seeds, mint, grain, and hay. Malheur County is a major producer of seed crops, potatoes, onions and sugar beets. Tree fruit production is important in Wasco and Umatilla Counties (Bradbury 2001). Processing plants add value in several of the rural communities.

Livestock grazing is one of the primary uses of rangeland in the covered area. It is the dominate agriculture in Harney and Lake Counties. Livestock enterprises include rangeland grazing by cattle, sheep, and horses; feedlots for beef; and concentrated dairy and hog farms. This rangeland may be utilized during the summer or reserved for fall and winter grazing.

There is a significant amount of acreage in organic production in the area. In 2008, there were 116 farms with 83,333 acres certified organic in these 17 counties.

Beekeepers maintain hives to produce honey and other bee products on land which is included in the proposed treatment area as well as on land located near the proposed treatment area. Alfalfa, seed crops, and tree fruits rely on pollination from bees which may live or forage on or near proposed suppression areas.

Much of the land in the potential suppression area is publicly owned. The area contains parts of six National Forests; Deschutes, Malheur, Umatilla, Wallowa-Whitman, Fremont-Winema, Ochoco; Crooked River National Grasslands; and Hell's Canyon National Recreation Area administered by USDA Forest Service. USDI Fish and Wildlife Service administers the Hart Mountain National Antelope Refuge, Klamath Marsh, Bear Valley, Lower and Upper Klamath National Wildlife Refuges, Malheur NWR, McKay Creek NWR, Cold Springs NWR, Umatilla NWR, and Deer Flats NWR. The USDI Bureau of Land Management administers much of the public rangeland and is the major landowner in the southeast and south-central part of Oregon. More than half the public forest and

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rangeland is leased for grazing (Meacham et. al. 2001). The remainder is either not farmable or set aside as protected areas.

This area also contains many parks, wilderness areas, public forests, and wilderness studies area administered by state or local governments. The Department of Interior, National Park Service administers John Day Fossil Beds National Monument. There may also be areas of rangeland habitat considered as "sensitive areas" for the survival of non-listed species of concern.

The general public uses rangelands in the proposed suppression area for a variety of recreational purposes including hiking; camping; wildlife, bird, and insect collecting and watching; hunting; falconry; shooting; plant collecting; rock and fossil collecting; artifact collecting; sightseeing; and dumping. Members of the general public traverse rangelands in or near the proposed suppression area by various means including on foot, horseback, all-terrain vehicles, bicycles, motorcycles, four-wheel drive vehicles, snowmobiles, and aircraft.

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 (stone tool making) occur within the proposed suppression area. Elements of the Oregon Trail transect portions of the proposed suppression area, and monuments have been erected in several places. Museums, displays and structures associated with mining, logging, Japanese internment camps, and irrigation development exist in areas near the proposed suppression area.

There are five federally recognized Indian tribes in this area. According to the 2016 Oregon Blue Book (http://bluebook.state.or.us), the Confederated Tribes of Warm Springs had a Tribal Member population of 4,800 and a 644,000 acre reservation near Madras, OR. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have 2893 enrolled members and a 172,000 acre reservation near Pendleton, OR. The Burns Paiute Tribe has 349 members, a 13,736 acre reservation near Burns, OR. The Fort McDermitt Paiute-

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Shoshone Tribe's reservation straddles the Oregon-Nevada border, 18,829 acres are in Oregon.

The Klamath Tribes exercise court affirmed treaty rights within the 1954 former Klamath Reservation Boundary, approximately 1.8 million acres in the northern half of the county. This area includes the Klamath Marsh National Wildlife Refuge and large portions of the Freemont-Winema Forests. In addition to treaty resources in this area, cultural resources and tribal traditional use areas extend beyond the 1954 Reservation Boundary to the aboriginal homelands of the Klamath Tribes.

The 1855 Treaty that created the Warm Springs and Umatilla Reservations reserved specific rights in the Treaty, which include the right to hunt and gather traditional foods and medicines on open and unclaimed lands. These rights are generally referred to as "Treaty reserved rights" and extend to approximately 16.4 million acres of ceded land in Washington and Oregon. Other Native Americans may practice traditional food and medicine gathering in 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.O., 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 grasshopper suppression programs.

According to U.S. Census Bureau 2016 estimates (www.census.gov), the population makeup of Oregon is 87.4% White. Hispanic or Latino of any race is the next most numerous group comprising 12.8 %. Other identifiable groups include Black or African American 2.1%, American Indian and Alaska Native 1.8 %, Asian 4.5%, and Native Hawaiian and Other Pacific Islander 0.4%. Hispanic workers are often engaged in production and processing of crops.

The number of persons in the area below the poverty level in 2016 ranged from 22.9% in Malheur County to 10.6% in Deschutes County. Median household income ranged from $54,441 in Morrow County to $33,400 in Wheeler County. Comparing the potential suppression area to Oregon, the average percentage of persons below poverty in the 17 eastern Oregon counties is 15.8% versus 13.3% for the State of Oregon. The median household income for the State of Oregon is $53,270, but the average median household income in the 17 eastern Oregon counties is $42,655. The higher percentage of persons below poverty and the lower average median household income in the 17 eastern Oregon counties indicate that those areas may have a significantly higher proportion of low-income populations compared to the state as a whole.

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 those risks. APHIS has developed agency guidance for its programs to follow to ensure the protection of children (USDA, APHIS, 1999).

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IV. Environmental Consequences

Each alternative described in this EA potentially has adverse environmental effects. The general environmental impacts of each alternative are discussed in detail in the 2002 and 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 nontarget 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 the EIS and this Draft EA. These Environmental Documents can be found at the following website: 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 University, 2018). It is not possible to accurately predict the environmental consequences of the No Action 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 Action 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 generalist 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 32-63% 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 destroyed; thus, plant growth is impaired for several years. Rare plants may be consumed during critical times of development such as during seed production, and loss of important plant species, or seed production may lead to reduced biological diversity of the rangeland habitats, potentially creating opportunities for the expansion of invasive and exotic weeds (Lockwood and Latchininsky, 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 economic infestation levels, grasshoppers begin to compete with livestock for food by reducing available forage (Wakeland and Shull, 1936;

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Belovsky, 2000; Pfadt, 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 to rangeland. 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 or Reduced Agent Area Treatments with Adaptive Management Strategy

Under Alternative 2, APHIS would participate in grasshopper programs with the option of using one of the following insecticides 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.

a) 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 HHERAs 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). However, adherence to label requirements and

additional program measures designed to prevent carbaryl from reaching sensitive habitats or mitigate exposure of non-target organisms will reduce environmental effects of treatments.

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 and Trial, 1980; Bonderenko et al., 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 and Strachan, 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 et al., 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).

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Numerous studies have reported no effects on bird populations in areas treated with carbaryl (Buckner et al., 1973; Richmond et al., 1979; McEwen et al., 1996). Some applications of formulated carbaryl were found to cause depressed AChE levels (Zinkl et al., 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.

Most 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, 1995).

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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, 2015a, 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 of 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 proposed use of carbaryl in a bait formulation, 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, finding no concerns for adverse health risk for program workers, are available at: 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.

b) 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 and Dupras, 1977; Schaefer et al., 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, 1992,

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2000). Field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days (USEPA, 2018). Diflubenzuron persistence varies depending on site conditions and rangeland persistence is unfortunately not available. Diflubenzuron degradation is microbially mediated with soil aerobic half-lives much less than dissipation half-lives. 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 the amount of 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 (USDA APHIS, 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 (Rosenberg et al., 1982; Cooper et al., 1990; Sample et al., 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 and Hall, 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

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wasps, predatory insects, and sucking insects show greater tolerance to diflubenzuron exposure (Murphy et al., 1994; Eisler, 2000; USDA FS, 2004).

Diflubenzuron is moderately toxic to spiders and mites (USDA APHIS, 2018c). Deakle and Bradley (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 et al. (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 et al., 1996).

Due to its mode of action, diflubenzuron has greater activity on immature stages of terrestrial invertebrates. Based on standardized laboratory testing diflubenzuron is considered practically non-toxic to adult honeybees. The contact LD50 value for the honeybee, *Apis mellifera*, is reported at greater than 114.8 µg a.i./bee while the oral LD50 value was reported at greater than 30 µg a.i./bee. USEPA (2018) reports diflubenzuron toxicity values to adult honeybees are typically greater than the highest test concentration using the end-use product or technical active ingredient. The lack of toxicity to honeybees, as well as other bees, in laboratory studies has been confirmed in additional studies (Nation et al., 1986; Chandel and Gupta, 1992; Mommaerts et al., 2006). Mommaerts et al. (2006) and Thompson et al. (2005) documented sublethal effects on reproduction-related endpoints for the bumble bee, *Bombus terrestris* and *A. mellifera*, respectively, testing a formulation of diflubenzuron. However, these effects were observed at much higher use rates relative to those used in the program.

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

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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.

APHIS reduces the risk to native bees and pollinators through monitoring grasshopper populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper populations allows APHIS to determine if populations require treatment and to make treatments in a timely manner reducing pesticide use and emphasizing the use of Program insecticides that are not broad spectrum. Historical use of Program insecticides demonstrate that diflubenzuron is the preferred insecticide for use. Over 90% of the acreage treated by the Program has been with diflubenzuron. Diflubenzuron poses a reduced risk to native bees and pollinators compared to liquid carbaryl and malathion applications.

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.

c) Reduced Area Agent Treatments (RAATs)

The use of RAATS is the most common application method for all program insecticides and would continue to be so, accept in rare pest conditions that warrant full coverage and higher rates. The goal of the RAATs strategy is to suppress grasshopper populations to a desired level, rather than to reduce those populations to the greatest

possible extent. This strategy has both economic and environmental benefits. APHIS would apply a single application of insecticide per year, typically using a RAATs strategy that decreases the rate of insecticide applied by either using lower insecticide spray concentrations, or by alternating one or more treatment swaths. Usually RAATs applications use both lower concentrations and skip treatment swaths. The RAATs strategy suppresses grasshoppers within treated swaths, while conserving grasshopper predators and parasites in swaths that are not treated.

The concept of reducing the treatment area of insecticides while also applying less insecticide per treated acre was developed in 1995, with the first field tests of RAATs in Wyoming (Lockwood and Schell, 1997). Applications can be made either aerially or with ground-based equipment (Deneke and Keyser, 2011). Studies using the RAATs strategy have shown good control (up to 85% of that achieved with a total area insecticide application) at a significantly lower cost and less insecticide, and with a markedly higher abundance of non-target organisms following application (Lockwood et al., 2000; Deneke and Keyser, 2011). Levels of control may also depend on variables such as body size of targeted grasshoppers, growth rate of forage, and the amount of coverage obtained by the spray applications (Deneke and Keyser, 2011). Control rates may also be augmented by the necrophilic and necrophagic behavior of grasshoppers, in which grasshoppers are attracted to volatile fatty acids emanating from cadavers of dead grasshoppers and move into treated swaths to cannibalize cadavers (Lockwood et al., 2002; Smith and Lockwood, 2003). Under optimal conditions, RAATs decrease control costs, as well as host plant losses and environmental effects (Lockwood et al., 2000; Lockwood et al., 2002).

The efficacy of a RAATs strategy in reducing grasshoppers is, therefore, less than conventional treatments and more variable. Foster et al. (2000) reported that grasshopper mortality using RAATs was reduced 2 to 15% from conventional treatments, depending on the insecticide, while Lockwood et al. (2000) reported 0 to 26% difference in mortality between conventional and RAATs methods. APHIS will consider the effects of not suppressing grasshoppers to the greatest extent possible as part of the treatment planning process.

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RAATs reduces treatment costs and conserves non-target biological resources in untreated areas. The potential economic advantages of RAATs was proposed by Larsen and Foster (1996), and empirically demonstrated by Lockwood and Schell (1997). Widespread efforts to communicate the advantages of RAATs across the Western States were undertaken in 1998 and have continued on an annual basis. The viability of RAATs at an operational scale was initially demonstrated by Lockwood et al. (2000), and subsequently confirmed by Foster et al. (2000). The first government agencies to adopt RAATs in their grasshopper suppression programs were the Platte and Goshen County Weed and Pest Districts in Wyoming; they also funded research at the University of Wyoming to support the initial studies in 1995. This method is now commonly used by government agencies and private landowners in States where grasshopper control is required.

Reduced rates should prove beneficial for the environment. All APHIS grasshopper treatments using carbaryl, diflubenzuron, or malathion are conducted in adherence with USEPA-approved label directions. Labeled application rates for grasshopper control tend to be lower than rates used against other pests. In addition, use rates proposed for grasshopper control by APHIS are lower than rates used by private landowners.

d) Experimental *Metarhizium robertsii* Applications

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 et al., 2001; Zimmerman, 2007; Roberts, 2018; Zhang et al. 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

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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 et al., 2009; Kepler et al., 2014; Mayerhofer et al., 2019) revealed DWR2009 is very closely related to many other strains within *M. robertsii*, all of which are basically biologically

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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 et al., 2001; Zimmerman, 2007; EA, 2010; Roberts, 2018).

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e) Experimental LinOilEx Applications

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 and Hartbauer, 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 and Hartbauer, 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.

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B. Other Environmental Considerations

1. Cumulative Impacts

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 of time."

Potential cumulative impacts associated with the No Action 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 rangeland. Increased insecticide applications from the lack of coordination or foregoing RAATs methods could increase the exposure risk to non-target species. In addition, land managers may not employ the extra program measures designed to reduce exposure to the public and the environment to insecticides.

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 an area with different insecticides but does not overlap the treatments. 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

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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, the vast majority 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.

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 the following as options for the Program: 1) the use of UAS to aerially apply Program insecticides, 2) the use of the biopesticide *Metarhizium robertsii* (isolate DWR2009), and 3) the use of the non-traditional insecticide LinOilEx. 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*

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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.

APHIS will consider the potential for disproportionately high and adverse human health or environmental impacts of its actions on minority and low-income communities in a specific program areas. APHIS has evaluated the proposed grasshopper program at the general level of the 17 listed Oregon counties, and has determined that there is no disproportionately high and adverse human health or environmental effects on minority populations or low-income populations evident at this broad geographic level of general planning.

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 APHIS, 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.

Impacts on children will be minimized by the implementation of the treatment guidelines:

Aerial Broadcast Applications (Liquid Chemical Methods)

1) Notify all residents within treatment areas, or their designated representatives, prior to proposed operations. Advise them of the control method to be used, the proposed method of application, and precautions to be taken (e.g., advise parents to keep children and pets indoors during ULV treatment). Refer to label recommendations related to restricted entry period.
2) No treatments will occur over congested urban areas. For all flights over congested areas, the contractor must submit a plan to the appropriate Federal Aviation Administration District Office and this office must approve of the plan; a letter of authorization signed by city or town authorities must accompany each plan. Whenever possible, the program plans aerial ferrying and turnaround routes to avoid flights over congested areas, bodies of water, and other sensitive areas that are not to be treated.

Aerial Application of Baits (Dry Chemical Methods)

Do not apply 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.

Prior to the treatment season, program personnel notify Tribal land managers of the potential for grasshopper outbreaks on their lands. Consultation with local Tribal representatives takes 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

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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 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 reducing, 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 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.

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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, 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
- Insecticides are not aerially applied in a a 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 submitted a programmatic biological assessment for grasshopper suppression in the 17-state program area and requested consultation with USFWS on March 9, 2015. 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 considers the role of pollinators in any consultations conducted with the FWS to protect federally-listed plants. Mitigation measures, such as no treatment buffers are applied with consideration of the protection of pollinators that are important to a listed plant species.

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.

Protection of Greater Safe-Grouse

After evaluating the best available scientific and commercial information regarding the greater sage-grouse (*Centrocercus urophasianus*), the US Fish & Wildlife Service determined that protection for the greater sage-grouse under the Endangered Species Act is no longer warranted and has withdrawn the species from the candidate species list. For pesticide application in Oregon, APHIS will implement conservation objectives and measures recommended by the Service and BLM for protection of greater sage-grouse.

Grasshoppers and Mormon crickets periodically have infestations which cause significant long-term damage to sagebrush. The use of insecticides is not known to pose range-wide threats to sage-grouse. However, insecticides have been documented as causing mortality to sage-grouse. Some insecticides could have detrimental effects to individual sage-grouse through direct contact, either by consumption of insects exposed to certain insecticides or by reduction of insect populations during times when insects are a crucial part of the birds' diets (U.S. Fish and Wildlife Service 2010).

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Conservation Objective: Maintain important sage-grouse forage base and avoid or minimize direct mortality to sage-grouse.

Conservation Measures:

1. Consult with Soil & Water Conservation Service. Avoid carbaryl; use diflubenzuron (Dirnilin) if possible;
2. Work with agency specialists to plan and design control efforts to avoid harming sage-grouse and non-target species;
3. Avoid spraying treatment areas in May and June (or as appropriate to local circumstances) to provide insect availability for early development of sage-grouse chicks;
4. Use approved chemicals with the lowest toxicity to sage-grouse that still provide effective control;
5. When feasible use Reduced Area/Agent Treatments (RAAT).

APHIS will abide by the protective measures in the December 22, 2011 BLM Instruction Memorandum No. 2012-043. In addition to the protective measures for greater sage-grouse in the December 22, 2013 BLM instructional memorandum, the Service and BLM also recommends including:

MD VEG 7: Do not use non-specific insecticides in brood-rearing habitat during the brood-rearing period (July 1 to October 31). Use instar-specific insecticides to limit impacts on greater sage-grouse chick food sources (September 2015 Oregon Greater Sage-Grouse Approved Resource Management Plan Amendment (GRSG ARMPA);

Required Design Features Common to All 19: There will be no disruptive activities two hours before sunset to two hours after sunset from March 1 to June 30 within 1.0 mile of the perimeter of occupied leks. Disruptive activities are those that are likely to alter greater sage-grouse behavior or displace birds such that reproductive success is negatively affected (GRSG ARMPA);

In general habitat management areas: Treat the minimum amount of area needed to ensure grasshopper or Mormon cricket control objectives, as agreed to by BLM and

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APHIS locally, while avoiding occupied or likely occupied nesting or late brood-rearing habitat to the extent possible;

In all habitat areas: The 2002 Rangeland Grasshopper and Mormon Cricket Suppression Program Final Environmental Impact Statement identifies the aerial application of diflubenzuron (Dimilin), applied in a Reduced Agent and Area Treatment (RAAT) method, or ground applications of carbaryl bait as the preferred treatment for grasshopper and Mormon cricket control;

Implement treatment effectiveness monitoring, if warranted. For example, carbaryl is sometimes used in critical situations, and monitoring is conducted after the use this active ingredient.

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 and Brown, 2009; Burling et al., 2010; Broyles, 2013). Particulate matter, CO, benzene, acrolein, and formaldehyde have been identified as compounds of particular concern in wildland fire smoke (Reinhardt and Ottmar, 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, available at: www.aphis.usda.gov/plant-health/grasshopper.

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The safety data sheet for each insecticide identifies these combustion products for each insecticide as well as recommendations for PPE. The PPE is similar to 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.

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 (stone tool making) occur within the proposed suppression area. Elements of the Oregon Trail transect portions of the proposed suppression area, and monuments have been erected in several places. Museums, displays and structures associated with mining, logging, Japanese internment camps, and irrigation development exist in areas near the proposed suppression area.

There are five federally recognized Indian tribes in this area. According to the 2016 Oregon Blue Book (http://bluebook.state.or.us), the Confederated Tribes of Warm Springs had a Tribal Member population of 4,800 and a 644,000 acre reservation near Madras, OR. The Confederated Tribes of the Umatilla Indian Reservation (CTUIR) have 2893 enrolled members and a 172,000 acre reservation near Pendleton, OR. The Burns Paiute Tribe has 349 members, a 13,736 acre reservation near Burns, OR. The Fort McDermitt Paiute-Shoshone Tribe's reservation straddles the Oregon-Nevada border, 18,829 acres are in Oregon.

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The Klamath Tribes exercise court affirmed treaty rights within the 1954 former Klamath Reservation Boundary, approximately 1.8 million acres in the northern half of the county. This area includes the Klamath Marsh National Wildlife Refuge and large portions of the Freemont-Winema Forests. In addition to treaty resources in this area, cultural resources and tribal traditional use areas extend beyond the 1954 Reservation Boundary to the aboriginal homelands of the Klamath Tribes.

The 1855 Treaty that created the Warm Springs and Umatilla Reservations reserved specific rights in the Treaty, which include the right to hunt and gather traditional foods and medicines on open and unclaimed lands. These rights are generally referred to as "Treaty reserved rights" and extend to approximately 16.4 million acres of ceded land in Washington and Oregon. Other Native Americans may practice traditional food and medicine gathering in the proposed suppression area.

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VI. Listing of Agencies and Persons Consulted

McMaster, Kemper, State Supervisor, Oregon Fish and Wildlife Office, US Fish and Wildlife Service, 2600 SE 98th Ave., Portland, OR 97266

Gilbert, Nancy, Field Supervisor, Bend Fish and Wildlife Office, US Fish and Wildlife Service, 20310 Empire Ave., Suite A100, Bend, OR 97701

Mauer, Alan, Biologist, Bend Fish and Wildlife Office, US Fish and Wildlife Service, 20310 Empire Ave., Suite A100, Bend, OR 97701

Buerger, Theodore, Manager, Environmental Contaminants Division, Oregon Fish and Wildlife Office, US Fish and Wildlife Service, 2600 SE 98th Ave., Portland, OR 97266

Wilson, Walt, Biologist, Ellensburg Field Office, NOAA Fisheries, 304 S. Water St., Ste. 201, Ellensburg, WA 98926

Johnson, Mike, Refuge Manager, Klamath Basin National Wildlife Refuges, H.C. 63, Box 303, Chiloquin, OR 97624.

Hawkes, Tony, Environmental Contaminants Specialist, US Fish and Wildlife Service, 6610 Washburn Way, Klamath Falls, OR 97603

Sada, Laurie Field Supervisor, Klamath Fish and Wildlife Office, US Fish and Wildlife Service, 6610 Washburn Way, Klamath Falls, OR 97603-9365

Murray, Eric, Fisheries Biologist, LaGrande Field Office, NOAA Fisheries, 3502 Highway 30, LaGrande, OR 97850

Jackson, Dick, Entomologist (retired), Oregon Department of Agriculture, PO Box 723, Hermiston, OR 97838

Tehan, Mike, Branch Chief, Oregon Habitat Division, NOAA Fisheries, 525 NE Oregon, Suite 500, Portland, OR 97323

Brown, Miles, Natural Resource Specialist, Oregon State Office, Bureau of Land Management, 333 SW 1st Avenue, Portland, Oregon 97204

Silva, Lynne, Rangeland Management Specialist, Vale District Office, Bureau of Land Management, 100 Oregon Street, Vale, OR 97918

Rasmussen, Tom, Resource Area Manager, Lakeview District Office, Bureau of Land Management, HC 10 Box 337, 1301 South G St., Lakeview, OR 97630

Richman, Leslie, Rangeland Management Specialist, Burns District Office, Bureau of Land Management, 28910 Hwy 20 West, Hines, Oregon 97738

Rogg, Helmuth, Entomologist, Oregon Department of Agriculture, 10507 N. McAllister, LaGrande, OR 97850

Thomas, Larry, Environment Protection Specialist, Prineville District Office, Bureau of Land Management, P. O. Box 550 - 3050 NE Third, Prineville, OR 97754

Meyer, Ralph, County Executive Director, USDA, Farm Service Agency, 256 Warner Milne Road, Oregon City, OR 97045

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Bearden, David A., Deputy Director, Spokane Regional Office, USDA Risk Management Agency, 112 N University Rd, Suite 205, Spokane, WA 99206

Pontes, Lena, Farm Program Coordinator, Oregon Tilth, 470 Lancaster Drive NE, Salem, OR 97301 Tweten, Randy, Eastern Oregon Team Leader, NOAA Fisheries, 3502 Hwy 30, LaGrande, OR 97850 Simmons, Jennifer, County Executive Director, USDA Farm Service Agency, Klamath Falls, OR 97603

Weist, Randy, Range Management Specialist, Rangeland Manager, Division of State Lands, State of Oregon, 20300 Empire Avenue, Suite 1, Bend, OR 97701

Laye, Doug, Fish and Wildlife Biologist, Klamath Fish and Wildlife Office, US Fish and Wildlife Service, 6610 Washburn Way, Klamath Falls, OR 97603-9365

Dyer, Thomas H., District Manager, Burns District Office, USDI Bureau of Land Management, 28910 Hwy 20 West, Hines, OR 97738

Huber, Audie, Intergovernmental Affairs Manager, Department of Natural Resources, Confederated Tribes of the Umatilla Indian Reservation

Blom, Paul, Entomologist, Oregon Department of Agriculture, 10507 N. McAllister, LaGrande, OR 97850

Appendix A - APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program
FY-2021 Treatment Guidelines

The objectives of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program are to 1) conduct surveys in the Western States; 2) provide technical assistance to land managers and private landowners; 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;
   e) Memoranda of Understanding with other Federal agencies.
2) Subject to the availability of funds, upon request of the administering agency, the agriculture department of an affected State, or private landowners, APHIS, to protect rangeland, shall immediately treat Federal, Tribal, 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.

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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 and Tribal Trust land, 50 percent of the cost on State land, and 33 percent of cost on private land. There is an additional 16.15% charge, however, on 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 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 party/ies 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 small 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 the included crop as well as rangeland and current Worker Protection Standards must be followed by the applicator and private landowner.

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

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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;
d) providing technical guidance.

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

GENERAL PROCEDURES FOR ALL AERIAL AND GROUND APPLICATIONS

1) Follow all applicable Federal, Tribal, State 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 the 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
      i) solid bait
      ii) ultra-low volume (ULV) spray
   b) Diflubenzuron ULV spray
   c) 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).

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Furthermore, 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 safety 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 aerial suppression program will have a Contracting Officer's Representative (COR) OR a Treatment Manager on site. Each State will have at least one COR available to assist the Contracting Officer (CO) in GH/MC aerial 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 very 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 program 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

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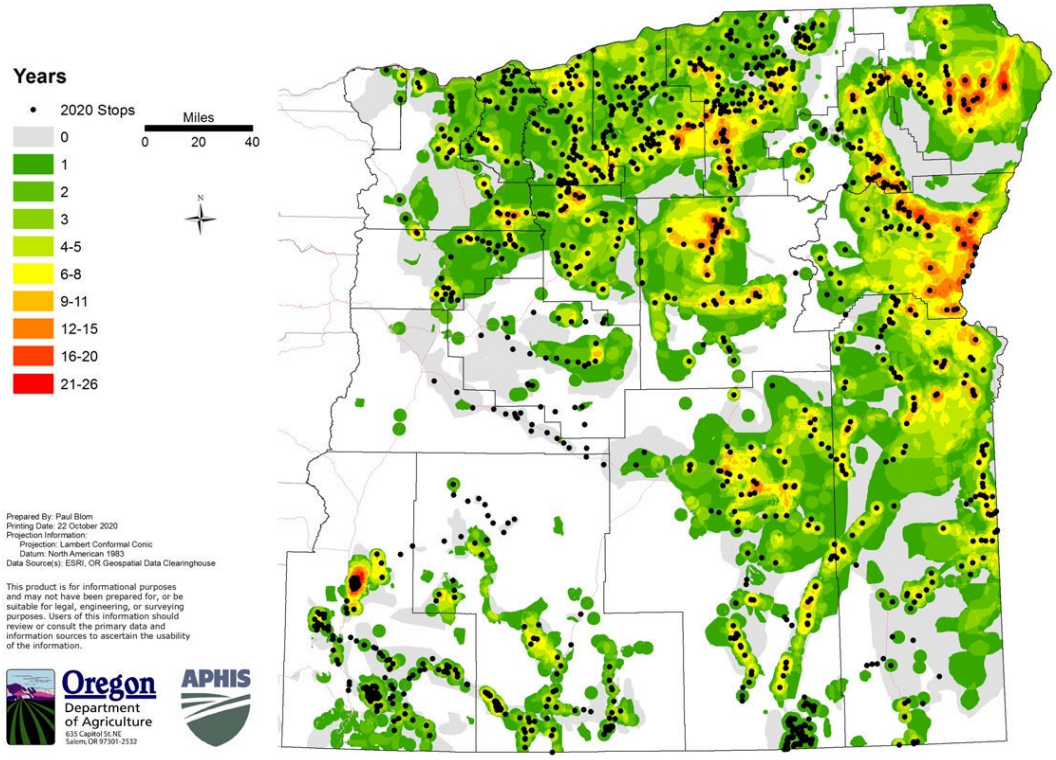
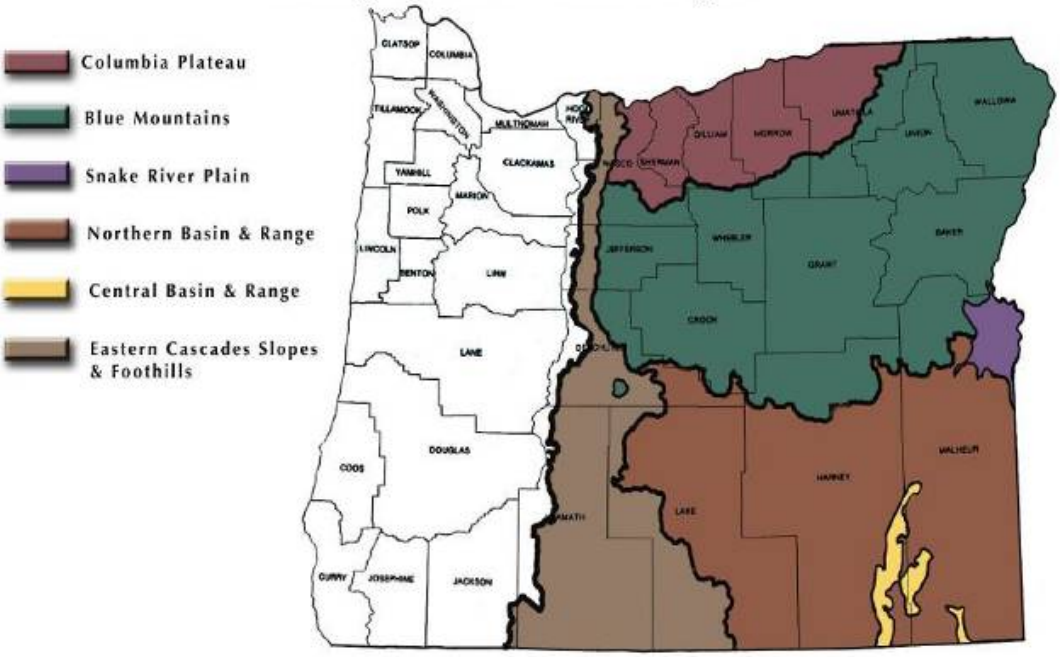
1) APHIS Aerial treatment contracts will adhere to the current year's Statement of Work (SOW).
2) Minimize the potential for drift and volatilization by not using ULV sprays when the following conditions exist in the spray area:
   a) Wind velocity exceeds 10 miles per hour (unless state law requires 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;
   e) Temperature inversions (ground temperature higher than air temperature) develop and deposition onto the ground is affected.
3) Weather conditions will be monitored and documented 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 wingspan of the aircraft whenever possible or as specified by the COR or the Treatment Manager.
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 B: Map of the Affected Environment

Economic Infestations of Grasshoppers in Oregon 1953 through 2020



Ecoregions Of Eastern Oregon



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Appendix C: FWS/NMFS Correspondence

Bridget Moran
Field Office Supervisor
US Fish & Wildlife Service
Bend Field Office
63095 Deschutes Market Road
Bend, Oregon 97701
Phone: 541-383-7146

January 19th, 2021

Dear Supervisor Moran:

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), in conjunction with Federal, State, and local cooperators, is preparing for possible grasshopper/ Mormon cricket mitigation programs on rangeland in eastern Oregon again this year. This letter is to request an informal exchange of Section 7 consultation information between the Service and APHIS to ensure that any grasshopper suppression programs conducted by APHIS in Oregon are in compliance with the Endangered Species Act (ESA).

As required by APHIS policy, until the programmatic Biological Assessment (BA) for the Grasshopper Program is completed it is necessary for State APHIS Offices to consult with their local FWS to assure compliance with the ESA. The local consultations must be completed prior to any treatments and completion is indicated by receipt of a letter of concurrence from the Service.

APHIS has prepared a 2021 BA for Oregon that arrives at affects determinations for each listed species and critical habitats which occur in the proposed action area. Where it is determined that the action may affect a listed species or its habitat, the BA specifies mitigation measures that are designed to reduce the potential effects to the point where they are not likely to adversely affect the listed species or its habitat. This BA also addresses the chemical diflubenzuron (Dimilin) and the RAATs (Reduced Agent-Area Treatment) strategy as treatment alternatives which were not considered in the last National Programmatic Biological Opinion, October 3, 1995.

The informal local consultation process has been used to obtain concurrence from your agency on the effects determinations made by APHIS. There are no additions to this BA from recent year's consultations, and we are proposing the same mitigation and conservation measures that were agreed to in previous years.

Please provide any coordination necessary with the Klamath Falls, La Grande, and Bend Field Offices. A written response from the Service is requested indicating whether you concur with the 'not likely to adversely affect' (NLAA) determinations in the Biological Assessment.

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Specifically, a written response is requested regarding the continued concurrence that potential grasshopper program mitigation activities have a NLAA determination, for the following ESA-listed threatened or endangered species and their designated critical habitats (referenced by (CH)):

- Yellow-billed cuckoo (*Coccyzus americanus*)
- Lahontan cutthroat trout (*Oncorhynchus clarki henshawi*);
- Hutton tui chub (*Gila bicolor* spp.);
- Warner sucker (CH) (*Catostomus warnerensis*);
- Lost River sucker (CH) (*Deltistes luxatus*);
- Shortnose sucker (CH) (*Chasmiste brevirostris*);
- Bull trout (CH) (*Salvelinus confluentus*);
- Applegate's milk-vetch (*Astragalus applegatei*);
- Howell's spectacular thelypody (*Thelypodium howellii spectabilis*);
- Spalding's catchfly (*Silene spaldingii*);
- Oregon spotted frog (CH) (*Rana pretiosa*).

For the species for which APHIS has arrived at 'no effect' determinations, please provide input if the Service has information to indicate otherwise. If there is no information to indicate that a determination other than "no effect" is warranted, then no further review of those species is necessary. APHIS has consulted separately with NOAA Fisheries for effects determinations for ESA-listed anadromous fishes.

Your cooperation and timely response in assisting APHIS to meet its ESA responsibilities are appreciated.

Sincerely,

Colin Park
Plant Health Safeguarding Specialist
USDA, APHIS, PPQ

Enclosed: 2021 APHIS Biological Assessment