Animal and Plant Health Inspection Service
U.S. DEPARTMENT OF AGRICULTURE

Final Environmental Assessment Rangeland Grasshopper and Mormon Cricket Suppression Program

BLAINE, CASCADE, CHOUTEAU, FERGUS, GLACIER, HILL, JUDITH BASIN, LEWIS&CLARK, LIBERTY, MEAGHER, PETROLEUM, PHILLIPS, PONDERA, TETON, TOOLE and VALLEY counties (except Fort Peck Reservation), MONTANA

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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

Final Site-Specific Environmental Assessment

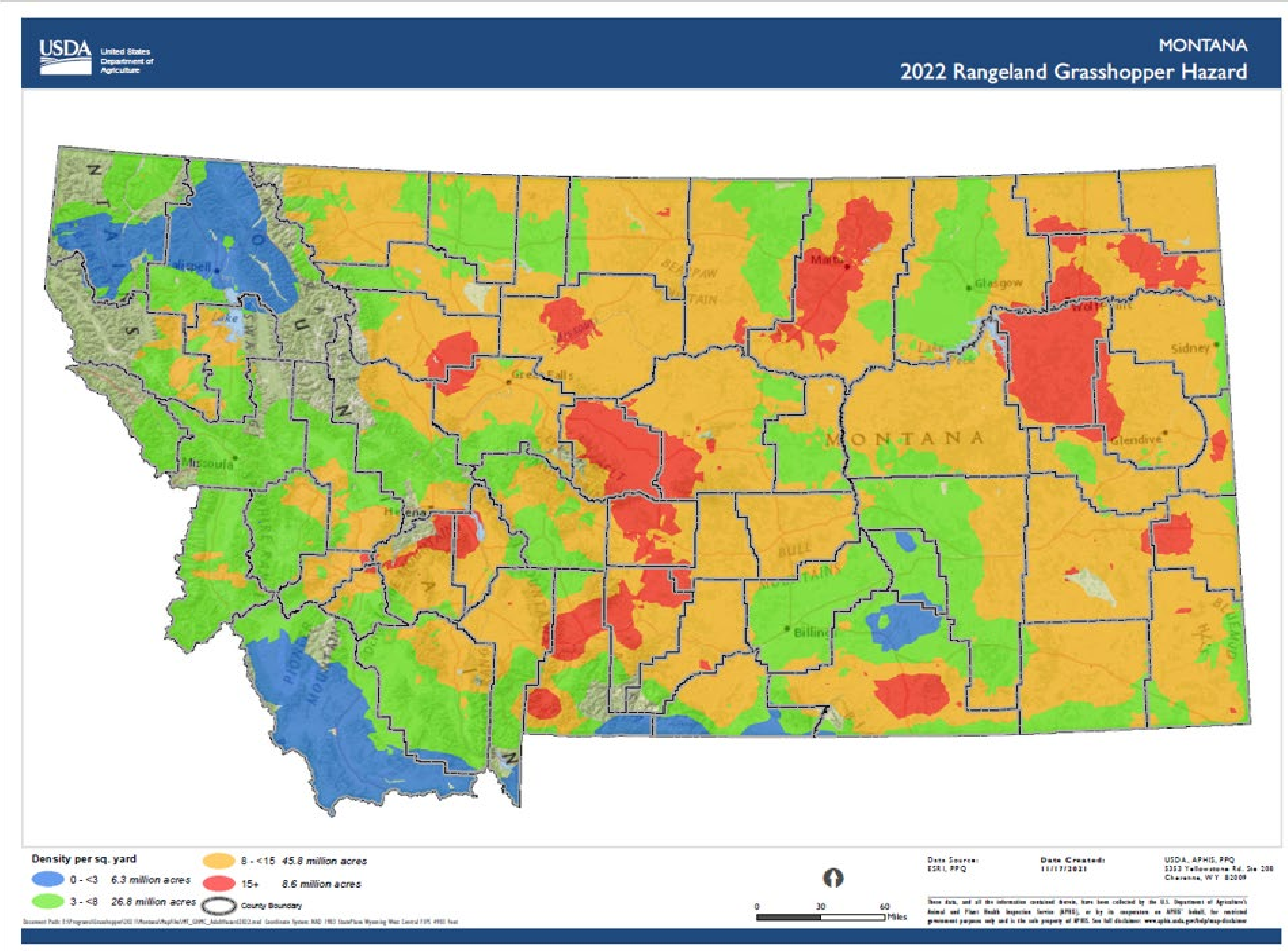
Rangeland Grasshopper and Mormon Cricket Suppression Program
BLAINE, CASCADE, CHOUTEAU, FERGUS, GLACIER, HILL, JUDITH BASIN, LEWIS&CLARK, LIBERTY, MEAGHER, PETROLEUM, PHILLIPS, PONDERA, TETON, TOOLE, and VALLEY counties (except Fort Peck Indian Reservation), MONTANA

I. Need for Proposed Action

A. Purpose and Need Statement

An infestation of grasshoppers or Mormon crickets may occur in Blaine, Cascade, Chouteau, Fergus, Glacier, Hill, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole, and Valley (except Fort Peck Indian Reservation) counties, Montana. The Animal and Plant Health Inspection Service (APHIS) may, upon request by land managers or State departments of agriculture, conduct treatments to suppress grasshopper infestations as part of the Rangeland Grasshopper and Mormon Cricket Suppression Program (program). The term "grasshopper" used in this environmental assessment (EA) refers to both grasshoppers and Mormon crickets, unless differentiation is necessary.

Populations of grasshoppers that trigger the need for a suppression program are normally considered on a case-by-case basis. Participation is based on potential damage such as stressing and/or causing the mortality of native and planted range plants or adjacent crops due to the feeding habits of large numbers of grasshoppers. The benefits of treatments include the suppressing of over abundant grasshopper populations to lower adverse impacts to range plants and adjacent crops. Treatment would also decrease the economic impact to local agricultural operations and permit normal range plant utilization by wildlife and livestock.
Some populations that may not cause substantial damage to native rangeland may require treatment due to the secondary suppression benefits resulting from the high value of adjacent crops and damage to re- vegetation programs.



The goal of the proposed suppression program analyzed in this EA is to reduce grasshopper populations below economical infestation levels in order to protect rangeland ecosystems or cropland adjacent to rangeland.

This EA analyzes potential effects of the proposed action and its alternatives. This EA applies to a proposed suppression program that would take place from 5/11/2022 to 9/30/2022 in Blaine**,** Cascade, Chouteau, Fergus, Glacier, Hill, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole and Valley counties (except Fort Peck Indian Reservation), Montana.

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 2022 Control Program for Blaine**,** Cascade, Chouteau, Fergus, Glacier, Hill, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole and Valley counties (except Fort Peck Indian Reservation), Montana.

B. Background Discussion

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

In rangeland ecosystem areas of the United States, grasshopper populations can build up to economic infestation levels[1] despite even the best land management and other efforts to prevent outbreaks. At such a time, a rapid and effective response may be requested and needed to reduce the destruction of rangeland vegetation. In some cases, a response is needed to prevent grasshopper migration to cropland adjacent to rangeland. In most circumstances, APHIS is not able to accurately predict specific 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.

The site-specific data used to make treatment decisions in real time is gathered during spring nymph surveys. The general site-specific data include: grasshopper densities, species complex, dominant species, dominant life stage, grazing allotment terrain, soil types, range conditions, local weather patterns (wind, temp., precipitation), slope and aspect for hatching beds, animal unit months (AUM's) present in grazing allotment, forage damage estimates, number of potential AUM's consumed by grasshopper population, 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. Baseline thresholds for Mormon crickets are two per square yard and grasshoppers are eight per square yard, though neither of those thresholds guarantees justification for treatment alone. These are all factors that are considered when determining the economic infestation level.

APHIS surveys grasshopper populations on rangeland in the Western United States, provides technical assistance on grasshopper management to land owners and 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. §

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

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.

APHIS' authority for cooperation in this suppression program is based on Section 417 of the Plant Protection Act of 2000 (7 U.S.C. § 7717).

In April 2014, APHIS and the Forest Service (FS) signed a Memorandum of Understanding (MOU) detailing cooperative efforts between the two groups on suppression of grasshoppers on national forest system lands (Document #14-8100-0573-MU, April 22, 2014). 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 MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the Forest Service.

The MOU further states that the responsible FS official will request, in writing, the inclusion of appropriate lands in the APHIS suppression project when treatment on national forest land is necessary. The FS must also approve 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 FS approves the Pesticide Use Proposal.

In January 2022, 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 system lands (Document #22-8100-0870-MU, January 11, 2022). 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 MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from 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 approve a pesticide use proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate document and BLM approves the pesticide use proposal.

In September 2016, APHIS and Bureau of Indian Affairs (BIA) signed a MOU detailing cooperative efforts between the two agencies on suppression of grasshoppers and Mormon crickets on BIA managed lands, APHIS PPQ MOU # 16-8100-0941-MU, September 16, 2016). 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 damaging grasshopper and Mormon cricket populations. The MOU also states that these documents will be prepared under the APHIS NEPA implementing procedures with cooperation and input from the BIA.

The MOU further states that the responsible BIA official will request, in writing, the inclusion of appropriate lands in the APHIS suppression project when treatment on Tribal land is necessary. The BIA must also approve a pesticide use proposal for APHIS to treat infestations. According to the provisions of the MOU, APHIS can begin treatments after APHIS issues an appropriate document and BIA approves the pesticide use proposal.

APHIS supports the use of Integrated Pest Management (IPM) principles in the management of grasshoppers and Mormon Crickets. APHIS provides technical assistance to Federal, Tribal, State and private 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. In addition, APHIS' authority under the Plant Protection Act is to treat

Federal, State and private lands for grasshoppers and Mormon cricket 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 and Mormon cricket populations that will reduce non-target effects. RAATs are one of the methods that has been developed to reduce the amount of pesticide used in suppression activities and is a component of IPM. APHIS continues to evaluate new suppression tools and methods for grasshopper and Mormon cricket 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 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.

Intergovernmental agreements between APHIS and cooperators with Tribal Nations may preclude disclosure of Tribal information to the public without the consent of the Tribal Administrator. Individuals may request information on the specific treatment areas on Tribal Lands from the individual Tribal Nations.

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 and Mormon cricket 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 Montana, 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.

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 1220 Cole Ave, Helena, MT 59601, or 1400 S 24th ST W, Suite 8A, Billings, MT 59102. These documents are also available at the Rangeland Grasshopper and Mormon Cricket Program web site, http://www.aphis.usda.gov/plant-health/grasshopper.

All insecticides used by APHIS for grasshopper 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 A to this final EA.

This final 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 Blaine**,** Cascade, Chouteau, Fergus, Glacier, Hill, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole, and Valley (except Fort Peck Indian Reservation) counties, Montana, 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 within Blaine**,** Cascade, Chouteau, Fergus, Glacier, Hill, Judith Basin, Lewis & Clark, Liberty, Meagher, Petroleum, Phillips, Pondera, Teton, Toole, and Valley (except Fort Peck Indian Reservation) counties, Montana. Under this alternative, APHIS may opt to provide limited technical assistance, but any suppression program would be implemented by a Federal land management agency, a State agriculture department, a local government, or a private group or individual.

B. 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. 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 commonly used by the program, is determined by the life stage of the dominant species within the outbreak population. Diflubenzuron can produce 90 to 97% grasshopper mortality in nascent populations with a greater percentage of early instars. If the window for the use of diflubenzuron closes, as a result of treatment delays, then carbaryl or rarely malathion are the remaining control options. Certain species are more susceptible to carbaryl bait, and sometimes that pesticide is the best control option.

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

- 8.0 fluid ounces (0.25 lb a.i.) of carbaryl ULV spray per acre;
- 10.0 pounds (0.20 lb a.i.) of 2 percent carbaryl bait per acre;
- 0.75 or 1.0 fluid ounce (0.012 lb a.i.) of diflubenzuron per acre; or
- 4.0 fluid ounces (0.31 lb a.i.) of malathion per acre.

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 20 feet for malathion, 100 feet for carbaryl and 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, carbaryl, diflubenzuron, or malathion 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:

- 16.0 fluid ounces (0.50 lb a.i.) of carbaryl spray per acre;
- 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; or
- 8.0 fluid ounces (0.62 lb a.i.) of malathion per acre.

The potential generalized environmental effects of the application of carbaryl, diflubenzuron, and malathion, under this alternative 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.

Sensitive Area Exclusion

PPQ grasshopper suppression actions will only occur on lands where PPQ has received a written request for assistance from the land manager or their representative. As part of that process, PPQ Montana asks each cooperator to complete a questionnaire that identifies sensitive sites on their property (Appendix D).
Sensitive sites can include: sage-grouse habitat; schools; residences; organic producers; surface water; bee hives; rangeland weed biological control sites; or any other site the landowner would like buffered or excluded from the treatment block. See Appendix A for specific buffers.

An APHIS or cooperating agency Geographic Information System (GIS) Specialist then creates a shapefile of the treatment block that outlines all sensitive sites, exclusions, and appropriate buffers. This layer will account for all natural surface water on the property utilizing both GIS data and landowner/manager input. Treatment maps are then ground-truthed by personnel to verify accuracy.

All aerial contractors are required to use GPS navigation equipment capable of uploading the produced shapefile of the treatment block. This GPS navigation equipment displays all sensitive sites and appropriate buffers so the contractor can turn off application equipment when flying over buffers. This GPS navigation equipment also records the aircraft's flight path and application equipment operation (on/off) allowing for a recording of the applications and real time assurance of appropriate calibration.

C. Experimental Treatments

APHIS-PPQ continues to refine its methods of grasshopper and Mormon cricket management in order to improve the abilities of the Rangeland Grasshopper and Mormon Cricket Suppression Program (hereafter referred to as the Program) to make it more economically feasible, and environmentally acceptable. These refinements can include reduced rates of currently used insecticides, improved formulations, development of more target-specific baits, development of biological insecticide suppression alternatives, and improvements to aerial and ground application equipment. A division of APHIS-PPQ, Science and Technology's (S&T) Insect Management and Molecular Diagnostics Laboratory (Phoenix Station) is located in Phoenix, Arizona and its Rangeland Grasshopper and Mormon Cricket Management Team (hereafter referred to as Rangeland Unit) conducts methods development and evaluations on behalf of the Program. The Rangeland Unit's primary mission is to comply with Title 7 of the U.S. Code Section 7717 and protect the health of rangelands (wildlife habitats and where domestic livestock graze) against economically damaging cyclical outbreaks of native grasshoppers and Mormon crickets in the 17 contiguous western states of the U.S.A. by finding, testing, and developing better, cheaper, and greener methods of integrated pest management in support of the APHIS Rangeland Grasshopper and Mormon Cricket Suppression 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 and Mormon crickets. This often includes testing and refining insecticide 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 throughout the 17 rangeland states. In fact, the specific location is often unable to be chosen until Rangeland Unit visits a location and assesses the population, terrain, and habitat using multiple criteria. The plots often include "no treatment" (AKA 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 insecticides on non-target arthropods. Note that an Experimental Use Permit is not needed when testing non-labeled experimental insecticides 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 set up on natural rangelands and the Rangeland Unit often works on private land with the permission of landowners. Locations of experimental treatments are always made available to the appropriate agencies to ensure these activities are not conducted near sensitive species or habitats. Due to the relatively small size of the experimental plots, no adverse effects to the environment, including protected species and their critical habitats, are expected, and great care is taken to avoid sensitive areas of concern prior to initiating studies.

Methods Development Studies

Methods development studies typically use planes, Unmanned Aircraft Systems (UAS), and all-terrain vehicles (ATVs) or utility terrain vehicles (UTVs) to apply insecticides using conventional (or uniform) applications and/or the Reduced Agent Area Treatments (RAATs) methodology. Experimental treatments involving biopesticides (such as native fungal pathogens) may also use an ultra-low volume sprayer system, such as an Ulvamast. Mixtures of native pathogens and low doses of insecticides may be conducted to determine if these multiple stressor combinations enhance mortality. Aircraft will be operated by Federal Aviation Administration certificated pilots under the USDA agricultural aircraft operator certificate.

Rangeland Unit often uses approximately 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 insecticides 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 on the top.

Insecticides and Biopesticides Used in Studies

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

1) Liquids: diflubenzuron (e.g., Dimilin 2L and all available generics) and carbaryl (e.g., Sevin XLR PLUS). Current Program standard application rates for conventional coverage (2019 GH-MC EIS, Table 2-1) are: diflubenzuron - 1.0 fl. oz./acre in a total volume of 31 fl. oz./acre; carbaryl - 16.0 fl. oz./acre in a total volume of 32 fl. oz./acre. Experimental rates often vary, but the doses used are at or lower than standard Program rates unless otherwise noted.

2) Baits: carbaryl. Current Program standard application rates for conventional coverage (2019 GH-MC EIS, Table 2-1) are: 2% bait at 10 lbs./acre (2 lbs. AI/acre) or 5% bait at 4 lbs./acre (2 lbs. AI/acre).

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

Biopesticides likely to be involved in studies currently include:

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

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

At explained earlier, Rangeland Unit is unable to say where in the 17 rangeland states it will be doing the following proposed treatments using experimental insecticides and biopesticides until shortly before experiments begin. The final location decision is primarily dependent upon grasshopper and/or Mormon cricket population densities, and availability of suitable sites.

Possible Study 1: Evaluate persistence and efficacy of the experimental biopesticide DWR2009 in liquid form or bait form by coating wheat bran with the pathogen. There are two possible treatment options: 1) place a species of local abundance into microplot cages and treat using the FAASST for liquid or feed bait to specimens by hand or using a push-spreader; 2) Use ATV/UTV-mounted liquid and bait spreaders to apply DWR2009 to $\leq$ 10 acres. Mortality and sporulation will then be observed for a duration of time to determine persistence and efficacy in both the field and lab.

Possible Study 2: 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 acreage ≤ 10 acres. ATV/UTV-mounted liquid sprayers 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 3: A stressor study to evaluate efficacy of the experimental biopesticide DWR2009 in liquid form when combined with Program insecticides, such as diflubenzuron. There are two possible treatment options: 1) place a species of local abundance into microplot cages and treat using the FAASST (to apply varying dose levels of diflubenzuron at or below label/Program rates) for liquid; 2) Use ATV/UTV-mounted sprayers to apply DWR2009 to ≤ 10 acres. Mortality and sporulation will then be observed for a duration of time to determine persistence and efficacy in both the field and lab.

Possible Study 4: Evaluate efficacy of the experimental insecticide 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 the EA encompasses 30,373,115 acres within 16 counties in Central and Northern Montana of which 13,420,127 acres are considered rangeland. These counties are: Blaine (population- 6,601), Cascade (81,755), Chouteau (5,759), Fergus (11,413), Glacier (13,694), Hill (16,542), Judith Basin (1,940), Lewis and Clark (67,282), Liberty (2,369), Meagher (1,827), Petroleum (489), Phillips (4,133), Pondera (6,084), Teton (6,056), Toole (4,977), and Valley (7,539). Ownership or stewardship of the land in this area is as follows: Private – 19,691,925 acres, BLM – 3,569,188 acres, USFS – 2,399,477 acres, State – 1,968,853 acres, Indian Trust – 1,721,148 acres, and Other Federal – 1,022,524 acres. Appendix 2 indicates the boundaries of the area covered by this EA. Specific treatment areas will be identified as an addendum to this document as they become identified.

The vast majority of this area is in the short-grass prairie region but also includes smaller areas in the mountain region. The elevation ranges from 2,000 feet along the lower River Valleys to nearly 10,500 feet (Mount Cleveland - 10,466) in the Rocky Mountains. The area is composed of glaciated and sedimentary plains with rolling hills, foothills with moderate to steep slopes and complex mountains that can be very rugged with deep canyons and sparse vegetation or timber covered with open meadows. Annual precipitation varies from 10 inches a year in the semi-arid plains to over 60 inches in the northwest mountain areas. The largest portion of the region falls within the 10-18 inches of precipitation per year range.

Major water resources include, but are not limited to: Missouri River, Blackfoot River, Dearborn River, Marias River, Milk River, Musselshell River, Judith River, Smith River, Sun River, Teton River, Two Medicine River, Armell's Creek, Beaver Creek, Big Sandy Creek, Birch Creek, Box Elder Creek, Cow Creek, Cut Bank Creek, Deep Creek, Dog Creek, Dry Wolf Creek, Dupuyer Creek, Flatwillow Creek, Frenchman Creek, Hound Creek, McDonald Creek, Muddy Creek, Peoples Creek, Sage Creek, Whitewater Creek, Willow Creek, Fort Peck Lake, Benton Lake, Canyon Ferry Lake, Crystal Lake, Duck Lake, Freezeout Lake, Hauser Lake, Holter Lake, Lake Bowdoin, Lake Elwell (Tiber Reservoir), Lake Frances, Lake Helena, Petrolia Lake, St. Mary Lake, Two Medicine Lake, War Horse Lake, Wild Horse Lake, Bynum Reservoir, Fresno Reservoir, Gibson Reservoir, Nelson Reservoir, North Chinook Reservoir, Pishkun Reservoir, Whitewater Reservoir, and Yellow Water Reservoir. Numerous small streams, ponds, reservoirs, seasonal streams, and stock ponds are located throughout the area.

Agriculture, being the number one industry in the Montana economy, livestock grazing (primarily cattle, sheep, and horses) occurs in every county in the state. Generally the crops grown in the area covered by this EA are small grains such as wheat, barley and oats, and irrigated and non-irrigated hay (alfalfa and grass).

The 16 county seats represented in this EA have a very large variance in population totals – four county seats have less than 1,000 residents, three have 1,000-1,999 residents, two have 2,000-2,999 residents, three have 3,000-3,999 residents, one has 5,000-5,999 residents, one has 9,000-9,999 residents, one has over 25,000 residents, and one over 56,500 residents. The county seat of Petroleum County (one of the least populated counties in the continental United States) is Winnett with a population of 185 and the county seat of Cascade County is Great Falls with a population of 59,178. Helena, the state capitol, and the county seat of Lewis and Clark County, has the second largest population with 31,169. Stanford, with a population of 384 is the second smallest and the county seat of Judith Basin County.

There are three Indian Reservations within the boundaries of this EA. They are the Blackfeet Indian Reservation within parts of Glacier and Pondera Counties, Fort Belknap Indian Reservation within parts of Blaine and Phillips Counties, and Rocky Boy's Indian Reservation in parts of Chouteau and Hill Counties.

Helena National Forest occupies areas of Lewis and Clark and Meagher Counties. Lewis and Clark National Forest is in areas of Cascade, Fergus, Judith Basin, Glacier, Lewis and Clark, Meagher, Pondera, and Teton Counties.

In addition to the national forests, other major recreational areas include Glacier National Park (no action is expected to be taken inside the boundaries of the Park), Bob Marshal Wilderness, Gates of the Mountains Wilderness, Scapegoat Wilderness, Bowdoin National Wildlife Refuge, Charles M. Russell National Wildlife Refuge, UL Bend National Wildlife Refuge, War Horse National Wildlife Refuge, Fort Peck Lake, Canyon Ferry Lake, Duck Lake, Freezeout Lake, Hauser Lake, Holter Lake, Lake Elwell (Tiber Reservoir), St. Mary Lake, National Wild and Scenic Missouri River, Chief Joseph Battleground of Bear's Paw, Sleeping Buffalo Hot Springs, Giant Springs State Park, Fort Benton Historic District, BLM lands, many smaller wildlife refuges, historic sites, and numerous streams, rivers, lakes, and other bodies of water used for recreational activities.

B. Site-Specific Considerations

1. Human Health

The population of the area covered by this EA is concentrated primarily in cities and towns. Hospitals are located in Big Sandy (population from July 1, 2016 Census estimates unless specified– 590), Chester (884), Choteau (1,686), Conrad (2,550), Cut Bank (3,012), Fort Benton (1,456), Glasgow (3,364), Great Falls (59,178), Havre (9,846), Helena (31,169), Lewistown (5,570), Malta (1,950), Shelby (3,216), and White Sulphur Springs (908). In addition licensed ambulance service is available in Augusta (315), Babb (174), Belt (588), Browning (1,031), Chinook (1,233), Denton (247), Dutton (308), East Helena (2,074), Fairfield (726), Fort Belknap Agency (1,293, 2010 Census), Fort Peck (247), Geraldine (261), Grass Range (108), Hinsdale (217, 2010 Census), Lincoln (1,013), Opheim (88), Power (171, 2000 Census), Rocky Boy Agency (324, 2000 Census), Roy (108, 2010 Census), Rudyard (258, 2010 Census), Saco (197), Stanford (384), Sunburst (338), Turner (61, 2010 Census), Valier (498), Whitewater (64, 2010 Census), Winifred (206), and Winnett (185). Schools are located in most of the cities and towns. Since treatments are conducted in rural rangeland, no impact to these facilities is expected.

Agriculture is a primary economic factor for the area and single-family dwellings are widely scattered throughout the region. In the event a rural schoolhouse or inhabited dwelling is encountered, mitigative measures will be implemented to ensure no treatments occur within the required buffer zones.

Potential exposures to the general public from traditional application rates are infrequent and of low magnitude.

These low exposures to the public pose little risk of direct toxicity, carcinogenicity, neurotoxicity, genotoxicity, reproductive toxicity, or developmental toxicity. Program use of Carbaryl, Malathion, and Diflubenzuron had occurred routinely in many past programs, and there is a lack of any adverse health effects reported from these projects. Therefore, routine safety precautions are anticipated to continue to provide adequate protection of worker health. Immunotoxic effects from Carbaryl and Malathion exposure are generally expected at concentrations much higher than those from grasshopper applications, but individuals with allergic or hypersensitive reactions to the insecticides or other chemicals in the formulated product could be affected. 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.

2. Nontarget Species

The area assessed by this EA is inhabited by a large variety of organisms, including terrestrial vertebrates and invertebrates, migratory birds, biocontrol agents, pollinators, aquatic organisms, plants (both native and introduced), etc. An extensive list can be searched through The Montana Natural Heritage Program: www.mtnhp.org

Under the No Action Alternative, destruction of grasses and forbs by grasshoppers could cause localized disruption of food and cover for a number of wildlife species. Under chemical control there is a possibility of indirect effects on local wildlife populations, particularly insectivorous birds that depend on a readily available supply of insects, including grasshoppers, for their own food supply and for their young. We have found no valid data which suggests that (absent a spill) any species other than certain mice would be subjected to a dosage in excess of 1/5 of the LD50 for Carbaryl (Pg. B-37 GH EIS.) Therefore, it is not apparent that any fatalities would be likely to occur as a result of Carbaryl intoxication.

Malathion and Carbaryl have been shown to reduce brain cholinesterase (ChE) (an enzyme important in nerve cell transmissions) levels in birds. Effects of ChE inhibition are not fully understood but could cause inability to gather food, escape predation, or care for young.

In any given treatment season, only a fraction (less than 1 percent) of the total rangeland in a region is likely to be sprayed for grasshopper control. For species that are widespread and numerous, lowered survival and lowered reproductive success in a small portion of their habitat would not constitute a significant threat to the population.

The wildlife risk assessment in the APHIS FEIS 2019 estimated wildlife doses of Malathion and Carbaryl to representative rangeland species and compared them with toxicity reference levels.
No dose of Malathion will approach or exceed the reference species LD50. Some individual animals may be at risk of fatality or behavioral alterations that make them more susceptible to predation resulting from ChE level changes in Malathion spraying for grasshopper control. However, most individual animals would not be seriously affected. Carbaryl also poses a low risk to wildlife, with few fatalities likely to occur and a low risk of behavioral anomalies caused by cholinesterase depression. There is some chance of adverse effects on bird reproduction through the use of any of these chemicals through direct toxicity to developing embryos in birds' eggs.

Some species of herbivorous mammals and birds may consume wheat bran bait after it has been applied to grasshopper-infested areas. Carbaryl is moderately toxic to mammals and slightly toxic to birds. We have found no valid data which suggests that (absent a spill) any species other than certain mice would be subjected to a dosage in excess of 1/5 of the LD50 for Carbaryl (Pg. B-37 GH EIS.) Therefore, it is not apparent that any fatalities would be likely to occur as a result of Carbaryl intoxication. Additionally, we note that Carbaryl 5% bait is labeled at three pounds per 1000 sq. ft. in poultry houses when poultry are present. http://www.cdms.net/Label-Database.) Chitin or chitin-like substances are not as important to terrestrial mammals, birds, and other vertebrates as chitin is to insects; therefore, the chitin inhibiting properties of Diflubenzuron applications under the conditions of Alternative 2 such as reductions in the food base for insectivorous wildlife species, especially birds. As stated above, Diflubenzuron is practically nontoxic to birds, including those birds that ingest moribund grasshoppers resulting from Diflubenzuron applications, as described in Alternative 2.

While immature grasshoppers and other immature insects can be reduced up to 98 percent in area covered with Diflubenzuron, some grasshoppers and other insects remain in the treatment area. Although the density of grasshoppers and other insects may be low, it is most likely sufficient to sustain birds and other insectivores until insect populations recover. Those rangeland birds that feed primarily on grasshoppers may switch to other diet items. However, in some areas the reduced number of invertebrates necessary for bird survival and development may result in birds having less available food. In these cases, birds will either have less than optimal diets or travel to untreated areas forsuitable prey items, causing a greater foraging effort and a possible increased susceptibility to predation. It also should be noted that suppressing grasshopper populations conserves rangeland vegetation that often is important habitat to rangeland wildlife. Habitat loss is frequently the most important factor leading to the decline of a species, and reducing grasshopper densities can be an aid in reducing habitat loss.

Domestic bees will be protected in accordance with operational procedures. Field level contacts with local beekeepers and the Montana Department of Agriculture will ensure safeguards for bees.

Biological Control agents used for controlling introduced weeds may be encountered within treatment areas. Local mitigation will be determined on a case by case basis in consultation with the local land managers.

3. Socioeconomic Issues

Recreation use is moderate over most of the affected area. There are several dispersed camping sites. Outdoor recreation in areas of high grasshopper/Mormon cricket populations may be adversely impacted due to annoyance of these insects.

Livestock grazing is one of the primary uses of most of the covered area, which provides summer range for ranching operations. Ranchers may graze cattle, sheep and/or horses in these areas. This rangeland may be utilized during the summer or reserved for fall and winter grazing.

A substantial threat to the animal productivity of these rangeland areas is the proliferation of grasshopper/Mormon cricket populations. These insects have been serious pests in the Western States since early settlement. Weather conditions favoring the hatching and survival of large numbers of insects can cause outbreak populations, resulting in damage to vegetation. The consequences may reduce grazing for livestock and result in loss of food and habitat for wildlife. Livestock grazing contributes to important cultural and social values to the area. Intertwined with the economic aspects of livestock operations are the lifestyles and culture that have co-evolved with Western ranching.

Ranchers displaced from grazing lands due to early loss of forage from insect damage will be forced to search for other rangeland, sell their livestock prematurely or purchase feed hay. It will affect other ranchers by increasing demand, and consequently, cost for hay and/or pasture in the area. This will have a beneficial effect on those providing the hay or range, and a negative impact on other ranchers who use these same resources throughout the area.

In addition, grazing on impacted lands will compound the effects to vegetation of recent drought conditions over the last five years (e.g., continual heavy utilization by grasshoppers/crickets, wildlife and wildfire), resulting in longer-term impacts (e.g., decline or loss of some preferred forage species) on grazing forage production on these lands. The lack of treatment would result in the eventual magnification of grasshopper problems resulting in increased suppression efforts, increased suppression costs, and the expansion of suppression needs onto lands where such options are limited. For example, control needs on crop lands where chemical options are restricted because of pesticide label restrictions.

Under the no action alternative, farmers would experience economic losses. The suppression of grasshoppers in the affected area would have beneficial economic impacts to local landowner, farmers and beekeepers. Crops near infested lands would be protected from devastating migrating hordes, resulting in higher crop production; hence, increased monetary returns.

4. Cultural Resources and Events

To ensure that historical or cultural sites, monuments, buildings or artifacts of special concern are not adversely affected by program treatments, APHIS will confer with BLM, USFS, or other appropriate land management agencies on a local level to protect these areas of special concern. APHIS will also confer with the appropriate Tribal Authority and with the BIA office at a local level to ensure that the timing and location of planned program treatments do not coincide or conflict with cultural events or observances, on Tribal and/or allotted lands.

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.

The human population at most sites in grasshopper programs is diverse and lacks any special characteristics that implicate greater risks of adverse effects for any minority or low-income populations. A demographic review in the APHIS EIS 2002 revealed certain areas with large populations, and some with large American Indian populations. Low-income farmers and ranchers would comprise, by far, the largest group affected by APHIS program efforts in this area of concern.

Three Indian Reservations exist within the boundaries of this EA. They are the Blackfeet Indian Reservation (15,560 members), the Fort Belknap Indian Reservation (6,693 members), and Rocky Boy's Indian Reservation (6,177 members). Member numbers are approximations and may or may not include tribal members living off and/or near each of the reservations.

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).

Treatments used for grasshoppers programs are primarily conducted on open rangelands where children would not be expected to be present during treatment or enter during the restricted entry period after treatment. Based on review of the insecticides and their use in programs, the risk assessment concludes that the likelihood of children being exposed to insecticides from a grasshopper program is very slight and that no disproportionate adverse effects to children are anticipated over the negligible effects to the general population.

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 final EA. These Environmental Documents can be found at the following website: http://www.aphis.usda.gov/plant-health/grasshopper.

A. Environmental Consequences of the Alternatives

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

1. No Suppression Program Alternative

Under this alternative, APHIS would not conduct a program to suppress grasshoppers. If APHIS does not participate in any grasshopper suppression program, Federal land management agencies, State agriculture departments, local governments, private groups or individuals, may not effectively combat outbreaks in a coordinated effort. Without the technical assistance and coordination that APHIS provides during grasshopper outbreaks, the uncoordinated programs could use insecticides that APHIS considers too environmentally harsh. Multiple treatments and excessive amount of insecticide could be applied in efforts to suppress or even locally eradicate grasshopper populations. There are approximately 100 pesticide products registered by USEPA for use on rangelands and against grasshoppers (Purdue 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 to 63% of the total value of rangeland across the western states (Rashford et al., 2012). Other market and non-market values such as carbon sequestration, general ecosystem services, and recreational use may also be impacted by pest outbreaks in rangeland.

Vegetation damage during serious grasshopper outbreaks may be so severe that all grasses and forbs are 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; 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 insecticides carbaryl, diflubenzuron, or malathion, depending upon the various factors related to the grasshopper outbreak and the site-specific characteristics. The use of an insecticide would typically occur at half the conventional application rates following the RAATs strategy. APHIS would apply a single treatment to affected rangeland areas to suppress grasshopper outbreak populations by a range of 35 to 98 percent, depending upon the insecticide used.

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 HHERA assessed available laboratory studies regarding the toxicity of carbaryl on fish and wildlife. In summary, the document indicates the chemical is highly toxic to insects, including native bees, honeybees, and aquatic insects; slightly to highly toxic to fish; highly to very highly toxic to most aquatic crustaceans, moderately toxic to mammals, minimally toxic to birds; moderately to highly toxic to several terrestrial arthropod predators; and slightly to highly toxic to larval amphibians (USDA APHIS, 2018a). 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).

A number of 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.

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

Carbaryl can cause cholinesterase inhibition (i.e., overstimulate the nervous system) in humans resulting in nausea, headaches, dizziness, anxiety, and mental confusion, as well as convulsions, coma, and respiratory depression at high levels of exposure (NIH, 2009a; Beauvais, 2014). USEPA classifies carbaryl as “likely to be carcinogenic to humans” based on vascular tumors in mice (USEPA, 2007, 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 ULV applications of the carbaryl spray (Sevin® XLR Plus) and bait applications of the carbaryl 5% and 2% baits formulations to control grasshoppers are not expected based on low potential for human exposure to carbaryl and the favorable environmental fate and effects data. Technical grade (approximately 100% of the insecticide product is composed of the active ingredient) carbaryl exhibits moderate acute oral toxicity in rats, low acute dermal toxicity in rabbits, and very low acute inhalation toxicity in rats. Technical carbaryl is not a primary eye or skin irritant in rabbits and is not a dermal sensitization in guinea pig (USEPA, 2007). This data can be extrapolated and applied to humans revealing low health risks associated with carbaryl.

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

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

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, 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 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 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 and Mormon cricket populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper and Mormon cricket 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) Malathion

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

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

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

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

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

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

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

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

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

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

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

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

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

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

d) 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.

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.

a) 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 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 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).

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.

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 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.

Individual landowners may conduct treatments of their own. These localized hotspot treatments are likely to be small in area such as garden plots or crop border treatments. Other federal or non-federal grasshopper control actions would not be conducted in the same area.

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* 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."

The human population at most sites in grasshopper programs is diverse and lacks any special characteristics that implicate greater risks of adverse effects for any minority or low-income populations. A demographic review in the APHIS EIS 2002 revealed certain areas with large populations, and some with large American Indian populations. Low income farmers and ranchers would comprise, by far, the largest group affected by APHIS program efforts in this area of concern.

Three Indian Reservations exist within the boundaries of this EA. They are the Blackfeet Indian Reservation (10,405 members), the Fort Belknap Indian Reservation (4,921 members), and Rocky Boy's Indian Reservation (3,323 members). Member numbers are approximations and may or may not include tribal members living off and/or near each of the reservations.

When planning a site-specific action related to grasshopper infestations, APHIS considers the potential for disproportionately high and adverse human health or environmental impacts of its actions on minority and low-income populations before any proposed action. In doing so, APHIS program managers will work closely with representatives of these populations in the locale of planned actions through public meetings.

APHIS intervention to locally suppress damaging insect infestations will stand to greatly benefit, rather than harm, low-income farmers and ranchers by helping them to control insect threats to their livelihood. Suppressing grasshopper/Mormon cricket infestations on adjacent federally administered or private range lands will increase inexpensive available forage for their livestock and will significantly decrease economic losses to their crop lands by invading insects. Suppression would reduce/negate the need to perform additional expensive crop pesticide treatments or to provide supplemental feed to their livestock which would further impact low- income individuals.

In past grasshopper programs, the U.S. Department of the Interior's (USDI) Bureau of Land Management or Bureau of Indian Affairs have notified the appropriate APHIS State Plant Health Director when any new or potentially threatening grasshopper infestation is discovered on BLM lands or Tribal and/or allotted lands held in trust and administered by BIA. Thus, APHIS has cooperated with BIA when grasshopper programs occur on trust lands. APHIS program managers will work with BIA and local Tribal Authorities to coordinate treatment programs.

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)

- 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.
- 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.

Ultra-Low Volume Aerial Application (Liquid Chemical Methods)

- Do not spray while school buses are operating in the treatment area.
- 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 and Mormon cricket 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 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.

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) 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 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.

On February 10, 2022, APHIS reached informal consultation with the USFWS office in Helena, MT (Appendix C). In this biological assessment PPQ-Montana determined that the proposed action will not affect grizzly bear *(Ursus arctos)*; Canada lynx, *(Lynx canadensis)*; black-footed ferret, (*Mustela nigripes)*; and whooping crane *(Grus Americana).* APHIS has determined the suppression program may affect, but is not likely to adversely affect the northern long-eared bat *(Myotis septentrionalis);* piping plover, *(Charadrius melodus)*; least tern, *(Sterna antillarum)*; red knot, (*Calidris canutus rufa*); yellow-billed cuckoo, (*Coccyzus americanus*); Spalding’s catchfly, *(Silene spaldingii);* pallid sturgeon, *(Scaphirhynchus albus)*; white sturgeon, *(Acipenser transmontanus)*; and bull trout, *(Salvelinus confluentus);* Ute Ladies’-tresses, *(Spiranthes diluvialis);* water howellia, *(Howellia aquatilis);* Meltwater

Lednian Stonefly, (*Lednia tumana);* and the Western Glacier Stone fly, (*Zapada glacier).*

Further, APHIS has determined that the suppression program will have no effect on Canada lynx *(Lynx canadensis)* or white sturgeon *(Acipenser transmontanus)* critical habitat, and may affect, but is unlikely to adversely affect critical habitat for the piping plover *(Charadrius melodus)* or bull trout *(Salvelinus confluentus).*

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. Baseline thresholds for Mormon crickets are two per square yard and grasshoppers are eight per square yard, though neither of those thresholds guarantees justification for treatment alone. Should grasshoppers be unavailable in small, localized areas, sage grouse chicks may consume other insects, which sage grouse chicks likely do in years when grasshopper numbers are naturally low. By suppressing grasshoppers, rangeland vegetation is available for use by other species, including sage grouse, and rangeland areas are less susceptible to invasive plants that may be undesirable for sage grouse habitat.

APHIS also implements several BMP practices in their treatment strategies that are designed to protect nontarget invertebrates, including pollinators. APHIS minimizes insecticide use by using lower than labeled rates for all Program insecticides, alternating swaths during treatment, making only one application per season and minimizing use of liquid broad-spectrum insecticides. APHIS also continues to evaluate new monitoring and control methods designed to increase the response to economically damaging populations of grasshoppers and Mormon crickets while protecting rangeland resources such as pollinators.

APHIS-BLM Coordination and Mitigation Measures to Protect BLM Sensitive Species

Grasshopper and Mormon Cricket treatments could potentially disturb sensitive status species during critical life stages. In addition, grasshoppers provide a food source for many species, for instance grasshoppers and other insects are important for sage-grouse chicks during early brood rearing. However, extreme grasshopper outbreaks can cause massive defoliation and the loss of forbs, reducing nesting cover for the following spring and reducing another important food source for sage- grouse. An effective rangeland treatment program will balance these short- and long- term impacts. The goal is to reduce grasshopper numbers to what would be encountered in a normal year, leaving an ample food base while protecting rangeland resources. To coordinate treatment actions with the BLMs sensitive species program's goals some general guidelines are provided to ensure effective communication and timely responses to treatment requests.

Stipulations for use on BLM administered lands identified for treatment by non-BLM parties

This is a list of common stipulations to be used when grasshopper treatments are requested by outside parties to include BLM lands in the treatment area. GIS data will be provided to APHIS by the BLM MT/DKs State Office.

Stipulations

- Buffer all water bodies by 500 feet (a stream layer will be provided).
- Only authorize diflubenzuron for use on BLM-administered lands
- Timbered areas to be avoided when treatment occurs will be identified by the local BLM Field Office.
- Pre and post grasshopper treatment and monitoring data will be provided upon completion. This would include a post treatment monitoring report to show effectiveness. Each suppression program will conduct environmental monitoring as outlined in the current year's Environmental Monitoring Plan. This report to be submitted to the BLM MT/DKs Invasive Species Specialist at the State Office at the end of each treatment season.

General Guidelines for Treatment

1. Notify BLM local and state offices in a timely manner, no less than 3 business days, before spraying of proposed treatments.
2. Coordinate with local BLM offices to identify areas containing sensitive status species (see the BLM Montana list).
3. Coordinate with local BLM offices to identify exclusion areas, other mitigation measures, and sensitive site monitoring needed for the protection of important fish, wildlife, and plant habitat.

Mitigation Measures for Sage-grouse

1. Exclude key sage-grouse areas, primarily nesting and brood-rearing habitats, as identified by local BLM office. (BLM Sage Grouse Habitat areas defined in the 2015 Resource Management Plans and Sage-grouse Amendments will be provided).
2. RAATs is to be used in all sage-grouse habitat.
3. Exclude priority areas from treatment in May.
3. No disruptive[1] ground activity within sage-grouse priority areas or within 3 miles of a sage-grouse lek outside of these areas from March 15 – June 30.

4. Treat priority areas through aerial application only and limit ground treatments within 3 miles of a sage-grouse lek outside a priority area to after June 30.
5. Avoid treatment in wet meadows areas as identified by field offices as important for sage-grouse brood rearing.

[1] Disruptive activity are activities likely to alter the behavior, displace, or cause excessive stress to existing animal populations occurring at a specific location and/or time, generally considered to be for more than one hour during a 24-hour period in a site-specific area. This does not include aerial RAATs.

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 (http://www.aphis.usda.gov/plant-health/grasshopper).

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

V. Literature Cited

Beauvais, S. 2014. Human exposure assessment document for carbaryl. Page 136. California Environmental Protection Agency, Department of Pesticide Regulation.

Belovsky, G. E., A. Joern, and J. Lockwood. 1996. VII.16 Grasshoppers—Plus and Minus: The Grasshopper Problem on a Regional Basis and a Look at Beneficial Effects of Grasshoppers. Pages 1-5 in G. L. Cunningham and M. W. Sampson, editors. Grasshopper Integrated Pest Management User Handbook, Technical Bulletin No. 1809. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Washington, DC.

Belovsky, G. E. 2000. Part 1. Grasshoppers as integral elements of grasslands. 1. Do grasshoppers diminish grassland productivity? A new perspective for control based on conservation. Pages 7-29 in J. A. Lockwood et al, editor. Grasshoppers and Grassland Health. Kluwer Academic Publishers, Netherlands.

Bonderenko, S., J. Gan, D. L. Haver, and J. N. Kabashima. 2004. Persistence of selected organophosphate and carbamate insecticides in waters from coastal watershed. Env. Toxicol. Chem. 23:2649-2654.

Bradshaw, J. D., K. H. Jenkins, and S. D. Whipple. 2018. Impact of grasshopper control on forage quality and availability in western Nebraska. Rangelands 40:71-76.

Branson, D., A. Joern, and G. Sword. 2006. Sustainable management of insect herbivores in grassland ecosystems: new perspectives in grasshopper control. BioScience 56:743-755.

Broyles, G. 2013. Wildland firefighter smoke exposure. Page 26. U.S. Department of Agriculture, Forest Service.

Buckner, C. H., P. D. Kingsbury, B. B. McLeod, K. L. Mortensen, and D. G. H. Ray. 1973. The effects of pesticides on small forest vertebrates of the spruce woods provincial forest, Manitoba. The Manitoba Entomologist 7:37-45.

Burling, I., R. Yokelson, D. Griffith, T. Johson, P. Veres, J. Roberts, C. Warneke, S. Urbanski, J. Reardon, D. Weise, W. Hao, and J. de Gouw. 2010. Laboratory measures of trace gas emissions from biomass burning of fuel types from the southeastern and southwestern United States. Atmospheric Chemistry and Physics 10:11115-111130.

Caro, J. H., H. P. Freeman, and B. C. Turner. 1974. Persistence in soil and losses in runoff of soil-incorporated carbaryl in a small watershed. J. Agricul. Food Chem. 22:860-863.

Catangui, M.A., Fuller, B.W., and Walz, A.W., 1996. Impact of Dimilin® on nontarget arthropods and its efficacy against rangeland grasshoppers. *In* U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1996. Grasshopper Integrated Pest Management User Handbook, Tech. Bul. No. 1809. Sec. VII.3. Washington, DC.

Chandel, R.S., and P.R Gupta. 1992. Toxicity of diflubenzuron and penfluron to immature stages of *Apis cerana indica* and *Apis mellifera*. Apidologie 23:465–473.

Cooper, R. J., K. M. Dodge, P. J. Marinat, S. B. Donahoe, and R. C. Whitmore. 1990. Effect of diflubenzuron application on eastern deciduous forest birds. J. Wildl. Mgmt. 54:486-493.

Cordova, D., E. Benner, M. D. Sacher, J. J. Rauh, J. S. Sopa, G. Lahm, T. Selby, T. Stevenson, L. Flexner, S. Gutteridge, D. F. Rhoades, L. Wu, R. M. Smith, and Y. Tao. 2006. Anthranilic diamides: a new class of insecticides with a novel mode of action, ryanodine receptor activation. Pesticide Biochemistry and Physiology 84:196-214.

Deakle, J. P. and J. R. Bradley, Jr. 1982. Effects of early season applications of diflubenzuron and azinphosmethyl on populations levels of certain arthropods in cotton fields. J. Georgia Entomol. Soc. 17:189-200.

Deneke, D. and J. Keyser. 2011. Integrated Pest Management Strategies for Grasshopper Management in South Dakota. South Dakota State University Extension.

Dinkins, M. F., A. L. Zimmermann, J. A. Dechant, B. D. Parkins, D. H. Johnson, L. D. Igl, C. M. Goldade, and B. R. Euliss. 2002. Effects of Management Practices on Grassland Birds: Horned Lark Northern Prairie Wildlife Research Center. Page 34. Northern Prairie Wildlife Research Center, Jamestown, ND.

Dobroski, C. J., E. J. O'Neill, J. M. Donohue, and W. H. Curley. 1985. Carbaryl: a profile of its behaviors in the environment. Roy F. Weston, Inc. and V.J. Ciccone and Assoc., Inc., West Chester, PA; Woodbridge, VA.

Eisler, R. 1992. Diflubenzuron Hazards to Fish, Wildlife, and Invertebrate: A Synoptic Review. U.S. Department of Interior, Fish and Wildlife Service, Washington, D.C.

Eisler, R., 2000. Handbook of chemical risk assessment: health hazards to humans, plants, and animals. Lewis Publishers, New York.

El-Refai, A. and T. L. Hopkins. 1972. Malathion adsorption, translocation, and conversion to malaoxon in bean plants. J. Assoc. Official Analytical Chemists 55:526-531.

Fischer, S. A. and L. W. Hall, Jr. 1992. Environmental concentrations and aquatic toxicity data on diflubenzuron (Dimilin). Critical Rev. in Toxicol. 22:45-79.

Follett, R. F. and D. A. Reed. 2010. Soil carbon sequestration in grazing lands: societal benefits and policy

implications. Rangeland Ecology & Management 63:4-15.
Foster, R. N., K. C. Reuter, K. Fridley, D. Kurtenback, R. Flakus, R. Bohls, B. Radsick, J. B. Helbig, A. Wagner, and L. Jeck. 2000. Field and Economic Evaluation of Operational Scale Reduced Agent and Reduced Area Treatments (RAATs) for Management of Grasshoppers in South Dakota Rangeland. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, Phoenix, AZ.
George, T. L., L. C. McEwen, and B. E. Peterson. 1995. Effects of grasshopper control programs on rangeland breeding bird populations. J. Range Manage. 48:336–342.
Gramlich, F. J. 1979. Effects of Sevin on songbird cholinesterase. Environmental Monitoring of Cooperative Spruce Budworm Control Projects. Maine Department of Conservation, Bureau of Forestry, Augusta, ME.
Guerrant, G. O., L. E. Fetzer, Jr., and J. W. Miles. 1970. Pesticide residues in Hale County, Texas, before and after ultra-low-volume aerial applications of Malathion. Pesticide Monitoring J. 4:14-20.
Havstad, K. M., D. P. Peters, R. Skaggs, J. Brown, B. Bestelmeyer, E. Fredrickson, J. Herrick, and J. Wright. 2007. Ecological services to and from rangelands of the United States. Ecological Economics 64:261-268.
Howe, F. P. 1993. Effects of Grasshopper Insecticide Application on Diet, Food Delivery Rates, Growth, and Survival of Shrubsteppe Passarine. Page 108 PhD dissertation. Colorado State University, Fort Collins, CO.
Howe, F. P., R. L. Knight, L. C. McEwen, and T. L. George. 1996. Direct and indirect effects of insecticide applications on growth and survival of nestling passerines. Ecol. Appl. 6:1314-1324.
Kar, A., K. Mandal, and B. Singh. 2012. Environmental fate of cholorantraniliprole residues on cauliflower using QuEChERS technique. Environ. Monit. Assess 85:1255-1263.
Keever, D. W., J. R. Bradley, Jr, and M. C. Ganyard. 1977. Effects of diflubenzuron (Dimilin) on selected beneficial arthropods in cotton fields. J. Econ. Entomol. 6:832-836.
LaFleur, K. S. 1979. Sorption of pesticides by model soils and agronomic soils: rates and equilibria. Soil Sci. 127:94-101.
Larsen, J. and R. N. Foster. 1996. Using Hopper to Adapt Treatments and Costs to Needs and Resources. U.S. Department of Agriculture, Animal and Plant Health Inspection Service Grasshopper Integrated Pest Management User Handbook, Washington, D.C.
Larson, J. L., C. T. Redmond, and D. A. Potter. 2012. Comparative impact of an antrhanilic diamide and other insecticidal chemistries on beneficial invertebrates and ecosystem services in turfgrass. Pest Management Science 68:740-748.
Latchininsky, A., G. Sword, M. Sergeev, M. Cigiliano, and M. Lecoq. 2011. Locusts and grasshoppers: behavior, ecology, and biogeography. Psyche 2011:1-4.
Lockwood, J. A. and S. P. Schell. 1997. Decreasing economic and environmental costs through reduced area and agent insecticide treatments (RAATs) for the control of rangeland grasshoppers: empirical results and their implications for pest management. J. Orthoptera Res. 6:19-32.
Lockwood, J., S. Schell, R. Foster, C. Reuter, and T. Rahadi. 2000. Reduced agent-area treatments (RAAT) for management of rangeland grasshoppers: efficacy and economics under operational conditions. International Journal of Pest Management 46:29-42.
Lockwood, J. A. and A. Latchininsky. 2000. The Risks of Grasshoppers and Pest Management to Grassland Agroecosystems: An International Perspective on Human Well-Being and Environmental Health. Pages 193-215 in A. Latchininsky and M. Sergeev, editors. Grasshoppers and Grassland Health. Kluwer Academic Publishers.
Lockwood, J., R. Anderson-Sprecher, and S. Schell. 2002. When less is more: optimization of reduced agent-area treatments (RAATs) for management of rangeland grasshoppers. Crop Protection 21:551-562.
Matsumara, F. 1985. Toxicology of insecticides. Plenum Press, New York.
McEwen, L.C., Althouse, C.M., and Peterson, B.E., 1996. Direct and indirect effects of grasshopper integrated pest management (GHIPM) chemicals and biologicals on nontarget animal life. *In* U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1996. Grasshopper Integrated Pest Management User Handbook, Tech. Bul. No. 1809. Sec. III.2. Washington, DC.

Miles, C. J. and S. Takashima. 1991. Fate of malathion and O.O.S. trimethyl phosphorothioate byproduct in Hawaiian soil and water. Arch. Environ. Contam. Toxicol 20:325-329.
Mommaerts, V., Sterk, G., and G. Smagghe. 2006. Hazards and uptake of chitin synthesis inhibitors in bumblebees *Bombus terrestris*. Pest Mgt. Science 62:752–758.
Murphy, C. F., P. C. Jepson, and B. A. Croft. 1994. Database analysis of the toxicity of antilocust pesticides to non-target, beneficial invertebrates. Crop Protection 13:413-420.
Muzzarelli, R. 1986. Chitin synthesis inhibitors: effects on insects and on nontarget organisms. CRC Critical Review of Environmental Control 16:141-146.
Narisu, J., A. Lockwood, and S. P. Schell. 1999. A novel mark-capture technique and its application to monitoring the direction and distance of local movements of rangeland grasshoppers (Orthoptera: Acridade) in context of pest management. J. Appl. Ecol. 36:604-617.
Narisu, J., A. Lockwood, and S. P. Schell. 2000. Rangeland grasshopper movement as a function of wind and topography: implications for pest movement. J. Appl. Ecol. 36:604-617.
Nation, J.L., Robinson, F.A., Yu, S.J., and A.B. Bolten. 1986. Influence upon honeybees of chronic exposure to very low levels of selected insecticides in their diet. J. Apic. Res. 25:170–177.
Neary, D. G. 1985. Fate of pesticides in Florida's forests: an overview of potential impacts of water quality. Pages 18-24 in Procs. Soil and Crop Sci. Soc. of FL.
Nigg, H. N., R. D. Cannizzaro, and J. H. Stamper. 1986. Diflubenzuron surface residues in Florida citrus. Bul. Environ. Contam. Toxicol. 36:833-838.
NIH. 2009a. Carbaryl, CASRN: 63-25-2. National Institutes of Health, U.S. National Library of Medicine, Toxnet, Hazardous Substances Database.
NIH. 2009b. National Institutes of Health, U.S. National Library of Medicine, Hazardous Substances Database.
Norelius, E. E. and J. A. Lockwood. 1999. The effects of reduced agent-area insecticide treatments for rangeland grasshopper (Orthoptera: Acrididae) control on bird densities. Archives of Environmental Contamination and Toxicology 37:519-528.
Pascual, J. A. 1994. No effects of a forest spraying of malathion on breeding blue tits (*Parus caeruleus*). Environ. Toxicol. Chem. 13:1127–1131.
Peach, M. P., D. G. Alston, and V. J. Tepedino. 1994. Bees and bran bait: is carbaryl bran bait lethal to alfalfa leafcutting bee (Hymenoptera: Megachilidae) adults or larvae? J. Econ. Entomol. 87:311- 317.
Peach, M. P., D. G. Alston, and V. J. Tepedino. 1995. Subleathal effects of carbaryl bran bait on nesting performance, parental investment, and offspring size and sex ratio of the alfalfa leafcutting bee (Hymenoptera: Megachilidae). Environ. Entomol. 24:34-39.
Pfadt, R. E. 2002. Field Guide to Common Western Grasshoppers, Third Edition. Wyoming Agricultural Experiment Station Bulletin 912. Laramie, Wyoming.
Purdue University. 2018. National Pesticide Information Retrieval System. West Lafayette, IN.
Quinn, M. A., R. L. Kepner, D. D. Walgenbach, R. N. Foster, R. A. Bohls, P. D. Pooler, K. C. Reuter, and J. L. Swain. 1991. Effect of habitat and perturbation on populations and community structure of darkling beetles (Coleoptera: tenebrionidae) on mixed grass rangeland. Environ. Entomol. 19:1746- 1755.
Rashford, B. S., A. V. Latchininsky, and J. P. Ritten. 2012. An Economic Analysis of the Comprehensive Uses of Western Rangelands. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
Reinhardt, T. and R. Ottmar. 2004. Baseline measurements of smoke exposure among wildland firefighters. Journal of Occupational and Environmental Hygiene 1:593-606.
Reisen, F. and S. Brown. 2009. Australian firefighters' exposure to air toxics during bushfire burns of autumn 2005 and 2006. Environment International 35:342-353.
Richmond, M. L., C. J. Henny, R. L. Floyd, R. W. Mannan, D. W. Finch, and L. R. DeWeese. 1979. Effects of Sevin 4-oil, Dimilin, and Orthene on Forest Birds in Northeastern Oregon. USDA, Pacific SW Forest and Range Experiment Station.
Rosenberg, K. V., R. D. Ohmart, and B. W. Anderson. 1982. Community organization of riparian breeding birds: response to an annual resource peak. The Auk 99:260-274.
Sample, B. E., R. J. Cooper, and R. C. Whitmore. 1993. Dietary shifts among songbirds from a

diflubenzuron-treated forest. The Condor 95:616-624.
Schaefer, C. H., A. E. Colwell, and E. F. Dupras, Jr. 1980. The occurrence of p-chloroaniline and p-c hlorophenylurea from the degradation of pesticide in water and fish. Proceedings of the 48th Ann. Meeting Mosquito Vector Cont. Assoc.:84-89.
Schaefer, C. H. and E. F. Dupras, Jr. 1977. Residues of diflubenzuron [1-(4-chlorophenyl)-3(2,6- difluorobenzoyl) urea] in pasture soil, vegetation, and water following aerial applications. J. Agric. Food Chem. 25:1026-1030.
Smith, D. and J. Lockwood. 2003. Horizontal and trophic transfer of diflubenzuron and fipronil among grasshoppers and between grasshoppers and darkling beetles (Tenebrionidae). Archives of Environmental Contamination and Toxicology 44:377-382.
Smith, D. I., J. A. Lockwood, A. V. Latchininsky, and D. E. Legg. 2006. Changes in non-target populations following applications of liquid bait formulations of insecticides for control of rangeland grasshoppers. Internat. J. Pest Mgt. 52:125-139.
Stanley, J. G. and J. G. Trial. 1980. Disappearance constants of carbaryl from streams contaminated by forest spraying. Bul. Environ. Contam. Toxicol. 25:771-776.
Swain, J. L. 1986. Effect of Chemical Grasshopper Controls on Non-Target Arthropods of Rangeland in Chaves County, New Mexico. New Mexico State University.
Tepedino, V. J. 1979. The importance of bees and other insect planetaries in maintaining floral species composition. Great Basin Naturalist Memoirs 3:139-150.
Thompson, H.M, Wilkins, S. Battersby, A.H., Waite, R.J., and D. Wilkinson. 2005. The effects of four insect growth-regulating (IGR) insecticides on honeybee (*Apis mellifera* L.) colony development, queen rearing and drone sperm production. Ecotoxicology 14:757–769.
Thomson, D. L. K. and W. M. J. Strachan. 1981. Biodegradation of carbaryl in simulated aquatic environment. Bul. Environ. Contam. Toxicol. 27:412-417.
USDA APHIS– see U.S. Department of Agriculture, Animal and Plant Health Inspection Service
U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 1999. APHIS Directive 5600.3, Evaluating APHIS programs and activities for ensuring protection of children from environmental health risks and safety risks. September 3, 1999. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Riverdale, MD. [online] available: http://www.aphis.usda.gov/library/directives.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2015. Biological Assessment for the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program. Page 162. U.S. Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018a. Human Health and Ecological Risk Assessment for Carbaryl Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018c. Human Health and Ecological Risk Assessment for Diflubenzuron Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2018d. Human Health and Ecological Risk Assessment for Malathion Rangeland Grasshopper and Mormon Cricket Suppression Applications. United States Department of Agriculture, Animal and Plant Health Inspection Service.
U.S. Department of Agriculture, Animal and Plant Health Inspection Service. 2019. Rangeland Grasshopper and Mormon Cricket Suppression Program Final Environmental Impact Statement. United States Department of Agriculture, Animal and Plant Health Inspection Service.
USDA FS. 2004. Control/eradication agents for the gypsy moth—human health and ecological risk assessment for diflubenzuron (final report). United States Department of Agriculture, Forest Service
USDA FS. 2008. Malathion- Human Health and Ecological Risk Assessment. U.S. Department of Agriculture, Forest Service.
USEPA – See U.S. Environmental Protection Agency
U.S. Environmental Protection Agency. 1997. Reregistration Eligibility Decision (RED): Diflubenzuron.

U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2000a. Malathion Reregistration Eligibility Document Environmental Fate and Effects. Page 146. U.S. Environmental Protection Agency, Office of Prevention, Pesticides and Toxic Substances.
U.S. Environmental Protection Agency. 2000b. Reregistration Eligibility Decision (RED) for Malathion. U.S. Environmental Protection Agency.
USEPA. 2003. Environmental Fate and Ecological Risk Assessment for Re-Registration of Carbaryl. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2006. Malathion Reregistration Eligibility Document. Page 147. U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2007. Reregistration Eligibility Decision (RED) for Carbaryl. Page 47. U.S. Environmental Protection Agency, Prevention, Pesticides and Toxic Substances.
U.S. Environmental Protection Agency. 2012a. Fyfanon ULV AG. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2012c. Sevin XLR Plus Label. Pages 1-40 Pesticide Product and Label System. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2015a. Annual Cancer Report 2015, Chemicals Evaluated for Carcinogenic Potential Page 34. U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2015b. Memorandum - Diflubenzuron: human health risk assessment for an amended Section 3 registration for carrot, peach subgroup 12-12B, plum subgroup 12-12C, pepper/eggplant subgroup 8010B, cottonseed subgroup 20C, alfalfa (regional restrictions) and R175 Crop Group Conversion for tree nut group 14-12. Page 71 U.S. Environmental Protection Agency, Office of Pesticide Programs.
U.S. Environmental Protection Agency. 2016a. Appendix 3-1: Environmental transport and fate data analysis for malathion. In: Biological Evaluation Chapters for Malathion ESA Assessment.
U.S. Environmental Protection Agency. 2016b. Chapter 2: Malathion Effects Characterization for ESA Assessment. In: Biological Evaluation Chapters for Malathion ESA Assessment.
U.S. Environmental Protection Agency. 2016c. Malathion: Human Health Draft Risk Assessment for Registration Review. Page 258. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2017a. Memorandum - Carbaryl: Draft Human Health Risk Assessment in Support of Registration Review. Page 113 U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2017b. Prevathon Label. U.S. Environmental Protection Agency.
U.S. Environmental Protection Agency. 2018. Preliminary Risk Assessment to Support the Registration Review of Diflubenzuron.
USFWS. 2007. National Bald Eagle Management Guidelines. Page 23 pp. U.S. Fish and Wildlife Service.
Wakeland, C. and W. E. Shull. 1936. The Mormon cricket with suggestions for its control, Extension Bulletin No. 100. University of Idaho, College of Agriculture, Idaho Agricultural Extension.
Zinkl, J. G., C. J. Henny, and L. R. DeWeese. 1977. Brain cholinesterase activities of birds from forests sprayed with trichlorfon (Dylox) and carbaryl (Sevin 4-oil). Bul. Environ. Contam. Toxicol. 17:379- 386.

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Appendix A: APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program

FY-2022 Treatment Guidelines
Version 2/5/2021

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.

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 and Mormon cricket outbreaks. Land

managers are encouraged to have implemented integrated pest management systems prior to requesting a treatment. In the absence of available funding or in the place of APHIS funding, the Federal land management agency, Tribal authority or other 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 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.

10) In general, treatment blocks must be at least 10,000 contiguous acres to be considered for aerial treatment.

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

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

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

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;

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   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.

Sensitive Area Exclusion

PPQ grasshopper suppression actions will only occur on lands where PPQ has received a written request for assistance from the land manager or their representative. As part of that process, PPQ Montana asks each cooperator to complete a questionnaire that identifies sensitive sites on their property (Appendix D). Sensitive sites can include: sage-grouse habitat; schools; residences; organic producers; surface water; bee hives; rangeland weed biological control sites; or any other site the landowner would like buffered or excluded from the treatment block. See Appendix A for specific buffers.

An APHIS or cooperating agency Geographic Information System (GIS) Specialist then creates a shapefile of the treatment block that outlines all sensitive sites, exclusions, and appropriate buffers. This layer will account for all natural surface water on the property utilizing both GIS data and landowner/manager input. Treatment maps are then ground-truthed by personnel to verify accuracy.

All aerial contractors are required to use GPS navigation equipment capable of uploading the produced shapefile of the treatment block. This GPS navigation equipment displays all sensitive sites and appropriate buffers so the contractor can turn off application equipment when flying over buffers. This GPS navigation equipment also records the aircraft’s flight path and application equipment operation (on/off) allowing for a recording of the applications and real time assurance of appropriate calibration.

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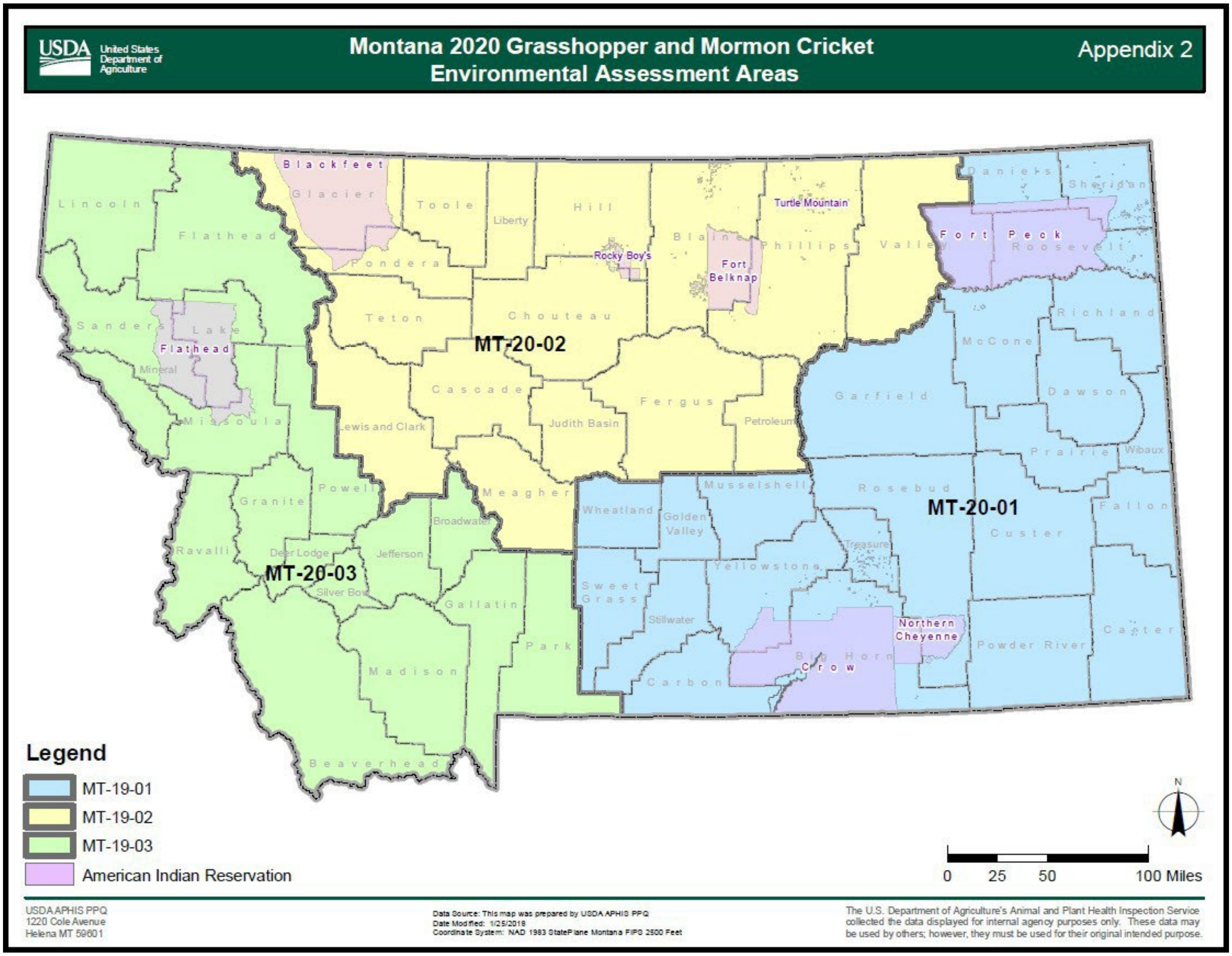
Appendix B: Map of the Affected Environment



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Appendix C: Letter of Request and Landowner Questionnaire

2022: USDA, APHIS, PPQ, Montana Grasshopper Suppression Program Site Specific Information Questionnaire and Request for Assistance.

DWP #:___________________________(USDA use only)

REQUEST FOR ASSISTANCE

I/We _________________________________ request USDA, APHIS, PPQ to assist with grasshopper suppression in 2022.

______________________________________ ________________

Agency / Ranch / Group / Individual Signature *Date*

PROJECT-QUESTIONNAIRE:

Please complete the following questions in their entirety. The information requested is imperative to successfully conducting any grasshopper suppression treatments.

Agency/Ranch/Group/Individual Name:

____

Authorized Representative Name:

____

(Designate an Authorized Representative to Communicate with if applicable)

1. Is there any key sage-grouse habitat in the proposed treatment area that should be excluded?
   ☐ Yes ☐ No
   If yes, please delineate clearly on the program map.

2. Are there any schools in the proposed treatment area?
   ☐ Yes ☐ No
   If yes, please indicate clearly on the program map.

3. A. Are there any residences in the proposed treatment area?
   ☐ Yes ☐ No
   If yes, please indicate clearly on the program map.

   B. Have all residents been notified of the treatment?
   ☐ Yes ☐ No
   If no, how will they be notified prior to treatment?

   ____

   ____

4. Are there any commercial or hobby honeybees in the proposed treatment area?

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☐ Yes ☐ No

If yes, what is the contact information for the beekeepers?

____

Will the bees be moved prior to treatment?

☐ Yes ☐ No

If no, identify actions:

____Treatments will not occur within ¼ mile of where bees remain. Identify all bee yards clearly on proposed treatment map.

5. Are there any Organic producers in the area or adjacent to requested treatment area?

   ☐ Yes ☐ No

   If yes, what is the contact information for the Organic producers?

   ____

   ____

6. Is there surface water (stock ponds, wetlands, streams) within the boundaries of the proposed treatment area that require the 500 ft. buffer?

   ☐ Yes ☐ No

   If yes, please delineate clearly all surface water on the proposed treatment map.

7. A. Are there any airstrips in or near the proposed treatment area?

   ☐ Yes ☐ No

   If yes, please indicate distance to the block or location on map <u>and</u> list contact information for strip owner/manager(s).

   ____

   ____

   B. Is there a source of clean water for mixing with pesticide formulations?

   ☐ Yes ☐ No

8. Please list any crops (defined as “planted with intent to harvest” and CRP (considered crop) within the borders of the proposed treatment and identify on the map.

   ____

   ____

   ____

9. Are there any rangeland weed biological control sites that should be avoided?

   ☐ Yes ☐ No

   If yes, please indicate clearly on the proposed program map.

10. List all other hazards or sensitive sites in the proposed treatment area that should be avoided.

    ____

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____

____

11. What percentage of ground would not be treated, due to tree-cover, etc.?

    Describe ____ ____________

12. List land ownership acres and estimate costs to cooperator.

    a. Federal/Trust Acres _______________ x $0 = __________________________

    b. State Acres ____________________x $ 2.00= __________________________

    c. Private Acres____________________x $3.00 = __________________________

    d. Private Crop Acres_______________x $4.50 =___________________________

    e. Total private cost share secured for payment at completion of program
    $_________________

    The estimates above are generally on the high-end of recent programs. Factors are driven primarily on commercial applicator bids. Those bids change based on: total acres to be treated, percentage of exclusions in block, terrain, ferry distance, distance from their home operations, competitive bids, and other factors.

13. If Contracting Bids are higher than expected, what is your maximum cost/acre acceptable?
    $________/acre

14. Cooperative Agreement Signed? ☐ Yes ☐ No Date:__________

Are there any other factors important for consideration of this Cooperative Project?

____
____

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__________________________________ ______________________________________
Printed Name Signature of Representative
Date

Appendix D: # 2022 Biological Assessment

For

Montana

Rangeland Grasshopper and Mormon Cricket Suppression Program

01/20/2022
Prepared by USDA, APHIS, PPQ
1220 Cole Ave.
Helena, MT 59601

BIOLOGICAL ASSESSMENT (BA) FOR STATEWIDE CONSULTATION AND CONFERENCE FOR 2022 GH/MC PROGRAMS IN MONTANA.

1.0 INTRODUCTION

The Animal and Plant Health Inspection Service (APHIS), in conjunction with Federal agencies, State departments of agriculture, Native American tribes, and private individuals is planning to conduct grasshopper/Mormon cricket control programs in Montana in 2022. This document is intended as statewide consultation and conference with the U.S. Fish and Wildlife Service (FWS) regarding the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program.

Beginning in 1987, APHIS has consulted with the FWS on a national level for the Rangeland Grasshopper Cooperative Management Program. Biological Opinions (BO) were issued annually by FWS from 1987 through 1995 for the national program. A letter dated October 3, 1995 from FWS to APHIS concurred with buffers and other measures agreed to by APHIS for Montana and superseded all previous consultations. Since then, funding constraints and other considerations have drastically reduced grasshopper/Mormon cricket control activities.

APHIS is requesting initiation of informal consultation for the implementation of the 2022 Mormon cricket and grasshopper suppression program on rangeland in Montana. Our determinations of effect for listed species, proposed species, critical habitat, and proposed critical habitat are based on the October 3, 1995 FWS letter, the analysis provided in the 2019 Environmental Impact Statement (EIS) for APHIS suppression activities in 17 states, the 2004 Montana BA, and local discussions with FWS.

APHIS has determined that the proposed action will not affect grizzly bear *(Ursus arctos)*; Canada lynx, *(Lynx canadensis)*; black-footed ferret, (*Mustela nigripes)*; and whooping crane *(Grus Americana)*. APHIS has determined the suppression program may affect, but is not likely to adversely affect the northern long-eared bat *(Myotis septentrionalis);* piping plover, *(Charadrius melodus)*; least tern, *(Sterna antillarum)*; red knot, (*Calidris canutus rufa*); yellow-billed cuckoo, (*Coccyzus americanus*); Spalding's catchfly, *(Silene spaldingii);* pallid sturgeon, *(Scaphirhynchus albus)*; white sturgeon, *(Acipenser transmontanus)*; and bull trout, *(Salvelinus confluentus);* Ute Ladies'-tresses, *(Spiranthes diluvialis);* water howellia, *(Howellia aquatilis);* Meltwater Lednian Stonefly, (*Lednia tumana);* and the Western Glacier Stone fly, (*Zapada glacier)*.

APHIS has determined that the suppression program will have no effect on Canada lynx *(Lynx canadensis)* or white sturgeon *(Acipenser transmontanus)* critical habitat, and may affect, but is unlikely to adversely affect critical habitat for the piping plover *(Charadrius melodus)* or bull trout *(Salvelinus confluentus)*.

With this letter, APHIS is requesting concurrence with our determination for listed species, and listed critical habitat that may occur in Montana within the area of the proposed 2022 grasshopper suppression program.

2.0 PURPOSE

This BA is for grasshopper/Mormon cricket control activities in the entire state of Montana. APHIS is requesting Endangered Species Act (ESA), section 7, informal consultation for those species that have been listed or proposed for listing in Montana since the October 3, 1995 FWS letter to Carl Bausch and for all listed species in those counties for the use of the growth regulator, Diflubenzuron. The agreements for Montana reached between APHIS and FWS will be in effect until a BO for the entire Rangeland Grasshopper Cooperative Management Program is issued and the nationwide, formal consultation process is completed.

Therefore, this BA will address species which have been proposed for listing since 1995 and have thus not been addressed in previous Biological Opinions. This BA also addresses the use of diflubenzuron as it relates to species previously addressed in past biological opinions.

Most rangeland treatments and border protection programs will be applied utilizing the reduced agent area treatments (RAATs) techniques. RAATs treatments differ from traditional programs by applying fewer agents to fewer acres while maintaining efficacy. On occasion, modified RAATs (less agent and/or treated area than conventional treatments, but more than RAATs) may be used.

APHIS respectfully requests informal ESA consultation on listed and proposed species in Montana. A written response from FWS is requested regarding FWS concurrence with the determinations in this assessment.

3.0 DESCRIPTION OF ACTION

This document incorporates by reference portions of the 1987 APHIS Rangeland Grasshopper Cooperative Management Program, Final Environmental Impact Statement (2019 APHIS FEIS) which discuss the purpose and needs, alternative strategies, affected environments, standard operational procedures, and environmental consequences of the grasshopper program.

Three environmental assessments (EAs), tiered to the 2019 Rangeland Grasshopper and Mormon Cricket Suppression Program Final Environmental Impact Statement (FEIS), are being prepared in anticipation of treatments in the State of Montana. When specific treatment areas are identified and become imminent, a site-specific map will be prepared and buffered according to agreed mitigations measures. Grasshopper Program decisions are then based on the conclusions reached in the EAs. Only the program operational procedures and alternatives found in the 2019 FEIS are available to APHIS for use in any site-specific treatment.

Grasshopper populations may build up to levels of damaging infestations despite even the best land management and other efforts to prevent outbreaks. At such time, a rapid and effective response may be requested and needed to reduce the destruction of rangeland vegetation, or in some cases, to also prevent grasshopper migration to private agricultural lands. The 2002 FEIS analyzes the alternatives available to APHIS when a Federal land management agency, Tribe or State agriculture departments (on behalf of a State, a local government, or a private group or individual) requests APHIS to suppress economically damaging grasshopper populations.

The chemical control methods will include the use of carbaryl, malathion, and diflubenzuron. Four alternatives are considered: 1) No action, 2) insecticide applications at conventional rates and complete area coverage, 3) reduced agent area treatments (RAATs), and 4) modified RAATs.

Conventional rates for these agents are:

- 16 fluid ounces (0.50 pound active ingredient (lb a.i.)) of carbaryl spray per acre,
- 10 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, or
- 8 fluid ounces (0.62lb a.i.) of malathion per acre.

Rates utilizing RAATs are:

- 8 fluid ounces (0.25 pound active ingredient (lb a.i.)) of carbaryl spray per treated acre,
- 10 pounds (0.20 lb a.i.) of 2-5 percent carbaryl bait per treated acre,
- .75 to 1.0 fluid ounce (0.012 lb a.i.) of diflubenzuron per treated acre, or
- 4 fluid ounces (0.31lb a.i.) of malathion per treated acre

Malathion and carbaryl inhibit acetyl cholinesterase (AChE) function in the nervous system. Reduced area/agent treatments (RAATs) rates for carbaryl are 8-12 ounces per acre containing 280-420 grams of a.i. in 100 foot treated swaths alternating with 100 foot untreated for air applications. 2 percent carbaryl bait containing .20 lb a.i. in 30-50 foot swaths alternating with 30- 50 foot untreated swaths are used for ground applications. With RAATs techniques, malathion is applied at a rate of four fl. oz. per acre or 342 grams of active ingredient in 100 foot treated swaths alternating with 25 foot untreated swaths. An example of modified RAATs by ground application may incorporate 5 percent carbaryl bait containing .50 a.i. in 30-50 foot swaths alternating with 30-50 foot untreated swaths.

Diflubenzuron is a growth regulator that functions as a chitin inhibitor affecting the formation and/or deposition of chitin in the insect's exoskeleton. Application rates range from .75 to 1.0 fluid ounce (fl. oz.) per acre in rangeland and 1.0 fl. oz. per acre in border protection situations where nearby agricultural lands are being threatened by grasshoppers originating in adjacent federally managed rangelan

4.0 ASSESSMENTS:

4.1 MAMMALS

4.1.1 **Bear, grizzly**, *Ursus arctos horribilis*

4.1.1.1 Status:

The grizzly bear was designated as Threatened on March 11, 1967. On November 17, 2000, the grizzly bear was designated as Experimental Population, Non-Essential in the Bitterroot area of Idaho and Montana (Final Special Rule, 17.84(l)).

4.1.1.2 Habitat and Distribution:

Grizzly bears are distributed throughout mountainous and transition prairie areas throughout Montana. Four Grizzly Bear Recovery Areas and adjacent Distribution Areas (or Primary Conservation Areas) are located throughout western Montana. (See Attachments 1 and 1a).

4.1.1.3 Assessment:

Any of the proposed actions are not likely to jeopardize the continued existence of the grizzly. This conclusion is based on the characteristics of the insecticides, application rates, and size of the species in relationship to the factors discussed on page 12 of the 1987 FWS Biological Opinion. This conclusion is adopted for Diflubenzuron.

Due to the wide-ranging habits (wandering nature) of the grizzly bear it is unlikely that either aircraft disturbance or toxic effects will be a factor.

4.1.1.4 Protective measures:

No treatment programs will be conducted in the current Grizzly Bear Distribution Areas (which includes the Grizzly Bear Recovery Areas) in Montana. These are areas where one would reasonably expect to find grizzly bear use occurring during most years.

4.1.1.5 Determination:

The risk analysis provided in the BA leads to the conclusion that the Program will have no effect on the grizzly bear as a result of the proposed pesticides at the proposed rates of application. Refer to the January 1987 APHIS BA and the June 1, 1987 FWS Biological Opinion.

4.1.2 **Lynx, Canada,** *Lynx Canadensis*

4.1.2.1 Status:

The Canada lynx was designated as Threatened on March 24, 2000.

4.1.2.2 Habitat and Distribution:

Canada lynx are highly dependent on snowshoe hare. In the western U.S., lynx live in sub alpine coniferous forests of northern latitudes. Canada lynx avoid openings such as clear cuts and grasslands because snowshoe hares also are unlikely to use such areas and because these areas lack the cover necessary for both species.

4.1.2.3 Assessment:

Grasshopper treatments generally occur only over open habitat common to grasshoppers. Due to the wide-ranging habits of the Canada lynx it is unlikely that either aircraft disturbance or toxic effects will be a factor.

The proposed actions will not adversely affect the snowshoe hare, the Canada lynx's primary food source. These conclusions are based on the characteristics of the insecticides, application rates, and size and habits of the species. These factors are similar to those previously consulted on for the grizzly bear and gray wolf.

4.1.2.4 Protective measures:

APHIS will not treat forested areas or rangelands that are not adjacent to crops but are surrounded by forest and are above 4000 feet in elevation.

4.1.2.5 Determination:

There will be no effect on the Canada lynx as a result of the proposed pesticides at the proposed rates of application and treatments are unlikely to occur in or near suitable habitat.

4.1.4 **Ferret, black-footed**, *Mustela nigripes*

4.1.4.1 Status:

The black-footed ferret was designated as Endangered on March 11, 1967 and on August 21, 1991 as Experimental Population, Non-Essential in parts of Montana and other states.

4.1.3.2 Habitat and Distribution:

Black-footed ferrets are directly correlated with active prairie dog towns. Proctor (1998) developed a GIS model to provide a method for creating habitat maps outlining suitable black- tailed prairie dog habitat on lands in the northern Great Plains short grass prairie at a scale that will identify regional potential for prairie dog ecosystem recovery, "including the needs of associated species."

Preferred and potential suitable habitat categories were developed… The categories that identified suitable habitat for black-tailed prairie dogs were the preferred (favored vegetation and favored slope), potential (favored slope, less favored vegetation) and potential (favored vegetation and less favored slope). Favored vegetation can be described as very low cover grassland, salt- desert shrub, dry salt-flats, and mixed barren sites. Favored slope has a 0-4% slope and less favored slope ranges 4-25% slope (Proctor 1998). Montana counties containing preferred habitat include the following: Treasure (43 acres), Golden Valley (1,007 acres), Rosebud (147,671 acres), Powder River (166,425 acres), Wheatland (1,448 acres), Musselshell (93,015 acres), Sweet Grass (2,965 acres), Carbon (65,269 acres), Blaine (276,860 acres), Stillwater (4,571 acres), Yellowstone (52,855 acres), Big Horn (8,399 acres), Park (4,204 acres), Gallatin (17,151 acres), Carter (444,645 acres), and Custer (233,128acres).

The elimination of black-footed ferrets throughout their historic range is thought to be directly related to widespread disease outbreaks, primarily sylvatic plague, land-use modifications to its native rangeland habitat, and large-scale use of toxicants to control black-tailed prairie dogs, the ferret's primary prey species. The ferret was thought to be extinct in 1979, when the last animal captured from a population in Mellette County, South Dakota died in captivity. In the wake of the rediscovery of the species in the wild in 1981 near Meeteetse, Wyoming, in 1989, the Service instituted the survey protocol Black-footed Ferret Survey Guidelines for Compliance with the Endangered Species Act, designed to detect ferrets in potentially suitable habitats. Despite the fact that thousands of hours of survey effort have been expended throughout the historic range of the species since 1981 in an attempt to locate additional extant populations, to date no other wild populations have ever been detected.

The failure to locate additional extant black-footed ferret populations, coupled with the ubiquity of sylvatic plague throughout the historic range of the species, has prompted the U.S. Fish and Wildlife Service to determine that the black-footed ferret has been extirpated throughout its range, except where it has been purposely reintroduced using captive-reared or translocated wild individuals. Purposeful reintroduction of black-footed ferrets has occurred at 29 reintroduction sites in 8 states since 1991, and reintroductions have taken place through the use of two ESA regulatory mechanisms. Under the authority of Section 10(j) of the ESA, experimental, non- essential populations of ferrets have been established in portions of Arizona, Colorado, Montana, South Dakota, Utah, and Wyoming. These rulemaking procedures have removed the need for Section 7 consultations with regard to the black-footed ferret, except on lands administered by the Service and the National Park Service. More recently, ferrets have been reintroduced through the Black-footed Ferret Programmatic Safe Harbor Agreement (BFF PSHA), which uses authorities described in Section 10(a)(1)(A) of the ESA.

4.1.3.3 Assessment:

The black-footed ferret was analyzed in the January 1987 APHIS BA for possible effects resulting from the Rangeland Grasshopper Cooperative Management Program. The APHIS/FWS ESA formal consultations concluded that the species continued existence would not be jeopardized by the proposed program. This conclusion is adopted for Diflubenzuron.

4.1.3.4 Protective measures:

APHIS will avoid treatment in the four defined reintroduction areas for the black-footed ferret. (See Attachment 3).

4.1.3.5 Determination:

Treatments will have no effect on black-footed ferrets as a result proposed pesticides and the proposed rates of application.

4.1.4 **Northern Long-Eared Bat** – *Myotis septentrionalis*

4.1.4.1 Status: The Northern Long-Eared Bat was designated Threatened on May 04, 2015.

4.1.4.2 Habitat and Distribution:

During summer, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat seems opportunistic in selecting roosts, using tree species based on suitability to retain bark or provide cavities or crevices. It has also been found, rarely, roosting in structures like barns and sheds. Northern long-eared bat spend winter hibernating in caves and mines, called hibernacula. They typically use large caves or mines with large passages and entrances; constant temperatures; and high humidity with no air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

The Northern Long-Eared Bat may occur in the following Montana counties: Carter, Custer, Dawson, Fallon, Powder River, Prairie, Richland, Roosevelt, and Wibaux. See the attached Northern Long-Eared Bat Species Occurrence, Montana map, attachment 11.

Northern long-eared bats emerge at dusk to fly through the understory of forested hillsides and ridges feeding on moths, flies, leafhoppers, caddisflies, and beetles, which they catch while in flight using echolocation. This bat also feeds by gleaning motionless insects from vegetation and water surfaces.

4.1.4.3 Assessment:

Grasshopper suppression activities generally occur only over open rangeland habitat common to grasshoppers. Due to the habitat in which the woodland northern long-eared bat inhabit (forested areas; caves and caverns; buildings) it is unlikely that either aircraft disturbance or toxic effects will be a factor. APHIS grasshopper suppression activities may affect, but are not likely to adversely affect northern long-eared bat.

4.1.4.4 Protective measures:

APHIS will consult with land managers requesting grasshopper suppression program activities prior to conducting treatments in northern long-eared bat priority areas and exclude sensitive areas based on that consultation on a site by site basis. APHIS will also consult with the Montana Natural Heritage Program in advance of treatment in areas northern long-eared bat may be present to ascertain whether known NLEB hibernaculum or known occupied maternity roost trees occur in the proposed treatment areas. No grasshopper suppression treatments will take place within 0.25 miles of all known occupied northern long-eared bat hibernacula or habit modeled by the National Heritage Program mapper, and a 150 foot buffer will be maintained around known occupied maternity roost trees.

4.1.4.5 <u>Determination</u>:

APHIS has determined that the 2022 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program may affect, but are not likely to adversely affect the Northern Long-Eared Bat.

4.2. BIRDS

4.2.1 Plover, piping, *Charadrius melodus*

4.2.1.1 <u>Status</u>:

The piping plover was designated Threatened on December 11, 1985.

4.2.1.2 <u>Habitat and Distribution:</u>

Populations are thought to exist in Garfield, McCone, Phillips, Pondera, Richland, Roosevelt, Sheridan and Valley counties, Montana. Habitat also occurs around Alkali Lake in Pondera county, Nelson reservoir and Bowdoin National Wildlife Refuge in Phillips county, and in and around Medicine Lake National Wildlife Refuge in Sheridan county. (See Attachment 6)

4.2.1.3 <u>Assessment</u>:

The 1995 Biological Opinion letter dated 10/3/95 to Mr. Bausch details the agreed-to measures for protecting the piping plover.

4.2.1.4 <u>Protective measures</u>:

The June 1, 1987, FWS Biological Opinion determined the need for protective measures to be used around bodies of water where piping plovers are known to nest. APHIS has adopted these measures for the use of diflubenzuron. For Montana, no aerial ULV treatments will occur within 0.25 mile of piping plover habitat. Where carbaryl bran bait is used, a 500-foot no-treatment zone will be maintained around piping plover habitat.

4.2.1.5 <u>Determination</u>:

Based on the determined protection measures, proposed pesticides and the proposed rates of application, grasshopper treatments are not likely to adversely affect the piping plover.

4.2.2 **Crane, whooping,** *Grus americana*

4.2.2.1 Status:

The whooping crane was designated Endangered on March 11, 1967.

4.2.2.2 Habitat and Distribution:

Although there are reported occurrences, critical habitat has not been designated in Montana (50 FR; 17.95 (b).) The whooping crane may occur statewide with preferred stopovers in shallow wetlands or streams with sparse vegetation and good horizontal visibility. Whooping cranes have been observed in the following counties of Montana: Custer, Dawson, Fallon, McCone, Richland, Roosevelt, Sheridan, Valley, and Wibaux.

4.2.2.3 Assessment:

Most of the Aransas National Wildlife Refuge/Wood Buffalo National Park population will have likely migrated to more northern latitudes in Canada during the proposed program period of mid-May or later.

4.2.2.4 Protective measures:

As stated in the January 1987 BA and the June 1, 1987 Biological Opinion, APHIS shall ensure that no whooping cranes have wandered into a proposed treatment area. If whooping cranes are observed in the treatment area, local FWS personnel will be contacted to determine protective measures.

4.2.2.5 Determination:

Based on the proposed pesticides, the proposed rates of application, the timing of the proposed action, there will be no effect on this species from the treatment of grasshoppers in Montana.

4.2.4 **Tern, least,** *Sterna antillarum*

4.2.4.1 Status:

The interior least tern was designated Endangered on May 28, 1985.

4.2.4.2 Habitat and Distribution:

Ranges for least terns in Montana include sandbars and beaches of the Missouri and Yellowstone rivers in the following counties: Custer, Dawson, Garfield, McCone, Prairie, Richland, Roosevelt, Valley, and Wibaux.

4.2.4.3 Assessment:

In Montana the least terns begin to arrive on the breeding ground in mid-April and would be expected to be present when treatments are needed. The BA prepared by APHIS in January 1987 and the June 1, 1987; FWS Biological Opinion determined the need for protective measures to be used around nesting colonies.

4.2.4.4 Protective measures:

No aerial ULV application will be applied 2.5 miles up and down river to prevent abandonment of nesting least turn colonies due to aircraft flyovers and a possible decrease on the fishery forage base due to accidental aquatic application. A 0.25 mile no-aerial ULV application buffer on each side of the river and around other bodies of water containing least tern colonies will also be observed. This, in addition, would include a 500 foot no treatment zone around nesting colonies. These protective measures are in compliance with the June 1, 1987, FWS Biological Opinion for malathion and carbaryl. APHIS has adopted these measures for the use of Diflubenzuron.

4.2.4.5 Determination:

APHIS determines these measures are not likely to adversely affect the least tern and its breeding habitat as a result of the protective measures, proposed pesticides, and the proposed rates of application.

4.2.5 **Yellow-Billed Cuckoo**, *Coccyzus americanus*

4.2.5.1 Status:

The yellow-billed cuckoo was designated Threatened on November 3, 2014.

4.2.5.2 Habitat and Distribution:

The Yellow-billed cuckoo inhabits the canopies of deciduous trees such as cottonwoods and willows that line large rivers. The yellow-billed cuckoo is primarily an invertivore that mainly eats caterpillars, other insects, some fruits, sometimes small lizards and frogs and bird eggs (Terres 1980). It gleans food from branches or foliage, or sallies from a perch to catch prey on the wing (Ehrlich et al. 1992).
Montana counties in which Yellow-Billed Cuckoo are known or believed to occur in: Flathead, Lake, Missoula, and Ravalli Counties. See the Yellow-Billed Cuckoo Species Occurrence Map Montana, attachment 9.

4.2.5.3 Assessment:

Due to the riparian nature of the yellow-billed cuckoo and the fact that APHIS suppression activities will not occur in riparian areas, it is believed that APHIS suppression activities may affect, but are not likely to adversely affect the yellow-billed cuckoo.

4.2.5.4 Protective measures:

In accordance with Executive Order 13186, Migratory Bird Act, APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. APHIS maintains a 500 foot buffer around all water bodies, which would exclude most riparian areas where the Yellow-billed cuckoo is likely to occur. Impacts will be minimized as a result of buffers to water, habitat, nesting areas, subsequently riparian areas, and the use of RAATs. For any given treatment, only a portion of the environment will be treated, therefore minimizing any potential impact to migratory bird populations.

4.2.5.5 Determination:

APHIS has determined that the 2022 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program may affect, but are not likely to adversely affect the yellow-billed cuckoo.

4.2.6 **Red Knot** – *Calidris canutus rufa*

4.2.6.1 Status:

The red knot was designated Threatened on January 12, 2015.

4.2.6.2 Habitat and Distribution:

The status of the red knot has not been ranked in Montana as it is rarely recorded in the State. The Montana Natural Heritage Program's database shows 34 detections for red knot between 1982 and 2013, averaging 2.9 birds per year across the past 30 years. The number of individuals recorded generally ranged from one to four birds and on only three occasions were eight or more birds recorded. Red knots were detected both during spring migration (20 records in May) and fall migration (14 records between late July and mid-September). While *Calidris canutus* records come from locations across the State, including west of the continental divide, a majority of records (roughly 64 percent) come from three areas in the northern part of the State: Freezeout Lake and Benton Lake NWR near Great Falls, Bowdoin NWR near Malta, and scattered lakes in the northeast corner of the State, including Medicine Lake NWR. Even in these areas there are many years in which red knots are not recorded—there is no evidence that these locations are used annually or frequently as stopover sites (Montana Fish, Wildlife, and Parks (MFWP) 2013). However, from a relatively small sample of Texas-wintering knots from which geolocator data have been retrieved, two stopped in northern Montana during migration (D. Newstead pers. comm. May 16, 2014).

Across all (six) subspecies, Calidris canutus is a specialized molluscivore, eating hard-shelled mollusks, sometimes supplemented with easily accessed softer invertebrate prey, such as shrimp- and crab-like organisms, marine worms, and horseshoe crab eggs (Piersma and van Gils 2011, p. 9; Harrington 2001, pp. 9–11).

Available information suggests that red knots use inland saline lakes as stopover habitat in the Northern Great Plains (Newstead et al. 2013, p. 57; North Dakota Game and Fish Department (NDGFD) 2013; Western Hemisphere Shorebird Reserve Network (WHSRN) 2012; Skagen et al. 1999). We have little information to indicate whether or not red knots may also utilize inland freshwater habitats during migration, but data suggest that certain freshwater areas may warrant further study as potential stopover habitats (C. Dovichin pers. comm. May 6, 2014; eBird.org 2014; Russell 2014, entire). Best available data indicate that small numbers of red knots sometimes use manmade freshwater habitats (e.g., impoundments) along inland migration routes (eBird.org 2014; Russell 2014, entire; Central Flyway Council 2013; NDGFD 2013; Oklahoma Department of Wildlife Conservation (ODWC) 2013; A. Simnor pers. comm. October 15, 2012).

In Montana, Red Knots are known to or may occur in the following counties: Cascade, Fallon, Garfield, Golden Valley, Lewis and Clark, Liberty, Madison, Musselshell, Phillips, Roosevelt, Rosebud, Sheridan, Teton, Valley, and Yellowstone. (See Attachment 10).

4.2.6.3 Assessment:

Grasshopper suppression activities generally occur only over open rangeland habitat common to grasshoppers. Red knot are likely only to be in Montana as they migrate. During migration, red knot tend to use riparian areas containing bodies of water. Due to the habitat in which the red knot would inhabit during migratory stop overs, it is unlikely that either aircraft disturbance or toxic effects will be a factor. APHIS grasshopper suppression activities may affect, but are not likely to adversely affect red knot.

4.2.6.4 Protective measures:

In accordance with Executive Order 13186, Migratory Bird Act, APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. APHIS maintains a 500 foot buffer around all water bodies, which would exclude most riparian areas where the Red Knot is likely to occur. Impacts will be minimized as a result of buffers to water, habitat, nesting areas, subsequently riparian areas, and the use of RAATs. For any given treatment, only a portion of the environment will be treated, therefore minimizing any potential impact to migratory bird populations.

4.2.6.5 Determination:

APHIS has determined that the 2022 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression activities may affect, but are not likely to adversely affect red knot.

4.3 FISH

4.3.1 **Sturgeon, Pallid,** *Scaphirhynchus albus*

4.3.1.1 Status:

The pallid sturgeon was designated Endangered on September 6, 1990.

4.3.1.2 Habitat and Distribution:

Pallid sturgeon may be present in the Missouri River, from its mouth to Morony Dam, Montana, in the Poplar River from the confluence with the Missouri River upstream 10 river miles, in the Marias River from the confluence with the Missouri River upstream 20 river miles, in the Milk River from the confluence with the Missouri River upstream 45 river miles, in the lower Yellowstone River below the Cartersville Diversion Dam, in the Powder River from the confluence with the Yellowstone River upstream to the confluence of the Little Powder River (Broadus), and in the Tongue River from the confluence with the Yellowstone River upstream 20 river miles. These fish are well adapted to life on the bottom in swift waters of large, turbid, free- flowing rivers. Habitat loss is a reason for decline, mainly from the construction of dams. Large woody debris is an important component of pallid sturgeon habitat. (See Attachment 11)

4.3.1.3 Assessment:

The APHIS/FWS ESA formal consultations concluded that the species continued existence would not be jeopardized by the proposed program. This conclusion is adopted for Diflubenzuron.

4.3.1.4 Protective measures:

In concurrence with the April 16, 1990, FWS Biological Opinion, a 0.25 mile no-aerial, ULV buffer would be implemented from known habitats. Within the 0.25 mile, only carbaryl bran bait will be used. APHIS has adopted these measures for the use of diflubenzuron.

4.3.1.5 Determination:

These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers and would not likely adversely affect the Pallid Sturgeon as a result of the protective measures, proposed pesticides, and the proposed rates of application.

4.3.2 **Sturgeon, White**, *Acipenser transmontanus*

4.3.2.1 Status:

The white sturgeon was designated Endangered on September 6, 1994

4.3.2.2 Habitat and Distribution:

Occurrences of Kootenai River White Sturgeon (KRWS) in Western Montana are isolated to the Kootenai River, downstream of Kootenai Falls (approximately 31 river miles downstream from

Libby Dam). Montana has less than 30 miles of white sturgeon habitat in the Kootenai River. Occurrences of adult and sub adult KRWS in the Kootenai River within Montana have been documented, however, no confirmed records of spawning have occurred in the past 20 years. Individuals reach sexual maturity between the ages 9-16 years (4-6 ft. in length), and females do not spawn annually but rather at intervals of 3-11 years, depending on food availability. KRWS spawn during the spring runoff period when water temperatures reach 8-19 C. Outside of the spawning period, 4 large adults typically occur in the larger deeper pools of the main river channel, while juveniles and sub adults seasonally occupy sloughs off the main channel. (See Attachment 12).

4.3.2.3 Assessment:

Treatments are highly unlikely to occur near white sturgeon habitat. The APHIS/FWS ESA formal consultations concluded that the species continued existence would not be jeopardized by the proposed program. This conclusion is adopted for Diflubenzuron.

4.3.2.4 Protective measures:

Mitigative measures will be modeled after the 9/16/93 and 12/6/94 FWS Biological Opinions. Buffers around areas of occurrence of 0.50 mile for the use of Malathion and 0.25 mile for the use of aerially applied carbaryl and adopted for diflubenzuron. Within the 0.25 mile buffer, only carbaryl bran bait will be used.

4.3.2.5 Determination:

These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers. The Program may affect, but is not likely adversely affect the white sturgeon as a result of the protective measures, proposed pesticides, and the proposed rates of application.

4.3.3 **Trout, Bull**, *Salvelinus confluentus*

4.3.3.1 Status:

The bull trout was listed as Threatened 1999. Critical Habitat for the bull trout was designated in 2010, for streams lakes, and reservoirs in the Clark Fork, Flathead, and Kootenai River basins. (See Attachment 13).

4.3.3.2 Habitat and Distribution:

Bull trout occur throughout the Flathead, Kootenai, Clark Fork, Bitterroot, Blackfoot, St. Regis, and Saint Mary’s River drainages, and their tributaries, in Montana. Juvenile bull trout typically move downstream as spring runoff is increasing, while migratory adults typically move upstream to spawn after runoff peaks and begins to recede. Spawning typically occurs September through November in the clear, cold gravels of headwater streams. (See Attachments 13 and 13a-m).

4.3.3.3 Assessment:

Treatments are unlikely to occur near bull trout habitat. Mitigative measures will be consistent with those for the pallid sturgeon as addressed in the April 16, 1990, FWS Biological Opinion.

4.3.3.4 Protective measures:

A 0.25 mile no-aerial ULV buffer would be implemented from known habitats of the bull trout, and critical habitat will not be treated. Within the 0.25 mile buffer, only carbaryl bran bait will be used. These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers.

4.3.3.5 Determination:

These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers. APHIS determines that the Program would not likely adversely affect the bull trout as a result of the protective measures, proposed pesticides, and the proposed rates of application.

4.4 PLANTS

4.4.1 Ladies'-tresses, Ute, *Spiranthes diluvialis*

4.4.1.1 Status:

The Ute Ladies'-Tresses was designated as threatened on January 17, 1992.

4.4.1.2 Habitat and Distribution:

This perennial orchid occurs in mesic or wet meadows and riparian/wetland habitats formed by springs, seeps, lakes, and streams. It is presently known in five counties in Montana: Beaverhead, Broadwater, Gallatin, Jefferson, and Madison (see attachment 6).

4.4.1.3 Assessment:

Bumblebees are the most important pollinators of the Ute Ladies'-tresses orchid.

4.4.1.4 Protective measures:

As outlined in the 8/29/91 Biological Opinion, aerial applications of ULV pesticides will not be used within 3 miles of the occupied habitats to protect pollinators. Within the 3-mile buffer, only carbaryl bran bait will be used. No treatments will be performed in Ute Ladies-tresses habitat.

4.4.1.5 Determination:

These measures may affect, but are not likely to affect the Ute Ladies'-Tresses.

4.4.2 **Howellia, Water**, *Howellia aquatilis*

4.4.2.1 Status:

The water howellia was designated at threatened on July 14, 1994.

4.4.2.2 Habitat and Distribution:

This aquatic annual plant occurs in wetlands habitats and is primarily self-pollinated. Montana populations occur in wetlands of Swan Lake, and Missoula counties.

4.4.2.3 Assessment:

Treatments in the vicinity of water howellia habitat are highly unlikely.

4.4.2.4 Protective measures:

As outlined in the 9/16/93 and 12/6/94 Biological Opinions, aerial applications of ULV pesticides will not be used within 3 miles of the occupied habitats to protect pollinators. No treatments will be performed on water howellia habitat.

4.4.2.5 Determination:

These measures may affect, but are not likely to affect the Water Howelia.

4.4.3 **Catchfly, Spalding's**, *Silene spaldingii*

4.4.3.1 Status:

The Spalding's Catchfly was designated as threatened on October 10, 2001.

4.4.3.2 Habitat and Distribution:

Spalding's catchfly is a long-lived perennial herb in the pink or carnation family and occurs in four Montana counties: Flathead, Lake, Lincoln, and Sanders. Habitat is restricted to remnants of the prairie grasslands of eastern Washington, Northern Oregon, Northern Idaho, and western Montana.

4.4.3.3 Assessment:

Bumblebees are importan pollinators of the Spalding's catchfly. Treatments in Spalding's catchfly areas will only be conducted with carbaryl bait or diflubenzuron.

4.4.3.4 Protective measures:

Mitigative measures will be similar to other insect pollinated plants: aerial applications of ULV pesticides will not be used within 3 miles of the occupied habitats to protect pollinators. The exception is the 2004 local concurrence with USFWS allowing aerial or ground applications of diflubenzuron or carbaryl bait within the Spalding's catchfly habitat. Prior to any treatments in Flathead, Lake, Lincoln, and Sanders counties, the local FWS will be consulted to determine presence of Spalding's Catchfly in the proposed treatments area. Buffered areas may be reduced if concurrence is obtained with the local FWS.

4.4.3.5 Determination:

These measures may affect, but are not likely to affect the Spalding's Catchfly. Use of diflubenzuron or carbaryl bait will have no significant impact on pollinators.

4.5 Invertebrates

4.5.1 Meltwater Lednian Stonefly, *Lednia tumana*

4.5.1.1 Status:

On November 21, 2019, USFWS listed the Meltwater Lednian Stonefly as threatened.

4.5.1.2 Habitat and Distribution:

High elevation alpine streams in Glacier National Park, Bob Marshall and Great Bear Wilderness, and on the Flathead Indian Reservation.

4.5.1.3 Assessment:

Treatments are unlikely to occur near meltwater lednian stonefly habitat.

Mitigative measures will be consistent with those for the pallid sturgeon as address in the April 16, 1990, FWS Biological Opinion. The APHIS/FWS ESA formal consultations concluded that the species continued existence would not be jeopardized by the proposed program. This conclusion is adopted for the meltwater lednian stonefly and for diflubenzuron.

4.5.1.4 Protective measures:

A 0.25 mile no-aerial ULV buffer would be implemented from known habitats of the meltwater lednian stonefly, and proposed critical habitat will not be treated. Within the 0.25 mile buffer, only carbaryl bait will be used. These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers.

4.5.1.5 Determination:

APHIS has determined that the 2022 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program activities may affect, but are not likely to adversely affect the meltwater lednian stonefly.

4.5.2 **Western Glacier Stonefly**, *Zapada glacier*

4.5.2.1 Status:

On November 21, 2019 the USFWS listed the western glacier stonefly as threatened.

4.5.2.2 Habitat and Distribution:

High elevation alpine streams in Glacier National Park and the Absaroka-Beartooth Wilderness.

4.5.2.3 Assessment:

Treatments are unlikely to occur near western glacier stonefly habitat.

Mitigative measures will be consistent with those for the pallid sturgeon as addressed in the April 16, 1990, FWS Biological Opinion. The APHIS/FWS ESA formal consultations concluded that the species continued existence would not be jeopardized by the proposed program. This conclusion is adopted for the western glacier stonefly and for diflubenzuron.

4.5.2.4 Protective measures:

A 0.25 mile no-aerial ULV buffer would be implemented from known habitats of the western glacier stonefly, and proposed critical habitat will not be treated. Within the 0.25 mile buffer, only carbaryl bran bait will be used. These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers.

4.5.2.5 Determination:

APHIS has determined that the 2022 USDA APHIS PPQ Montana Grasshopper/Mormon Cricket Suppression Program activities may affect, but are not likely to adversely affect the Western Glacier Stonefly.

5.0 CRITICAL HABITAT

Section 7 of the Endangered Species Act requires Federal agencies to ensure that actions they authorize, fund, or carry out are not likely to destroy or adversely modify critical habitat.

5.1 Canada Lynx, *Lynx Canadensis*

Critical habitat for the Canada Lynx exists in the following counties in Montana: Carbon, Flathead, Gallatin, Glacier, Lake, Lewis and Clark, Lincoln, Missoula, Park, Pondera, Powell, Stillwater, Sweet Grass, and Teton counties above 4,000 feet in elevation (See Attachment 2). Critical habitat primary constituent elements for the Canada lynx include boreal forests that include a mosaic of differing stages of forest succession containing: a) Snowshoe hares and their habitat including dense understories of shrubs and mature multistoried stands with conifer boughs touching the snow surface, b) Winter conditions that provide and maintain deep fluffy snow for extended periods of time, c) Sites for denning that have abundant coarse woody debris, such as downed trees and root wads, and: d) Matrix habitat (e.g., hardwood forest, dry forest, non-forest, or other habitat types that do not support snowshoe hares) that occurs between patches of boreal forest in close juxtaposition (at the scale of a lynx home range) such that lynx are likely to travel through such habitat while accessing patches of boreal forest within a home range (FWS 2014).

APHIS will not conduct any treatments on or near Canada Lynx critical habitat, and therefore will have no effect on Canada Lynx critical habitat.

5.2 Piping Plover, *Charadrius melodus*

Critical habitat for the Northern Great Plains Breeding Population of the Piping Plover was designated September 11, 2002. Montana critical habitats include: alkali lakes in Sheridan County; the Missouri river and Fort Peck reservoir shoreline in Garfield, McCone, Phillips, Richland, Roosevelt, and Valley counties; Bowdoin National Wildlife Refuge in Phillips County. Habitat includes prairie alkaline wetlands and surrounding shoreline, including 200 feet (ft), 61 meters (m) of uplands above the high water mark; river channels and associated sandbars, and islands; reservoirs and their sparsely vegetated shorelines, peninsulas, and islands; and inland lakes and their sparsely vegetated shorelines and peninsulas.

No aerial ULV treatments will occur within 0.25 mile of piping plover critical habitat. Where carbaryl bran bait is used, a 500-foot no-treatment zone will be maintained around piping plover critical habitat.

Based on the determined protection measures, proposed pesticides and the proposed rates of application, grasshopper treatments may affect, but are unlikely to adversely affect any piping plover critical habitat.

5.3 Sturgeon, White, *Acipenser transmontanus*

Critical habitat for the Kootenai River Population of the White Sturgeon was designated on September 6, 2001. However, there is no White Sturgeon critical habitat in Montana. Therefore grasshopper suppression programs will have no effect on White Sturgeon critical habitat.

5.4 Bull Trout, *Salvelinus confluentus*

Throughout the Flathead, Kootenai, Clark Fork, Bitterroot, Blackfoot, St. Regis, and Saint Mary's River drainages, and their tributaries, there are approximately 3,225 river miles and 223,740 acres of lakes and reservoirs designated as bull trout critical habitat in Montana. Treatments are unlikely to occur near bull trout critical habitat, and therefore may affect, but are unlikely to adversely affect any critical habitat.

In the event a treatment takes place near bull trout critical habitat, a 0.25 mile no-aerial ULV buffer would be implemented will not be treated. Within the 0.25 mile buffer, only carbaryl bran bait will be used. These measures are in conformance with previous FWS Biological Opinions for listed fish occurring in large rivers.

6.0 SUMMARY

This BA addresses the effects of grasshopper program activities on species listed since the 1995 BO and additionally provides measures for all earlier species that may be impacted by applications of diflubenzuron. Information is provided on the biology and ecology of those species and protective measures are suggested when necessary because program activities could potentially affect those species or their habitats.

APHIS has determined that the proposed action will not affect grizzly bear *(Ursus arctos)*; Canada lynx, *(Lynx canadensis)*; black-footed ferret, (*Mustela nigripes)*; and whooping crane *(Grus Americana).* APHIS has determined the suppression program may affect, but is not likely to adversely affect the northern long-eared bat *(Myotis septentrionalis);* piping plover, *(Charadrius melodus)*; least tern, *(Sterna antillarum)*; red knot, (*Calidris canutus rufa*); yellow-billed cuckoo, (*Coccyzus americanus*); Spalding's catchfly, *(Silene spaldingii);* pallid sturgeon, *(Scaphirhynchus albus)*; white sturgeon, *(Acipenser transmontanus)*; and bull trout, *(Salvelinus confluentus);* Ute Ladies'-tresses, *(Spiranthes diluvialis);* water howellia, *(Howellia aquatilis);* Meltwater Lednian Stonefly, (*Lednia tumana);* and the Western Glacier Stone fly, (*Zapada glacier).*

APHIS has determined that the suppression program will have no effect on Canada lynx *(Lynx canadensis)* or white sturgeon *(Acipenser transmontanus)* critical habitat, and may affect, but is unlikely to adversely affect critical habitat for the piping plover *(Charadrius melodus)* or bull trout *(Salvelinus confluentus).*

Should there be species in the affected areas that become newly listed, newly proposed, or otherwise not mentioned in previous biological opinions, APHIS will adhere to buffers and other protective measures for similar species that have been specified in previous biological opinions. This will ensure that Grasshopper Program activities will not likely jeopardize the continued existence of either listed species or species proposed for listing, or adversely modify critical habitat for listed species. APHIS will continue to incorporate, as appropriate, the results gained from the seven year, 30 million dollar GHIPM project to ensure grasshopper control activities have little impact on the environment.

6 7.0 Experimental Treatments: (applied using air and/or ground equipment)

APHIS-PPQ continues to refine its methods of grasshopper and Mormon cricket 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 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 and Mormon crickets. 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 and Mormon crickets. This often includes testing and refining pesticide and biopesticide formulations that may be incorporated into the Program. These investigations often occur in the summer (May-August) and the locations typically vary annually. The plots often include "no treatment" (or control) areas that are monitored to compare with treated areas. Some of these plots may be monitored for additional years to gather information on the effects of utilized pesticides on non-target arthropods. Note that an Experimental Use Permit is not needed when testing non-labeled experimental pesticides if the use is limited to laboratory or greenhouse tests, or limited replicated field Trials involving 10 acres or less per pest for terrestrial tests.

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

Methods Development Studies

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

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

Rangeland Unit is also investigating the potential use of Unmanned Aircraft Systems (UAS) for a number of purposes related to grasshopper and Mormon cricket detection and treatment. UAS will be operated by FAA-licensed pilots with an aerial pesticide applicator's permit.

Pesticides and Biopesticides Used in Studies

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

1) Liquids: diflubenzuron (e.g., Dimilin 2L and generics: currently Unforgiven and Cavalier 2L) and carbaryl (e.g., Sevin XLR-PLUS). Program standard application rates are: diflubenzuron - 1.0 fl. oz./acre in a total volume of 31 fl. oz./acre; carbaryl - 16.0 fl. oz./acre in a total volume of 32 fl. oz./acre. Experimental rates often vary, but the doses are lower than standard Program rates unless otherwise noted.

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

3) LinOilEx (Formulation 103), a proprietary combination of easily available natural oils and some commonly encountered household products, created by Manfred Hartbauer, University of Graz, Austria

Biopesticides likely to be involved in studies currently include:

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

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

At this time, we are unsure where in the 17 states we will be doing most of the following proposed experimental field studies. The final location decision is dependent upon grasshopper and/or Mormon cricket population densities, and availability of suitable sites.

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.

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.

Works Cited:

(1) Biological Assessment, National Section 7 Consultation: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, January, 1987.

(2) Biological Assessment, Local Section 7 Consultation: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, June 30, 2000.

(3) Biological Assessment, Local Section 7 Consultation: U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Plant Protection and Quarantine, May 16, 2003.

(4) Biological Assessment, Local Section 7 Consultation: U.S. Department of Interior, Bureau of Land Management, Miles City and Billings District Offices.

(5) Biological Opinions, National Section 7 Consultations: U.S. Department of Interior, Fish and Wildlife Service; June 1, 1987; July 26, 1988; July 17, 1989; August 3, 1990; August 29, 1991; September 24, 1992; September 16, 1993; December 6, 1994; and July 21, 1995.

(6) George, T. Luke, McEwen, Lowell C., and Petersen, Brett E., Effects of Grasshopper Control Programs on Rangeland Breeding Bird Populations, Journal of Range Management, July 1996, Vol. 48(4).

(7) Grasshopper Integrated Pest Management User Handbook, U.S. Department of Agriculture, Animal Plant Health Inspection Service, Plant Protection Quarantine, Technical Bulletin Number 1809.

(8) Rangeland Grasshopper Cooperative Management Program, Final Environmental Impact Statement – 1987

(9) Rangeland Grasshopper and Mormon Cricket Suppression Program, Final Environmental Impact Statement--2002

(10) Avian Power Line Interaction Committee (APLIC). 2006. Suggested practices for avian protection on power lines: The State of the Art in 2006. Edison Electric Institute, APLIC, and the California Energy Commission, Washington, DC and Sacramento, CA. 207 pp.

(11) Avian Power Line Interaction Committee (APLIC). 1995. Mitigating bird collisions with power lines: the state of the art in 1994. Edison Electric Inst., Washington, DC. 103 pp.

(12) Montana Bald Eagle Working Group. 1994. Montana bald eagle management plan. USDI, Bureau of Land Management, Billings, MT. 104 pp

(13) Eisler, R., 1992. Diflubenzuron hazards to fish, wildlife, and invertebrates: a synoptic review. Biol. Rpt. 4. Contaminant hazard review report 25. U.S. Department of the Interior, Fish and Wildlife Service. Washington, DC.

(14) Willcox, H., and Coffey, T., 1978. Environmental impacts of diflubenzuron (Dimilin). insecticide. Forest Insect and Disease Management, U.S. Department of Agriculture, Forest Service, Broomall, PA. 18 pp.

USDA APHIS – See U.S. Department of Agriculture, Animal and Plant Health Service

(15) U.S. Department of Agriculture, Animal and Plant Health Service. 2011. Fish and Wildlife Service Biological Assessment for the APHIS Rangeland Grasshopper and Mormon Cricket Suppression Program – Draft.

(16) Robbins, M.B., and B.C. Dale. 1999. Sprague's Pipit (*Anthus spragueii*). *In* A. Poole and F. Gill, editors. The Birds of North America, No. 439. Academy of Natural Sciences, Philadelphia, Pennsylvania; American Ornithologists' Union, Washington, D.C.

(17) Catangui, M.A., Fuller, B.W., and Walz, A.W., 1996. Impact of Dimilin on nontarget arthropods and its efficiency against rangeland grasshoppers. *In* Grasshopper Integrated Pest Management User Handbook, Tech. Bul. No.1809. Sec. VII.3. U.S. Department of Agriculture, Animal and Plant Health Inspection Service, Washington, DC.

(18) Weiland, R.T., Judge, F.D., Pels, T., and Grosscurt, A.C., 2002. A literature review and new observations on the use of diflubenzuron for control of locusts and grasshoppers throughout the world. J. Orthoptera Res. 11(1):43-54.

(19) Tingle, C.C.D. 1996. Sprayed barriers of diflubenzuron for control of the migratory locust (*Locusta migratoria capito* (Sauss.)) [Orthoptera: Acrididae] in Madagascar: short term impact on relative abundance of terrestrial non-target invertebrates. Crop Protection 15(6): 579-592.

(20) Smith, D.I., Lockwood, J.A., Latchininsky, A.V., and Legg, D.E., 2006. Changes in non- target populations following applications of liquid bait formulations of insecticides for control of rangeland grasshoppers. Internat. J. Pest Mgt. 52(2):125-139.

(21) U.S. Fish and Wildlife Service. RUFA RED KNOT BACKGROUND INFORMATION AND THREATS ASSESSMENT.

(22) Coccyzus americanus. In Nature Serve Explorer. Retrieved February 5, 2015, from http://explorer.natureserve.org/servlet/NatureServe?searchName=Coccyzus+americanus

(23) Numenius borealis. In Nature Serve Explorer. Retrieved February 5, 2015, from http://explorer.natureserve.org/servlet/NatureServe?searchName=Numenius+borealis

(24) Northern Long-eared Bat (Myotis septentrionalis). Retrieved on February 5, 2015, from http://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=A0JE

(25) Rangifer tarandus . Retrieved on February 5, 2015, from caribouhttp://explorer.natureserve.org/servlet/NatureServe?searchName=Rangifer+tarandus+caribou Neurology. (n.d.). In Wikipedia. Retrieved August 8, 2007, from http://en.wikipedia.org /wiki/Neurology

(26) 03/2019 USFWS list of T&E species in MT:
https://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/TEClist.pdf

https://www.fws.gov/montanafieldoffice/Endangered_Species/Listed_Species/countylist.pdf

https://www.fws.gov/montanafieldoffice/Endangered_Species/Species_information.html

FWS 2014. Endangered and Threatened Wildlife and Plants; Revised Designation of Critical Habitat for the Contiguous United States Distinct Population Segment of the Canada

Lynx and Revised Distinct Population Segment Boundary. Federal Register / Vol. 79, No. 177 / Friday, September 12, 2014. 54782-54846**.**

Xerces, 2019. Stoneflies: western glacier stonefly (*Zapada glacier*). https://xerces.org/western-glacier-stonefly/. Retrieved on March 25, 2019

United States Department of the Interior

FISH AND WILDLIFE SERVICE

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M.00 – APHIS
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0006034

February 10, 2022

Gary D. Adams, State Plant Health Director, Montana
Animal and Plant Health Inspection Service, Plant Protection and Quarantine
1629 Avenue D, Suite A-5
Billings, Montana 59102

Dear Mr. Adams:

Thank you for your January 20, 2022, letter, received on January 21, 2022, via electronic mail, requesting U.S. Fish and Wildlife Service (Service) concurrence on your determination of effects for listed species and designated critical habitats in your 2022 Biological Assessment (BA; APHIS 2022) for the Rangeland Grasshopper and Mormon Cricket Suppression Program (Program) in Montana. This response is provided under the authority of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1543), the Migratory Bird Treaty Act (MBTA)(16 U.S.C. 703-712), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668 et seq.).

The Animal and Plant Health Inspection Service (APHIS), in conjunction with Federal agencies, State departments of agriculture, Native American Tribes, and private individuals is planning to conduct grasshopper/Mormon cricket control programs in Montana in 2022. APHIS proposes chemical treatments of rangelands, which may include application of carbaryl, malathion, and/or diflubenzuron. Carbaryl would be applied by aerial spraying or distributing bran bait; malathion, and diflubenzuron would be applied by aerial spraying. Treatment rates are detailed in the BA (page 5) and would generally be less than standard application rates. Most treatments would be applied using reduced area agent treatment (RAATs) techniques, which generally reduce, by up to 50 percent, the amount of active ingredient applied relative to standard application rates.

In addition, APHIS proposes experimental treatments (ranging from less than 1 square-foot up to 640 acres). Locations for these treatments are to be determined and may or may not be within Montana. These experimental treatments would test the efficacy of new chemical and biological control compounds and/or new methods of application of the same chemicals listed in the preceding paragraph (see BA, pages 23-26 for details). New chemical and biological control compounds may include: LinOilEx (a proprietary formulation of natural oils and household products), *Metarhizium robertsii* (a native fungal pathogen), and/or *Beauveria bassiana* (a native fungal pathogen). The locations of experimental treatments will be coordinated with the Service and other agencies to ensure that these treatments are not applied in habitats, including designated critical habitats, for listed or other sensitive species.

APHIS has consulted with the Service on the Program (both National and State-specific consultations have been or are being conducted) since 1987. Information on the history of consultations on the Program is available in our prior letters, including Service (1995) and Service (2019), and in your BA (APHIS 2022). This letter addresses the Program only within Montana for the current calendar year.

Listed Species

APHIS has determined that the proposed action will have *no effect* to the grizzly bear *(Ursus arctos)*, Canada lynx *(Lynx canadensis)*, black-footed ferret (*Mustela nigripes)*, and whooping crane *(Grus americana*) and to designated critical habitats for white sturgeon *(Acipenser transmontanus)* and Canada lynx. APHIS has also determined that the Program *may affect, but is not likely to adversely affect* the northern long-eared bat (*Myotis septentrionalis*), piping plover *(Charadrius melodus)*, interior least tern *(Sterna antillarum)*, red knot (*Calidris canutus rufa*), yellow-billed cuckoo (*Coccyzus americanus*), pallid sturgeon *(Scaphirhynchus albus)*, white sturgeon, bull trout *(Salvelinus confluentus),* meltwater lednian stonefly (*Lednia tumana*), western glacier stonefly (*Zapada glacier*), Ute Ladies'-tresses *(Spiranthes diluvialis)*, water howellia *(Howellia aquatilis)*, and Spalding's catchfly *(Silene spaldingii)* and designated critical habitats for piping plover and bull trout.

The Service acknowledges your *no effect* determinations for grizzly bear, Canada lynx, black-footed ferret, whooping crane, and designated critical habitats for white sturgeon and Canada lynx.

The interior least tern has been removed from the list of threatened and endangered species, effective February 12, 2021 (86 FR 2564). Consultation on this species pursuant to the ESA is no longer necessary. We appreciate your efforts (discussed in the Migratory Birds section, below) to conserve this and other migratory bird species.

Upon review of the 2022 BA, the Service concurs with your *may affect, but is not likely to adversely affect* determinations for northern long-eared bat, piping plover, red knot, yellow-billed cuckoo, pallid sturgeon, white sturgeon, bull trout, meltwater lednian stonefly, western glacier stonefly, Ute Ladies'-tresses, water howellia, Spalding's catchfly, and designated critical habitats for piping plover and bull trout. The Service bases its concurrence on the information and analysis in the BA, including protective measures as stated in the BA, and information in our files. This concurrence is contingent upon the implementation of those committed protective measures. In most cases, there is little overlap between the rangelands that would be treated and habitat for these species. In addition, the BA proposes a suite of species-specific buffers and site-specific pre-treatment analyses (as detailed below) that further reduce the potential for listed species to be affected. No treatment would occur within critical habitat and a 0.25-mile buffer would be maintained for any aerial spraying near critical habitat for both piping plover and bull trout.

For the 3 listed plants, no aerial spray treatments would be implemented within 3 miles of occupied habitat to protect the plants and their pollinators. Carbaryl bran bait may be used within the buffers. The 3-mile buffer may be reduced for Spalding's catchfly, but only if site-specific follow-up consultation with the Service indicates that the species is not likely to be adversely affected.

No aerial spray treatments would be implemented within 0.25 mile of piping plover nesting habitat. No Carbaryl bran bait treatments would be implemented within 500 feet of piping plover nesting habitat.

The red knot is uncommon in Montana and only present during migration. This shorebird is most likely to be present near water bodies and riparian areas. The yellow-billed cuckoo has been observed in Montana west of the continental divide (only the western distinct population segment of this species is listed), but little information is available on its distribution and its breeding status is unknown (66 FR 38615). The yellow-billed cuckoo requires riparian habitats within its summer/breeding range and migrates to South America to overwinter. No treatments would occur in riparian areas or within 500 feet of water bodies.

The two listed stoneflies require cold, high elevation, headwater streams and are known almost entirely from National Park and National Forest lands. Treatments are generally unlikely to be implemented near suitable habitat for either species. In addition, no aerial spraying would be allowed within 0.25 mile of habitat for either species.

Regarding the 3 listed fishes, no treatments would be implemented within 500 feet of water bodies and no aerial spraying would be implemented within 0.25 mile of occupied habitats. In addition, treatments are generally unlikely to be implemented near suitable habitat for bull trout or white sturgeon.

Northern long-eared bats use a variety of forested habitats for roosting and feeding in summer and hibernate in caves and mines (hibernacula) in winter. Thus, there is little overlap between habitat for this species and the open rangelands proposed for treatment. In addition, APHIS would consult local land managers and the Montana Natural Heritage Program (MNHP) for information on specific treatment sites and would avoid treatments within 0.25 mile of northern long-eared bat habitat as modeled by MNHP and of known hibernacula for the species.

Regarding the proposed experimental treatments, because specific treatments and locations thereof are undetermined at this time, we do not have sufficient information to do a species-specific analysis. However, we expect that APHIS' proposed coordination with us and other agencies and their proposed avoidance of habitats (including designated critical habitats) for listed species, will be sufficient to avoid adverse effects to all of the species and critical habitats discussed above. In the unlikely event that adverse effects cannot be avoided, consultation should be re-initiated as discussed in the following paragraph.

This concludes informal consultation pursuant to the regulations implementing section 7(a)(2) of the Endangered Species Act, 50 C.F.R. 402.13. This project should be re-analyzed if new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not considered in this consultation; if the action is subsequently modified in a manner that causes an effect to a listed species or designated critical habitat that was not considered in this consultation; and/or, if a new species is proposed or listed or critical habitat is proposed or designated that may be affected by this project.

Greater Sage-Grouse

The greater sage-grouse, no longer considered a candidate for listing under the ESA, occurs in eastern and southwest Montana in sagebrush, sagebrush-grasslands, and associated agricultural lands. This species is managed by Montana Fish, Wildlife and Parks (FWP) and sagebrush habitats are managed by FWP, Department of Natural Resources and Conservation (DNRC) as well as by the Bureau of Land Management (BLM) on BLM-administered lands.

Grasshopper suppression program activities may be subject to Montana Executive Order 12-2015. We recommend that you consult the Montana Sage-Grouse Habitat Conservation Program website (https://sagegrouse.mt.gov/) and interactive map to assist in determining where designated greater sage-grouse habitat occurs relative to proposed suppression activities. We further recommend that proposed suppression activities be coordinated with the Montana DNRC, Conservation and Resource Development Division, regarding any applicable required compliance with Montana Executive Order 12-2015 and the Montana sage-grouse conservation strategy.

Migratory Birds

In accordance with Executive Order 13186, MBTA, APHIS will support the conservation intent of the migratory bird conventions by integrating bird conservation principles, measures, and practices into agency activities and by avoiding or minimizing, to the extent practicable, adverse impacts on migratory bird resources when conducting agency actions. Impacts will be 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 any potential impacts to migratory bird populations. We recommend that the Service's Nationwide Standard Conservation Measures for migratory birds (https://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures/nationwide-standard-conservation-measures.php) be considered as applicable and practicable in order to minimize potential localized migratory bird impacts. The Service also encourages APHIS pursuant to Executive Order 13186 (January 17, 2001), *Responsibilities of Federal Agencies to Protect Migratory Birds*, to enter into a Memorandum of Understanding with the Service that outlines a collaborative approach to promote the conservation of migratory bird populations.

Bald and Golden Eagles

We provide the following for your information should eagle nests occur in the vicinity of proposed treatment areas.

The bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*) are protected from a variety of harmful actions via take prohibitions in both the Migratory Bird Treaty Act (MBTA; 16 U.S.C. 703-712) and the Bald and Golden Eagle Protection Act (BGEPA; 16 U.S.C. 668–668d). The BGEPA, enacted in 1940 and amended several times, prohibits take of bald eagles and golden eagles, including their parts, nests, young or eggs, except where otherwise permitted pursuant to Federal regulations. Incidental take of eagles from actions such as electrocutions from power lines or wind turbine strikes are prohibited unless specifically authorized via an eagle incidental take permit from US Fish and Wildlife Service (Service). BGEPA provides penalties for persons who "take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle ... [or any golden eagle], alive or dead, or any part, nest, or egg thereof." BGEPA defines take to include the following actions: "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The Service expanded this definition by regulation to include the term "destroy" to ensure that "take" also encompasses destruction of eagle nests. Also, the Service defined the term disturb which means to agitate or bother a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, (1) injury to an eagle, (2) a decrease in its productivity, by substantially interfering with normal breeding, feeding, or sheltering behavior, or (3) nest abandonment, by substantially interfering with normal breeding, feeding, or sheltering behavior.

The Service has developed guidance for the public regarding means to avoid take of bald and golden eagles:

- The 2007 *National Bald Eagle Management Guidelines* serve to advise landowners, land managers, and others who share public and private lands with bald eagles when and under what circumstances the protective provisions of BGEPA may apply. They provide conservation recommendations to help people avoid and/or minimize such impacts to bald eagles, particularly where they may constitute "disturbance," which is prohibited by the BGEPA. https://www.fws.gov/northeast/ecologicalservices/pdf/NationalBaldEagleManagementGuidelines.pdf

The Service also has promulgated new permit regulations under BGEPA:

- New eagle permit regulations, as allowed under BGEPA, were promulgated by the Service in 2009 (74 FR 46836; Sept. 11, 2009) and revised in 2016 (81 FR 91494; Dec. 16, 2016). The regulations authorize the limited take of bald and golden eagles where the take to be authorized is associated with otherwise lawful activities. These regulations also establish permit provisions for intentional take of eagle nests where necessary to ensure public health and safety, in addition to other limited circumstances. The revisions in 2016 included changes to permit issuance criteria and duration, definitions, compensatory mitigation standards, criteria for eagle nest removal permits, permit application requirements, and fees in order to clarify, improve implementation and increase compliance while still protecting eagles. https://www.gpo.gov/fdsys/pkg/FR-2016-12-16/pdf/2016-29908.pdf

The Service's Office of Law Enforcement carries out its mission to protect eagles through investigations and enforcement, as well as by fostering relationships with individuals, companies, industries and agencies that have taken effective steps to avoid take, including incidental take of these species, and encouraging others to implement measures to avoid take. The Office of Law Enforcement focuses its resources on investigating individuals and entities that take eagles without identifying and implementing all reasonable, prudent, and effective measures to avoid that take. Those individuals and entities are encouraged to work closely with Service biologists to identify available protective measures, and to implement those measures during all activities or situations where their action or inaction may result in the take of eagles.

The Service appreciates your efforts to ensure the conservation of threatened and endangered species as part of our joint responsibilities under the ESA. Should you have any questions, please contact Jacob Martin within our office at (406) 430-9007 or jacob_martin@fws.gov.

Sincerely,

for Ben Conard
Acting Office Supervisor

References

Animal and Plant Health Inspection Service. 2022. 2022 Biological assessment for Montana, rangeland grasshopper and Mormon cricket suppression program, 01/20/2022, 28 pp. plus maps.

U.S. Fish and Wildlife Service. 1995. Letter from Deputy Director, Mountain Prairie Region to Deputy Director, Animal and Plant Health Inspection Service regarding nine biological opinions on the rangeland grasshopper and Mormon cricket suppression program. 36 pp.

U.S. Fish and Wildlife Service. 2019. Letter from Jodi Bush, Field Supervisor, Montana Ecological Services Field Office, to Gary D. Adams, State Plant Health Director, Montana, Animal and Plant Health Inspection Service regarding the 2019 rangeland grasshopper and Mormon cricket suppression program. 6 pp.

Appendix E: Public Comments and Responses

1. The EAs Fail to Disclose Areas Likely for Treatment and Do Not Adequately Describe the Affected Environment or Analyze Impacts to the Affected Environment

APHIS states in the EAs:

"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.

In this age of information, when the entire world can be informed of a decision via the push of a button, such an explanation for failing to inform the public--in advance--of treatment locations, acres, and methods falls rather flat. As APHIS explains in the EAs, APHIS only conducts treatments after receiving requests, which also help guide nymphal survey efforts. Moreover it is our understanding that a state's treatment requests must be submitted for funding approval to headquarters in Washington D.C., and that this budget requesting work occurs during the winter. Therefore, this information must exist in APHIS files. We believe this information should be used to disclose maps of requested and higher probability treatment areas, together with an estimate of acres to be treated and the likely method of treatment and chemical to be used -- in the Draft EAs and certainly by the Final EAs. We find it hard to imagine a good reason for not disclosing more specific treatment maps, together with acreage estimates and proposed method and chemical – as soon as such information is available, certainly by the Final EAs or as an Addendum to the Final EAs.

As published, the Draft EAs provide almost no solid information about where, how, and when the treatments may actually occur in 2022. As a result, it is impossible to determine if applications might occur to sensitive areas or species locations within the specified counties. Similarly, the EAs do not contain information regarding whether grasshopper numbers are rising or falling relative to historic patterns. Much more meaningful would be a description of the average size of treatments in this state and a map of such treatments over a credible period, such as 2-3 decades, accompanied by detailed nymphal information and treatment request maps.

APHIS' lack of transparency about proposed and historical treatment areas, particularly on public lands, is a disservice to the public and prevents citizens from reviewing sufficient information to be able to gauge the justification for and the risks involved in the suppression effort. Furthermore, as a result of the lack of specificity in the EAs, it is impossible to determine whether effects would actually be significant or not.

Obviously, final treatment decisions should hinge on a firm understanding of species-specific nymphal densities as well as other conditions related to the economic threshold, as described by APHIS, and it could be that APHIS would decide not to treat an area that was included in a budget request.

Nonetheless, in order to adequately inform the public, describe the affected environment, and ascertain impacts to critical ecological and social resources, APHIS should provide the treatment request areas with the EAs, even if actual treatments end up less than these.

- Treatment requests are often received once hatching has begun but before treatment plans are finalized. The request from BLM is normally received in January to March. The EAs do not fail to disclose the treatment request locations. The treatments can occur at any location within the action areas described in the EAs. The EAs describe geographically similar action areas which may have populations which require suppression. Any populations outside these action areas will not be treated. The commenter requests the exact pastures to be treated, this level of detail is not necessary for a thorough risk analysis for significant impacts as required by NEPA. APHIS must remind the Xerces Society their comments should suggest how program activities could have significant impacts to the human environment and the NEPA public review process is not a forum to tell the agency how to conduct the surveys and the suppression activities. The treatment locations are proposed only known after the nymphal survey has taken place. The EAs describe that any rangeland within the action area which have outbreak populations could be rangeland that could be treated. The timeline suggested by the commenter would not allow the draft EA to be published until after the exact pasture has been delimited, starting the 30-day public comment at that time. If this was the case, no outbreak populations would ever be treated. The life cycle of the nymphal stages can develop every 5-12 days depending on the temperature. The commenter had similar comments in the 2020 EAs. Please see the APHIS responses to comments 1, 2, 3, 4, 5, 6, 8, 54, 92,93, 97, 100 and 159 in the 2020 EAs.

2. Use of "Emergency" Explanation to Avoid More Site-Specific Assessment of Impacts is Indefensible and Groundless

APHIS claims that its grasshopper suppression efforts are akin to an "emergency." For example, the following is stated in the EAs:

The emergency response aspect is why site-specific treatment details cannot be known, analyzed, and published in advance.

The emergency explanation does not hold water when this program is given an annual budget and when grasshopper outbreak dynamics are reasonably well known. The Grasshopper IPM Project and subsequent studies did much to advance knowledge about grasshopper cycles and areas more prone to outbreak. For example see Cigliano et al. (1995) which identified areas most prone to outbreak in Montana, and Schell and Lockwood (1997) which did the same in Wyoming. Also see Oregon's EA, which provides a map of similar historic information.

Even armed with this information, APHIS did not bother to take a closer look at the areas that might be most likely to be affected by grasshopper sprays. Nor did APHIS consider impacts to these areas' ecological, scientific, or recreational resources, which are considerable, including Important Bird Areas, Sagebrush Focal Areas and Greater

Sage-Grouse Priority Habitat Management Areas, National Wildlife Refuges which support breeding migratory birds and many other wildlife species - such as Warhorse National Wildlife Refuge, UL Bend National Wildlife Refuge, Lake Mason National Wildlife Refuge - and various Wilderness Study Areas, such as the Terry Wilderness Study Area, and reservoirs that support fishing and camping.

While APHIS may reasonably assert the need to respond quickly, that does not excuse ignoring existing information or refusing to do required environmental disclosures as required by NEPA.

- APHIS regularly engages with the public about areas experiencing outbreak grasshopper and Mormon cricket populations. Previous year adult surveys can be used to predict areas of high populations, but one year's survey data does not always directly correlate to current populations. High variability of abiotic factors at a local level can significantly impact developing nymphal populations. Furthermore, grasshopper populations are mobile and can migrate into areas that were not forecasted to have outbreak populations.

  Beginning with public meetings, APHIS is open and transparent with the public about what our surveys found last year, where we expect outbreaks to be possible this year, and any areas that could be impacted by grasshoppers or Mormon crickets.

  The analyses of the EAs cover most areas in the state that have the criteria outlined above. However, it is impossible to know exactly where these treatments will occur in advance. The need for rapid response is akin to an emergency for rural communities who are significantly impacted by the economic damage caused by these pests. APHIS uses the EAs to capture the variability in these rural locations and can then work with local governments, conservation districts, state, and federal partners to rapidly respond to the public needs for treatments. Areas that meet the criteria, express a need and desire for treatments, and collaborate with APHIS have the potential to receive rapid response emergency treatments of the area when funds are available. Public is notified of treatments to the best of our ability via newspapers, meetings with local governments, and direct notice to those in the immediate treatment areas. Not only does APHIS not keep the public in the dark, APHIS actively seeks interaction from the public during the treatment planning process.

  The commenter shared a similar opinion in their comments on the 2021 EA. Please see response to comment # 2 of the 2021 EA. A similar comment from the 2020 EA's. Please see the APHIS responses to comments 1, 2, 3, 4, 5, 6, 8, 55, 91,92, 96, 99 and 158 in the 2020 EA's. Also, please see the response to comment #5 of this document which discusses the amount of funds needed to replace forage for the populations described in 2017 and 2019 which the commenter raised concerns over.

3. **APHIS baselessly claims that it protects pollinators through the use of program insecticides that are not broad-spectrum.**

APHIS claims in its EAs that it reduces the risk to native bees and pollinators through several measures including preference for insecticides that are not broad-spectrum. For example the following statement is included:

APHIS reduces the risk to native bees and pollinators through monitoring grasshopper and Mormon cricket populations and making pesticide applications in a manner that reduces the risk to this group of nontarget invertebrates. Monitoring grasshopper and Mormon cricket 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.

Yet APHIS identifies three potential insecticides in its operating guidelines included with the EAs: carbaryl, malathion, and diflubenzuron.

It is common knowledge that carbaryl and malathion are both broad-spectrum chemicals that interfere with transmission of neural signals. (Use of baits can reduce exposure to certain insects; this option is available with carbaryl as used in the program).

Diflubenzuron is the most commonly used insecticide under APHIS' grasshopper suppression program. Diflubenzuron is an insect growth regulator and functions by disrupting synthesis of chitin, a molecule necessary to the formation of an insect's cuticle or outer shell. An insect larva or nymph exposed to diflubenzuron is unable to successfully molt and thus dies. Chitin is not limited to insect cuticles, but is also, for example, a component of mollusk radula, fish scales and fungi cell walls.

The label for diflubenzuron itself calls the insecticide "broad-spectrum" (see Durant 2L label); therefore APHIS' statement is not credible. Additionally the EIS disclosed that under some circumstances, Dimilin may be quite persistent; field dissipation studies in California citrus and Oregon apple orchards reported half-live values of 68.2 to 78 days.

- The commentor is incorrect when stating the Durant 2L (EPA Reg. No.: 91234-103) label states it is a "broad-spectrum" insecticide. While the company may market as having a broad-spectrum of pests the chemical can control, it is at highly variable rates well above those used in the Grasshopper and Mormon cricket Suppression Program. The commentor is also incorrect in stating that the Montana EAs identify four potential insecticides in its operating guidelines. Montana has not included the use of chlorotraniliprole in the state specific EA.

  The commenter asserts the EA does not provide information on the possible effects of program chemicals on bees and pollinators. That information is provided under the Environmental Consequences section of the EA on pages 19 through 29. The Draft EA is tiered to more extensive analysis in the 2019 EIS (page 45-46, 55-57, and 65) and the HHERAs for Carbaryl (page 21 and 44), Malathion (pages 14-15, and 34), and Diflubenzuron (pages 13-14, 29-30) that addresses risk to pollinators including bees and their larval stages.

  APHIS recognizes that there may be exposure and risk to some pollinators at certain times of the application season from liquid insecticide applications used to control grasshopper and Mormon cricket populations. APHIS reduces the exposure and risk to pollinators by using rates well below those labeled for use by EPA. Current labeling for grasshopper treatments also allows multiple applications per season. APHIS uses one application per treatment season further reducing the risk to pollinators when compared to the current number of applications that can be made in a year to rangeland.

  As stated by the commentor, diflubenzuron is the most commonly used insecticide under APHIS' grasshopper suppression program including in Montana. When used at rates below label rates and alternating treated and untreated swaths, risks and impacts from exposure to non-targets are reduced when compared to full label rates at conventional 100% coverage.

4. **APHIS includes only a single action alternative and fails to analyze other reasonable alternatives, such as buying substitute forage for affected leaseholders. In addition, the single action alternative combines conventional and RAATs applications in one alternative, while the consequences do not fully explore and explain the relative impacts of these two methods.**

As described in the 2019 EIS, potential outcomes of forage loss on a leaseholder's plot of land, should it be untreated, could be the rancher seeking to buy alternative sources of forage, leasing alternative lands, or selling livestock. The EIS did not fully evaluate these options, so it is important that the EAs go further. For example, a reasonable alternative that could be examined would be for the federal government to subsidize, fully or partially, purchased hay. But in its current form, the EA includes no discussion of a reasonable alternative such as this.

Instead, the EAs contain a single action alternative that encompasses suppression treatments using either the "conventional" method (i.e. full rates, blanket coverage) or the RAATs method (i.e. reduced rates, skipped swaths). Given that these two options are combined into a single alternative the consequences section should be careful to fully analyze the impact of the treatments at the conventional rates with blanket coverage. However in many cases APHIS focuses simply on the RAATs method and does not discuss impact from the "conventional" method. As an example, this language is included for the discussion of carbaryl impacts on pollinators: *"In areas of direct application where impacts may occur, alternating swaths and reduced rates (i.e., RAATs) would reduce risk."* In other cases, APHIS provides an assessment but does not indicate if its risk conclusion applies to the conventional method and the RAATs method, or one or the other.

In the description of Alternative B (page 10), APHIS appears to have inadvertently left out the amount of lb ai/acre for diflubenzuron. At 1 oz/acre, this would constitute 0.016 lb ai/acre.

- The APHIS grasshopper suppression program draws its authority from the Plant Protection Act of 2000 (7 U.S.C § 7717). The statute authorizes APHIS to authority to exclude, eradicate, and control plant pests, including grasshoppers. Specifically, language in the PPA provides authority for APHIS to protect rangeland from "economic infestation" of grasshoppers. In its recent EIS updating the program (APHIS 2019), the Agency describes its determination of an economic infestation as follows:

  The "level of economic infestation" is a measurement of the economic losses caused by a particular population level of grasshoppers to the infested rangeland. This value is determined on a case-by-case basis with knowledge of many factors including, but not limited to, the following: economic use of available forage or crops; grasshopper species, age, and density present; rangeland productivity and composition; accessibility and cost of alternative forage; and weather patterns. In decision-making, the level of economic infestation is balanced against the cost of treating to determine an 'economic threshold' below which there would not be an overall benefit for the treatment. Short-term economic benefits accrue during the years of treatments, but additional long-term benefit may accrue and be considered in deciding the total value gained by a treatment. The Plant Protection Act of 2000 does not give authority to APHIS to purchase replacement feed for ranchers, but rather only provides funding when available to suppress outbreak populations of grasshoppers to save forage.

  The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators. However, APHIS does not solely rely on the reduced deposition of pesticides in the untreated swaths to determine the potential harmful effects of grasshopper treatments will not cause significant impacts. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments using conventional methods (total area coverage and higher application rates) is provided on pages 19-24 of the 2022 EAs. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

5. **Impacts are described as "reduced" in many portions of the environmental consequences section but APHIS rarely describes "reduced" in comparison to anything else.**

APHIS liberally employs relative language to create an impression of low risk. For example, in numerous locations in the environmental consequences section of the EAs, APHIS described risk as "reduced." Reduced compared to what, exactly? The inexactness and lack of specificity of such statements make the EAs of little utility for a citizen trying to determine the actual predicted impacts of insecticide spray on large blocks of Western rangelands and do not provide an accurate scientific assessment.

- The comment is a vague critique of the risk analysis provided by APHIS in the EAs. Often in the EA the term Reduced Agent Area Treatment (RAAT), typically described as the RAATs treatment method, is used. Compared to conventional blanket applications of pesticide, the RAATs strategy uses a reduced rate by alternating treatment swaths in a spray block, reducing application rates, or both.

6. **APHIS ignores the significance of Montana to native pollinators, which as a group are put at risk by the proposed action, despite widespread reports of insect decline and affirmative federal obligations for federal agencies put into place several years ago.**

The geographic area covered by this EA may be home to 200-700 species of native bees (McKnight et al. 2018, Figure 1). Perhaps this is not surprising since the majority of rangeland plants require insect- mediated pollination. Native, solitary bee species are important pollinators on western rangeland.
Hence, pollinators are important not only for their own sake but for the overall diversity and productivity of native rangelands, including listed plant species. However, this essential role that pollinators play in the conservation of native plant communities is given very short shrift in the EAs.

Many of the pollinators that call Montana home are already considered at-risk. See lists of at risk pollinators found in Montana in Attachments 1 and 2 from our comment letter submitted in 2020. We ask you to incorporate those attachments by reference.

Pollinators, including bumble bee species that occur in Montana and are within the range of historic and possibly future treatments, are facing significant declines (National Research Council 2007; Cameron et al. 2011).

Bumble bees as a group, and several bumble bee species endemic to western states are perhaps the best known examples of pollinators in serious decline. Bumble bees are known to be important pollinators on many rangeland plants, including listed plant species such as Ute Ladies' Tresses and *Silene spaldingii*. Scientists recognize serious information gaps about the relative and interacting effects of stressors to bumble bee populations, especially the effects of pathogens, pesticides, climate change and habitat loss (see Graves et al. 2021).

Potential spray areas in Montana are within the range of at least two bumble bee species that have experienced declines in abundance and range contractions: *Bombus suckleyii* and *B. occidentalis*. Their decline statistics and range contractions are captured in a valuable IUCN overview of North American bumble bee species (Hatfield et al. 2015). For *B. suckleyi,* its relative abundance is less than 10% of its historic values. *B. occidentalis* abundance relative to historic values is only 28.5%. Both these species are being considered for listing under the Endangered Species Act by the US Fish and Wildlife Service.

Additional bumble bee species are known to occur near areas that have been the target of spraying by APHIS repeatedly in recent years. *Bombus fervidus*, a vunerable species that has experienced nearly a 50% decline, is resident in most counties of Eastern Montana where treatments are likely. There are also records of *Bombus pennsylvanicus*, a species in severe decline, in the southern and eastern parts of Montana, again near where sprays have occurred historically.

In Britain and the Netherlands, where multiple bumble bee and other bee species have gone extinct, there is evidence of decline in the abundances of insect pollinated plants.

Unfortunately, documented declines for pollinators are just echoes of a larger ominous development facing insects as a whole. Recent reports suggest that insects are experiencing a multicontinental crisis that is apparent as reductions in abundance, diversity, and biomass (Forister et al. 2019).
Despite this very real crisis in biodiversity, the EAs do not consider the threats that treatments could pose to these dwindling bumble bees or other native bees that are dwindling but not yet on the Endangered Species List. The EA further fails to disclose which, if any, invertebrates within the geographic area are listed as sensitive by federal land management agencies or as Species of Conservation Concern, or whether the state of Montana designates any invertebrates as species of greatest conservation need.

Specific risks to bees from the insecticides diflubenzuron, carbaryl, and chlorantraniliprole, as exemplified by studies and models using honey bees, are described elsewhere in this letter. But concerningly, researchers have outlined the many ways in which risk assessments may underestimate risk to native bees by relying exclusively on honey bee studies (see, for example Gradish et al. 2019). Native bees and honey bees have significant life history differences, including the following:

- Honey bee queens do not forage; native bee queens do
- Honey bee larvae do not eat raw pollen; native bee larvae do
- Honey bees nest above the ground in hives; native bees mostly nest in the ground
- Honey bees have well-defined caste systems and very large sizes; most native bees have little or no social organization and nests are very small.
- Foraging exposure is different, for example foraging bumble bee adults may experience higher exposure due to their ability to be active during weather conditions and at times that honey bees do not forage, and because bumble fee foragers visit more flowers per day.

APHIS stands to worsen the plight of pollinators and of insects as a group through implementation of its grasshopper suppression program as described in the EAs. In particular, the status of at-risk native bees and at-risk native butterflies may worsen as a result of insecticide treatments for grasshopper control.

In addition, the EAs make no mention of the fact that there are affirmative obligations incumbent on federal agencies with regard to protection of pollinators, regardless of whether they are federally listed. Federal documents related to pollinator health were described in our previous comment letters (see those).

- The commenter submitted similar comments for the 2021 EAs. See responses to comments #5, 9, and 13 of the 2021 EA.

7. **APHIS has not demonstrated that treatments in Montana will meet the "economic infestation level." No site-specific data or procedures are presented in the EA to satisfy APHIS' own description of how it determines that the "economic infestation level" is exceeded.**

The APHIS grasshopper suppression program draws its authority from the Plant Protection Act of 2000 (7 U.S.C § 7717). The statute authorizes APHIS to exclude, eradicate, and control plant pests, including grasshoppers. Specifically, language in the PPA provides authority for APHIS to protect rangeland from "economic infestation" of grasshoppers. In its recent EIS updating the program (APHIS 2019), the Agency describes its determination of an economic infestation as follows:

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

Such a measure is in accordance with general IPM principles that treatments should only occur if it is judged that the cost of the treatment is less than the revenues expected to be received for the product.

APHIS should have undertaken such an analysis in the EIS or the site-specific EAs—or at least model it— so as to determine whether the treatments might be justified because they have reached a "level of economic infestation." Yet none of the variables are discussed in the EAs at all, nor is site-specific data presented for any of these factors, nor are procedures shown that APHIS intends to abide by to determine when an economic threshold is exceeded. Instead the reader is left to simply assume that all treatments obviously meet the economic threshold.

On public lands, from a taxpayer point of view, it makes sense that—as the grasshopper suppression effort is a federally supported program—costs of the treatment **to** the taxpayer should be compared to the revenues received **by** the taxpayer for the values being protected (livestock forage) on public lands.

Typical costs per acre can be obtained from previous treatments. For example, according to an Arizona 2017 Project Planning and Reporting Worksheet for DWP# AZ-2017-02 Revision #1 (Post treatment report) the cost of treatment amounted to $8.72/treated acre, or $3.99/"protected acre."[1] In 2019, similar post-treatment reports report the costs as $9.39 per treated acre and $4.41 per "protected acre". Note that these costs summaries only include what appear to be the direct costs of treatment (i.e. salaries and per diem of the applicators, chemical, etc.). Administrative costs do not appear to be included in these cost estimates, nor do nymph or adult survey costs.

Information from a FAIRS Report (obtained through FOIA, not from APHIS' environmental documents) for aerial applications in Wyoming appear to indicate that aerial contracts cost between $9.76-$14.61/acre. However, the report is not easy to interpret and it is unclear if these are correct costs/acre.

Information from a summary of treatments conducted across Western states in 2017, 2018, and 2019 shows treatment costs for treatment costs for treated acres ranging from $4.43-$35.00 (2107); $9.34-$45.44 (2018), and $2.70-$35.60 (2019).

In determining whether a treatment is economically justified, one must ask what is the revenue expected to be received for the product? CARMA, the model used by APHIS to determine if a treatment should occur, shows that in Montana, it takes from 0-16 acres of rangeland to support one animal unit- month (AUM). Currently, on federal BLM and Forest Service lands, the US taxpayer receives $1.35 per AUM. As a rough estimation, taking the median value within the carrying capacity range (8 acres per AUM), and calculating the value of the forage per acre as paid to the American taxpayer, the US taxpayer currently receives an estimated $0.17 per acre for the forage value on BLM or USFS federal rangelands in Montana.

Given that the direct costs of grasshopper treatments to the taxpayer appear to range from $3.99 up to $44.44/acre, it is clear that the economic threshold is nowhere near being met, at least on federal lands. The program makes no economic sense from the point of view of the taxpayer.

The ecological costs of treatment are not quantified in the EAs, but as we have pointed out in this EA, are numerous, and there is no evidence that they are not significant. It is unclear if the economic analysis that the PPA appears to require from APHIS is intended to include a quantitative assessment of ecological costs.

APHIS claims that treatments can reduce the likelihood of future outbreaks but this claim is not supported by evidence. Treatments are unreliable at thwarting outbreaks in subsequent years (Blickenstaff et al. 1974; Smith et al. 2006; Cigliano et al. 1995). At best, insecticide treatments may stem damage to forage and crops in the current year.

The EAs did not include APHIS' protocol for delineation surveys which occur in spring and summer to identify treatment areas. We know that APHIS encourages landowners to "sign up" for treatments, in an effort, it appears, to attract contract bids for the aerial effort, and perhaps to lower the per acre cost overall. Without inclusion of information about how APHIS selects nymphal survey points, how it determines which nymphal survey points are at an "economic" threshold, and how APHIS delineates treatment blocks and accounts for areas between survey points, we have legitimate concern that unjustified treatment may be occurring, with repercussions for sensitive ecological systems.

- Please see APHIS' response to comment 1 above.

  This comment is similar in nature to comments in the 2020 EA, please see the APHIS responses to comments 3, 4, 5, 6, 7, 8 from the 2020 EAs. The analysis provided by the commenter assumes all lands treated by APHIS in Montana are public. This is not the case. Due to much of the land ownership in Montana being checkered board, private lands are often included in treatments in order for treatments to make biological sense. The private landowners pay a direct portion of treatment costs. Therefore, the assumptions made in the analysis provided by the commenter are an overestimate to the taxpayer. The value of the forage is not based only on the grazing fees assessed by BLM or FS. There are a range of additional costs associated with replacement feed, the cost of hay, the cost to ship the hay, the cost and labor to move the hay to the rangeland, the cost of moving the cattle from the grazing allotments, the cost to provide or build a hay barn to store the hay, the cost of treating noxious weeds often introduced by hay, etc. The replacement feed costs in Montana greatly out way any treatment costs accrued by the agency.

  Furthermore, the Plant Protection Act of 2000 does not give authority to APHIS to purchase replacement feed for ranchers, only provides funding when available to suppress outbreak populations of grasshoppers to save forage. In Montana there are no overhead or Administrative costs associated with the ground treatment costs provided by APHIS. The administrative costs associated with contractors providing aerial treatments are minimal due the funds provided by the state for nymphal surveys, pre treatment efforts, and permanent staffing hours not included in the costs. The IPM Manual prepared by USDA discusses the cost benefit analysis for grasshopper suppression programs.

8. **The EAs understate the risks of the broad-spectrum insecticide diflubenzuron for exposed bees and other invertebrates. Diflubenzuron is toxic to pollinators and a broad range of invertebrates as demonstrated in lab studies coupled with exposure models and also in field studies. APHIS mischaracterizes or minimizes studies that have demonstrated risk, while overemphasizing studies that found little risk.**

In its EA, APHIS states:

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.

APHIS also misleadingly suggests that diflubenzuron lacks toxicity to honey bees. In fact APHIS only provides detail on toxic effects for adult bees, while ignoring effects to the life stage targeted by this insecticide: eggs and developing juveniles.

Common practice in risk assessment includes use of models to understand potential environmental concentrations, and comparing these to known toxicity endpoints for species or taxa of interest.
Another method is the use of field studies, with controls and/or pre and post treatment assessments to understand treatment effects.

APHIS did not utilize models of exposure in concert with toxicity endpoints to bolster its statement. Models do raise concern for bee mortality and for sublethal effects. As we described in our comments on the 2021 EAs, at either the higher or lower application rates allowed by APHIS, diflubenzuron deposition on flowers and pollen (in the absence of drift or wind) is estimated to range from 1.32 – 1.76 mg/kg (equivalent to 1320-1760 ppb). Adults will collect contaminated pollen and place it in nests for consumption by developing juveniles. Comparing these deposition rates with EPA-reported toxicity endpoints, we determined that diflubenzuron at these rates would pose an acute dietary risk quotient of
4.9 and a chronic dietary risk quotient of 33.99. (A threshold value is 1.0.) Risk quotients this high above indicate a high concern for exposed bees.

We also utilized deposition values using the point zero and point 500 feet analyses presented in the APHIS drift analysis included in its 2010 BA to NMFS. Even at 500 feet from the spray, we estimate acute dietary larval RQ as 2.4 and chronic dietary RQ larval RQ as 16.6.

An acute risk quotient (RQ) of 1.0 (or higher) indicates that the estimated environmental concentration is sufficient to kill 50% of exposed bees. The Level of Concern (LOC) is an interpretation of the RQ. Normally the LOC is established at RQ=1.0. However for acute risk to bees, because of bees' great ecological and agricultural importance, combined with concern about the risks posed to them by pesticides, EPA sets the LOC value at RQ=0.4. Using the deposition estimates above, larval acute RQs range from 2.8 – 4.9 (7-12X the EPA LOC threshold) within sprayed swaths, depending on drift. Outside of sprayed swaths, even 500 foot distant from a spray, the RQ estimate is 2.4, which is 6X the EPA Level of Concern.
Chronic risk to bees is evaluated with an LOC at RQ=1.0 (USEPA 2014). As indicated in our comment letter from 2021, even at 500 feet from the application site, using APHIS predictions for deposition, chronic RQ is estimated at 16.6. At the release site, assuming drift, the chronic RQ is estimated to be 19.1, assuming no drift it would be 34 at the full rate. RQs are thus 17-34X the EPA Level of Concern.

> Risk quotients this many times the LOC values indicate a potential for mortality and chronic harm to exposed bee larvae.

Managed bees may also be at risk; data shows that the alfalfa leafcutting bee (*Megachile rotundata*) and the alkali bee (*Nomia melanderi*) are both considered more susceptible than honey bees or *Bombus to* diflubenzuron. APHIS appeared to acknowledge the risk to bees in many of the 2020 EAs by instituting a 4-mile buffer around any known managed leafcutter or alkali managed bees and by including notification to all apiarists before a treatment. However, these prudent measures are missing entirely from the 2022 treatment guidelines.

APHIS mangled important studies examining pollinator impacts. For example, APHIS cites Mommaerts et al. (2006), noting that reproductive effects were observed on bumble bees, but APHIS claimed that these effects were observed at much higher use rates than those used in the program. Unfortunately, this is a gross mischaracterization of the Mommaerts study which found drastic reproductive failure at concentrations that would be expected from program rates.

In the EAs, APHIS left out entirely the results found in Graham et al. (2008), the largest field study of diflubenzuron ever conducted in Western rangelands. Graham et al. (2008) found that treated areas resulted in significantly lower abundance of bees compared to untreated areas. Lepidoptera (butterflies and moths) also showed lower abundances in sprayed zones. Other groups that also perform pollination were affected as well. For example, the study reported that flies and predatory and parasitic wasps were significantly lower in treated areas shortly after treatments and one year post-treatment.

Many of the effects noted in Graham were observed 1-year post treatment, a lag effect which is not unexpected since diflubenzuron acts to impede arthropod development, rather than killing adults directly.

Nearly all of the other studies of diflubenzuron impacts on non-targets cited by APHIS that were conducted in Western rangelands were of very small scale (40 acres or less) or were barrier treatments (not a method used in APHIS rangeland grasshopper suppression). Small acreage studies are of little use in gauging treatment impacts especially to more mobile invertebrates since small tested acres can be easily recolonized from the edges.

Considering that bumble bees (and other native bees) have inherently low fecundity, recovery may be slow in and near suppression areas. As a result, we have concerns that population level impacts could occur to already declining native bees, resulting in potential impact to other species, such as flowering plants.

Other studies that have examined diflubenzuron impacts to pollinators are also left out or not adequately treated in the EAs. For example, Camp et al. (2020) found that *Bombus terrestris* microcolonies fed with diflubenzuron resulted inhibited of drone production. Litsey et al. (2021) examined the impact to honey bees workers that had been exposed as larvae to chronic sublethal doses of insect growth disruptors. Bees developmentally exposed to diflubenzuron had lower
adult survival relative to controls.

Lepidoptera also pollinate, if incidentally. Adults consume nectar while larvae eat leaf tissue. Lepidopteran larvae are not relatively protected in nests while developing (like bees are) but are fully exposed to the elements.

While studies of diflubenzuron effects to non-pest lepidopteran species can be hard to find, several studies of this chemical on pest species are identified in Eisler (1992). Eisler identified the following concerning results from published studies:

- In studies on Gypsy moth, all larvae died when exposed at 100 ug/kg food (100 ppb)
- Cabbage moth (*M. brassicae*), 90% larvae died when exposed to 2200 ppb in spray (3rd instar)
- Large white butterfly (P. brassicae), 50% of larvae died at 390 ppb.

The results from the gypsy moth and large white butterfly studies were conducted with exposures expected from applications under this grasshopper suppression program, while the cabbage moth study utilized a rate slightly higher than what would be expected from a full rate application with no drift (Table 1).

These results, which were not identified in the EA when APHIS discussed risk to pollinators, lend additional urgency to the need for APHIS to seriously reconsider the effects of diflubenzuron on pollinators.

- The commenter expressed similar concerns that were addressed in the 2020 and 2021 EAs. Please see the APHIS responses to comments #10, 12, 14, 19, 20, 25, 28, and 41 in the 2020 EAs as well as comment #6 in the 2021 EAs.

  APHIS understands the commenter’s concern that using diflubenzuron to control rangeland grasshoppers could affect populations of non-target insects. The U.S. Geological Survey study cited

(Graham et al. 2008) did not find direct effects of diflubenzuron on arthropod communities. The researchers concluded, "At the order level, no consistent patterns of difference in proportional representation between treated and untreated sites at any of the three study areas indicate that treatment with diflubenzuron affects nontarget arthropods." The researchers collected data at three rangeland field sites. At one of these study areas, Grouse Creek, they were able to conduct pre-treatment and post treatment surveys. The other two study areas had been treated the prior year, and so only post-treatment data was collected. At Grouse Creek no significant differences in pre- and post-treatment arthropod numbers occurred within the sprayed zone. Total arthropods did not differ in the sprayed zone. Only Orthoptera showed a decrease from pre- to post-treatment numbers in the sprayed zone, indicating that diflubenzuron did accomplish the management goal of decreasing Orthoptera numbers in the sprayed zone. APHIS appreciates the commenter sharing this study that further affirms the use of diflubenzuron to selectively control grasshoppers and Mormon crickets.

The commenter may have noted the researcher's post-treatment comparisons of unsprayed and sprayed zones showed that spiders and non-ant Hymenoptera were significantly more abundant in the unsprayed zone following application of diflubenzuron. However, there were statistically significant differences in average abundance for the Hemiptera, non-ant Hymenoptera, and Orthoptera in the untreated and treated zones before the treatments.

APHIS wishes to clarify that while the researchers found the average numbers of Lepidoptera, Scorpions, and total arthropods differed markedly in the sprayed and unsprayed zones, but not to the point of statistical significance. The commenter expressed concern that Lepidoptera were more abundant in the unsprayed zone, but the researchers attributed this post-treatment difference to inherent differences in the Lepidoptera communities of the two zones. Based on the findings of this research, APHIS does not believe rangeland grasshopper treatments using diflubenzuron will have significant impacts on the environment.

APHIS wishes to remind the Xerces Society that the NEPA standard of risk evaluation is "Significant Impacts". The commenter's concern that grasshopper treatments might affect other organisms is valid. However, we believe based on our risk analysis those effects will not be long lasting or severe enough to cause significant impacts. Our operational procedures prevent or reduce the severity of these effects. For example, the use of a carbaryl bait instead of liquid, reduced pesticide application rates, one application per year and the use of alternating swaths vs full coverage. Lastly, we primarily use diflubenzuron treatments to which grasshoppers are more susceptible than other insects.

9. **APHIS relies too heavily on broad assertions that untreated swaths will mitigate risk. Untreated swaths are presented as mitigation for pollinators and refugia for beneficial insects, but drift from ULV treatments into untreated swaths at typical aircraft heights is not fully disclosed, while studies are mischaracterized.**

The EAs and the EIS suggest that the use of untreated swaths will mitigate impacts to natural enemies, bees, and other wildlife. For example:

- Final EIS p. 34: *"With less area being treated, more beneficial grasshoppers and pollinators will survive treatment."*
- Final EIS P. 57: "*The use of RAATS provide additional benefits by creating reduced rates and/or untreated swaths within the spray block that will further reduce the potential risk to pollinators."*

- Final EIS p. 26. *"Studies using the RAATs strategy have shown good control (up to 85% of that achieved with a traditional blanket 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).*
- Montana 2022 EAs: *"The use of RAATs provide additional benefits by using reduced rates and creating untreated swaths within the spray block that will further reduce the potential risk to pollinators."*

However, the width of the skipped swaths is uncertain, as there is no minimum width specified.

APHIS' citation of a study by Lockwood et al. (2000) to claim that RAATS treatments result in "a markedly higher abundance of non-target organisms following application" appears to be far too rosy an assessment. We note that:

- The study authors make clear that reduced impact to non-target arthropods was "*presumably due to the wider swath spacing width* [which measured 30.5 and 60 m in the study]"**.** Obviously, these swath widths are on the high end of what could be used under the EAs.
- APHIS leaves out one of the key findings of the study: For carbaryl, the RAATs treatment showed *lower* abundance and biomass of non-targets after treatment compared to the blanket treatments on one of the two ranches at the end of the sampling period (28 days). Also, on both ranches, abundance and biomass reached their lowest points at the end of the study after treatment with carbaryl, so we don't know how long it took for recovery to occur.

Moreover, many features of the study make it less than useful for predicting impacts under APHIS' current program. We note that:

- This study only investigated RAATs effects to non-targets for carbaryl, malathion, and fipronil, not on diflubenzuron.
- In addition, the study measured highest wind speeds at 6.0 mph, well below the maximum rate allowed under the operating guidelines indicated in the 2022 Treatment Guidelines (10 mph for aerial applications, no maximum wind speed specified for ground applications).
- The experimental treatment areas in the study (243 ha or 600 acres) were quite small compared to aerial treatment sizes that occur in reality (minimum 10,000 acres for aerial treatments). This could have allowed for recolonization from around the edges that would result in more rapid recovery, compared to a real-world treatment, some of which measure tens of thousands of acres.

APHIS also cited Deneke and Kyser (2011) to justify its statement that RAATs results in a "markedly higher abundance of non-target organisms following application." Deneke and Kyser's publication is an extension publication, not a research publication, and contains absolutely no data to show that RAATs conserves non-targets.

Neither the EAs nor the 2019 EIS presented estimated environmental concentrations (EECs) in the untreated swaths and simply included statements that untreated swaths would reduce risk to nontargets. To fully understand expected environmental concentrations in treated swaths, it is important to have a clear assessment of drift under the conditions that occur under the APHIS grasshopper program. While APHIS' 2019 EIS described its use of a quantitative analysis of drift anticipated from ULV aerial applications (see HHERA for diflubenzuron) to estimate deposition into **aquatic areas**, the information presented in the EIS and HHERA is insufficient to fully understand expected environmental concentrations **in untreated swaths**. To better understand this issue, we looked more closely at several drift analyses and studies to better understand the potential for drift.

a) EPA (2018) in its most recent ecological risk assessment for diflubenzuron, included a low volume aerial drift analysis using the model AgDrift. EPA assumed a volume mean diameter (VMD) of 90 µm [note that this is approximately 2/3 of the VMD used in the APHIS analysis]. Under EPA's analysis, the drift fraction comprises 19% at 150 ft. However, this analysis is likely not helpful for most aerial APHIS grasshopper program applications, as the EPA analysis is based on a boom height of 10 feet while APHIS aerial release heights are typically much higher.

b) Schleier et al. (2012) performed field studies to measure environmental concentrations of ground-based ULV-applied insecticides. Sites contained little vegetative structure and a flat topography. The authors observed that an average of 10.4% of the insecticides sprayed settled out within 180 m (591 ft.) of the spray source. According to the authors, these results are similar to measurements in other studies of ground-based ULV applications using both pyrethroid and organophosphate insecticides, which found 1 to 30% of the insecticide sprayed deposits on the ground within 100 m (328 ft) of the spray source.

c) According to information APHIS provided to NMFS in a 2010 Biological Assessment (obtained through a FOIA request), aerial release heights may reach 75' above the ground (APHIS 2010). Modeling of drift using aerial methods and a 75' release height was conducted using the model AgDISP in this BA; modeling using ground methods was conducted using the model AgDRIFT. In both cases the droplet size was set as "very fine to fine" which corresponds to a Volume Mean Diameter (VMD) of 137.5 um.

Outputs from the models are very difficult to interpret from the information in the BA which is only presented as a chart with the y-axis at a scale too coarse to adequately interpret the results and decline at different points distant from the spray. However, for the aerial diflubenzuron application, it appears that the model predicts deposition at point zero (below the treated swath) to be approximately 1 mg/m^2. APHIS states subsequently that the model predicts deposition at 500 feet to measure 0.87 mg/m2. Translated into lb/acre this means a deposition of 0.009 lb/A at point zero and 0.0078 lb/acre at 500 foot distance, with approximately a straight line of decreasing deposition between those two points.[2]

According to drift experts, the most important variables affecting drift are droplet size, wind speed, and release height (Teske et al. 2003). In analyzing these three drift analyses, we note that neither the Dimilin 2L label nor the Sevin XLR Plus label requires a minimum droplet size for ULV applications on grasslands and non-crop areas, for the control of grasshoppers and Mormon crickets. However, other uses of ULV technology for pest control assume much smaller droplet sizes than what APHIS has assumed (VMD of 137.5). For example, for ULV applications used in adult mosquito control operations, VMD measures between 8 and 30 µm and 90% of the droplet spectrum should be smaller than 50 µm (Schleier et al. 2012). EPA estimates VMD for ULV applications as 90 µm (USEPA 2018).

- The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators. However, APHIS does not solely rely on the reduced deposition of pesticides in the untreated swaths to determine the potential harm of grasshopper treatments will not cause significant impacts. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments using conventional methods (total area coverage and higher application rates) is provided on pages 19-25 of the 2022 EAs. Additional descriptions of APHIS' analysis methods and discussion of the toxicology can be found in the 2019 EIS.

  The commenter has expressed concern that APHIS' analysis modelling drift does not use the same variables values as similar analysis conducted by the US EPA. APHIS must explain that the EPA analysis is for general use of ULV pesticides while APHIS' analysis is based on multiple conservative estimations of operational procedures and variables for the grasshopper program. The commenter also cites a study (Schleier et al., 2012) and asserts the insecticide drift modelled and measured by the authors for ultra-low volume mosquito treatments are representative of the potential drift between treated and untreated swaths during a grasshopper suppression treatment using the RAATs method. APHIS disagrees with the commenter's understanding of the study based on the text of the article that states, “Ground-based ULV applications used for adult mosquito management are very different than agricultural pesticide applications because the nozzles produce an aerosol (droplets < 100 μm) and are pointed at a + 45° angle from the horizon. Ultra-low-volume applications used for adult mosquito management are most effective when the insecticide remains airborne and moves through the target area; in contrast, applications for agricultural pests are designed to minimize the movement of droplets (Hiscox et al., 2006).”

The commenter appreciates the graphical representation of spray drift provided by APHIS for the purpose of estimating pesticide deposition at various distances from the treated swath. The graphs are intended to explain how APHIS derived no-treatment distances for buffers intended to prevent harm to species protected by the Endangered Species Act. APHIS does not assert that spray drift is reduced to zero in untreated swaths, and that is not represented by the graphs or assumed by the risk analysis cited by the commenter (APHIS EAs, EIS, HHERAs). If the commenter agrees the graphs are reasonable representations of spray drift and wishes to extrapolate the modeling to deposition resulting from APHIS’ use of the RAATs method, the exponential drop of pesticide deposition close to the release point is more informative.

The skip swath size in the studies are relevant to Montana treatments. For larger treatments, a class C or D aircraft is required and a standard treatment width would be 150 feet. This means that skip swaths at 50% coverage would be 150 feet and at 33% coverage up to 300 feet. The latter method would have a larger skip than the largest measured in the study but would only be applied on the largest scale infestation, specifically for Mormon crickets, to minimize impacts to nontarget across such a large landscape.

It is a practice in Montana not to treat when the wind is blowing greater than 10MPH to avoid potential exposure as well as minimize incidental drift. Regular environmental measurements (wind speed, wind direction, air temp) are taken before and during a treatment. The minimum swath width for treatments has been described in past EAs as well as under section “II. Alternatives, B. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy (Preferred Alternative)” of the 2022 EA. The swath width has been described in detail in the above discussion. Typically, the swath width that is skipped is the swath width of the treated swath. This again was described in the 2020 EA, please see comments, 10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 41 of the 2020 EA.

- See the response to comment 8 above.

  The commenter assumes that there are widespread treatments in Montana. This is generally not the case, with treatments occurring in localized areas.

  Birds are highly mobile predators and will search for prey in areas with the treatment blocks where APHIS does not spray pesticides. For example, the skip swaths where the RAATs method is employed or within protective buffers established around water resources or other sensitive sites.

  In Montana, BLM, APHIS, and USFWS operate under a Memorandum of Understanding when treating near sage grouse habitat. The outlined mitigation measures in the MOU are put into place to minimize the impacts to foraging leks which utilize grasshopper and Mormon crickets in their diets. A three-mile buffer around active and pending lek sites provides ample forage for sage grouse leks.

  While the additional species mentioned (Swainson’s hawk, long-billed curlew, or sage thrasher) are listed under the Migratory Bird Treaty Act, none have been identified as needing additional mitigation measured during consultation with USFWS. Land managers and Montana Fish, Wildlife and Parks also have not identified any at risk, or even populations at all, that require supplementary mitigation measures.

10. APHIS fails to acknowledge the high risks of carbaryl (even when applied as baits) to a wide variety of species, including sage-grouse.

According to EPA (2017b), carbaryl is considered highly toxic by contact means to the honey bee, with an acute adult contact LD50 of 1.1 ug/bee. The APHIS 2019 EA describes the oral LC50 value as 0.1 ug/bee.[3] Larval bee toxicity was not available from the APHIS 2019 EA.

We conducted a similar analysis of risk to liquid carbaryl to bees in our 2021 comment letter. Even at the deposition rate APHIS expects at 500 feet away from the spray line with a lower nominal application rate of 0.375 lb ai/acre (we have already noted that these predicted deposition rates could be underestimates at that distance, based on empirical data), APHIS would exceed the acute toxicity Level of Concern designated by EPA by 150X. All of the other deposition values have similarly disturbing exceedences of EPA's acute dietary LOC, while contact exposure also shows potential to exceed the LOC. Nowhere within the EA or the EIS is this made clear.

Given the lack of disclosure and the unacceptably high acute risk quotients reached with these deposition rates, carbaryl spray is an unacceptable option.

A study by Abivardi et al. (1999) looked at the effect of carbaryl contact toxicity to recently emerged adult codling moths (*Cydia pomonella*), finding that at 187.5 ng/cm^2 (which is equivalent to 0.016 lb/ac—the same as the highest application rate under the grasshopper program), more than 70% of exposed male moths died within 24 hours, while these rates killed 30% of the females within 24 hours.

Carbaryl baits are thought to pose less exposure to bees as the large size of the flakes means most particles would not be collected deliberately. Still, the potential for the bait to dissolve in nectar or for small particles to be picked up incidentally and mixed with pollen exists. Peach et al. (2008) found significant mortality to larval alfalfa leafcutter bees fed with pollen-nectar provisions (30% at 2 mg carbaryl; 18% at 1 mg carbaryl; control had 11% mortality). It is unknown how bait that may fall into ground nests affect bees.

Carbaryl baits pose risks to other insects. Quinn et al. (1991) examined the effects of large scale aerial treatments of carbaryl bait on carabid ground beetles (many of these are predaceous, others eat weed seeds). Baits resulted in large effects on ground beetles, with the most abundant species (*Pasimachus elongatus*, a predator species) declining by 75% in baited areas, while remaining unchanged in untreated areas. The second most abundant species (*Discoderus parallelus, unknown food habits)* also declined by 81% in the treated areas, while increasing in the untreated areas. Effects disappeared by the 2nd year. The authors attributed the lack of a carryover effect in the second year to the timing of the control treatments, (they surmised that the beetles had reproduced prior to treatments), and to in-migration into the treated areas.

Coleoptera (beetles) are important for a variety of ecological roles - food for sage-grouse and other species, as well as dung burial and recycling, and some are also predators on other insects.

Peterson (1970) identifies Coleoptera, Orthoptera (grasshoppers), Hymenoptera (primarily ants), and a variety of unidentified and immature insects as the most frequent components of sage-grouse chick diets based on crop analysis in Montana.

Thus impacts to beetles and grasshoppers from carbaryl baits raise important concerns for effects to declining sage-grouse.

There is evidence that Mormon cricket do not pose a significant risk to rangelands (McVean 1991). Therefore, bait treatments for Mormon crickets on rangelands are likely not justified, particularly given the likely large impact to sensitive species such as sage-grouse.

- The commentor submitted similar comments to the 2021 EAs. See responses to comments #8, 10, 11, and 12.

11. **Impacts to Greater Sage-grouse are not sufficiently explored nor is sage-grouse and their habitat sufficiently protected under the EAs.**

APHIS makes no mention of state level mandates, including Montana Executive Order 12-201, nor whether APHIS will comply with the Montana Sage-grouse Conservation Strategy. The EAs also do not specifically evaluate whether treatments would adversely affect sage grouse populations due to impacts to the prey base, and assume, without providing evidence, that flattening the fluctuations in grasshopper population will have no impact.

Greater Sage-Grouse has seen its range cut in half and its population decreased 93 percent from historic numbers. An agreement is in place to prevent ESA listing through implementation of state-based conservation strategies.

Large areas of Eastern Montana are designated as Priority Habitat Management Areas for Greater Sage- Grouse or as sagebrush focal areas. Sage grouse chicks are dependent upon several orders of insects until they mature enough to eat sagebrush.

While we have never seen a comprehensive set of maps or data outlining where APHIS applies grasshopper treatments, from contract solicitations it appears that Eastern Montana receives more grasshopper spray than any other part of the West.

Peterson (1970) identifies Coleoptera, Orthoptera (grasshoppers), Hymenoptera (primarily ants), and a variety of unidentified and immature insects as the most frequent components of sage-grouse chick diets based on crop analysis in Montana. Greg and Crawford (2009) identified Lepidoptera as important components associated w/ chick survival.

The most robust studies of diflubenzuron (Graham et al. 2008) and carbaryl bait (Quinn et al. 1991 and 1992) replicated real-world APHIS treatments and tested the chemicals across thousands or tens of thousands of acres, sampled comparable unsprayed areas as controls, and conducted sampling a year after treatment to test for lag effects and recovery.
These studies found that orders of insects important to sage-grouse (and other species) were diminished due to the effects of grasshopper suppression. For example:

Carbaryl bait: Quinn et al. (1991) examined the effects of large scale aerial treatments of carbaryl bait on carabid ground beetles (many of these are predaceous, others eat weed seeds). Baits resulted in large effects on ground beetles, with the most abundant species (*Pasimachus elongatus*, a predator species) declining by 75% in baited areas, while remaining unchanged in untreated areas. The second most abundant species (*Discoderus parallelus, unknown food habits)* also declined by 81% in the treated areas, while increasing in the untreated areas. Effects disappeared by the 2nd year. The authors attributed the lack of a carryover effect in the second year to the timing of the control treatments, (they surmised that the beetles had reproduced prior to treatments), and to in-migration into the treated areas).

Diflubenzuron. Graham et al. (2008) found that treated areas resulted in significantly lower abundance of bees compared to untreated areas. Lepidoptera (butterflies and moths) also showed lower abundances in sprayed zones.

Overall, the authors concluded that Coleoptera, Diptera, Hemiptera, non- ant Hymenoptera, Lepidoptera, Orthoptera, and Scorpiones, may be more susceptible to diflubenzuron. Differences between sprayed and unsprayed zones were greater when sampled a year after diflubenzuron application, suggesting that the effect may lag behind application. Non-ant Hymenoptera (including bees and predatory and parasitic wasps) were significantly lower in treated zones at two out of three treated sites. Ants showed differences at the genus level in their responses to diflubenzuron treatment. Some genera (for example, *Forelius*) had higher numbers in sprayed zones, while the abundance of other genera (for example, *Tapinoma*) was lower in sprayed zones.
Formica and *Tapinoma* tended to have lower numbers in treated zones, while *Forelius* and perhaps *Pheidole* tended to increase in treated zones.

Johnson (1987) found that insect reduction as a result of rangeland grasshopper control reduced brood sizes in a wild sage-grouse population.

APHIS-Montana has some mitigations in place to protect sage grouse on BLM land but these do not go far enough. Protecting habitat within 4 miles of the leks is especially important. After coming to the leks to mate, the females nest in the general vicinity of the leks, depending on the availability of suitable habitat. According to www.sagegrouseinitiative.com, most nesting occurs within 3 miles of leks, though some nests may be as far as 12 miles from the nearest lek.

Under the 2022 EA for Montana, it is clear that leks are not protected in Montana from aerial application of diflubenzuron, even though these and surrounding areas are where most of the chicks are produced and where it is especially important that food sources include the insects that sage grouse chicks most need (grasshoppers, beetles, Lepidoptera, ants, and other insect species). Studies show that these groups of insects, especially grasshoppers, beetles, and Lepidoptera, are adversely affected by diflubenzuron sprays, even when RAATs are employed.

Conservation Recommendations from the USFWS to Oregon in its 2021 concurrence letter included the following: *"Sage-grouse brood areas should be located if not already known, and protected from insecticide spraying (Johnson 1987). Grasshopper control should also be delayed in brood-rearing areas to allow for maximal chick development before spraying reduces their insect forage (Johnson 1987).The Service recommends APHIS use these guidelines to avoid pesticide spraying of nesting and brood-rearing areas for sage-grouse in order to prevent further declines from current sage-grouse population levels."*

- Please see page 35 of this Final EA. Further APHIS strictly adheres to the BLM MOU and the Montana Sage Grouse Habitat Conservation Program, which exempts grasshopper treats using RAATS from mitigation measures.

12. APHIS never analyzes the possibility that its suppression effort may actually worsen future outbreaks of grasshoppers

Prior to chemical suppression of grasshoppers in the Americas, grasshoppers were regulated primarily by natural processes, including natural enemies such as birds, predatory insects, diseases, and even competition with other grasshoppers.

Chemical suppression of grasshoppers runs the very real risk of disrupting these important natural regulation processes, potentially setting the stage for worsened outbreaks in the future. This is not an idle thought – this possibility has explored by respected grasshopper researchers in a number of publications. For example, see Joern (2000) who discussed this information and concluded that large- scale grasshopper control may contribute to grasshopper problems. An analysis of adjoining Montana and Wyoming counties supported this analysis, showing that where large-scale chemical control was not regularly applied, acute problems rapidly disappeared and long intervening periods of low grasshopper density persisted. Conversely, in places where a history of control existed, chronic, long-term increases in grasshopper populations were observed (Lockwood et al. 1988).

Lockwood et al. (1996-2000) explored identified infested areas, their sizes and what happened to them in subsequent years. Data was presented for 15 untreated and 4 treated areas. Of these, only two untreated areas grew in size in their 2nd year, and most winked out by the 2nd year, not reappearing by the 3rd year. This is powerful evidence that not treating is a viable decision, or that treating is not warranted in the first year, at least for small infestations, and at least if the goal is to minimize the chance that an outbreak/hotspot would result in something worse in the following year.

APHIS often stretches science to the point beyond where it is credible. For example, APHIS cites a study by Catangui et al. (1996-2000) which investigated the effects of Dimilin on non-target arthropods at concentrations similar to those used in the rangeland grasshopper suppression program. In APHIS' characterization, the study showed that treatment with Dimilin should be of no concern since applications resulted in "minimal impact on ants, spiders, predatory and scavanger beetles." However, APHIS does not disclose that the plots studied by Catangui measured only 40 acres. This is a far cry from the ground treatments normally measuring thousands of acres or the aerial treatments measuring a minimum of ten thousand acres that are seen in the actual grasshopper suppression program. Small treated plots of 40 acres can be quickly recolonized from the edges. Large treated plots are quite a different story.

In contrast the field study of large scale applications by Graham et al (2008) found significant effects to important natural enemies of grasshoppers, including Diptera, and non-ant Hymenoptera. These groups contain important predators and parasitoids of grasshoppers and other organisms. These are the very organisms that help regulate grasshopper populations.
Quinn et al. (1993) examined the co-occurrence of nontarget arthropods with specific grasshopper nymphal and adult stages and densities. The study reported that nymphs of most dominant grasshopper species were associated with Carabidae, Lycosidae, Sphecidae and Asilidae, all groups known to prey on grasshoppers. The authors state that "the results suggest that insecticides applied to rangeland when most grasshoppers are middle to late instars[4] will have a **maximum impact on nontarget arthropods**." [Emphasis added]

Large scale treatment effects on ground beetles were investigated by Quinn et al. 1991. While this study was more akin to real-life treatments in the design, and found that initial large effects on ground beetles had disappeared by the 2nd year, this study did not investigate diflubenzuron, only malathion, carbaryl bait. The authors also state that "the lack of a carryover effect in the second year is most likely due to the timing of grasshopper control treatments…adult ground beetles probably were very active several weeks before the treatment date and may have already reproduced before treatments were applied. Insects may also have immigrated into the evaluation plots after treatment."

Since diflubenzuron would kill juvenile stages of insects and is more persistent than either malathion or carbaryl, it could have quite a different effect than these two chemicals. Therefore this study cannot be relied upon to assume that recovery would be similar to recovery under a carbaryl or malathion treatment.

Researchers even warned about the potential for treatments to worsen outbreaks in the Grasshopper IPM handbook. In Section IV.8 (Recognizing and Managing Potential Outbreak Conditions) Belovsky et al. cautioned:

"Pest managers need to consider more than the economic value of lost forage production or the outcry of individual ranchers. Grasshopper control might provide short-term relief but worsen future problems in these environments. From GHIPM findings (see VII.14), it appears that grasshopper populations in these environments have a high potential for being limited by natural enemies. Pesticide applications that reduce grasshopper numbers could also reduce natural enemy numbers directly by outright poisoning of the invertebrate natural enemies, or indirectly by lowering the numbers of vertebrate predators as their invertebrate prey are reduced.

Therefore, the ultimate result of control efforts could be an increase in grasshopper numbers for the future, as they are released from the control of natural enemies."

- The commenter again refers to comments addressed in the 2020 EAs. Please see response to comment 20 from the 2020 EAs and comment 8 above.

  APHIS disagrees with the commenter's opinion about the credibility of the science relied on by the agency. APHIS must remind the commenter that although grasshopper outbreaks are a natural process, and so their severity may be cyclical, the Plant Protection Act of 2000 directs APHIS to control grasshopper populations to mitigate the harm to American agriculture cause by those outbreaks.

  APHIS wishes to remind the Xerces Society that the NEPA standard of risk evaluation is "Significant Impacts". We believe based on our risk analysis those effects will not be long lasting or severe enough to cause significant impacts. Our operational procedures prevent or reduce the severity of these effects. For example, the use of a carbaryl bait instead of liquid, reduced pesticide application rates, one application per year and the use of alternating swaths vs full coverage. Lastly, we primarily use diflubenzuron treatments to which grasshoppers are more susceptible than other insects.

  The commenter assumes that there are widespread treatments in Montana. This is not the case.

  The commenter also assumes without APHIS' involvement in treating outbreak populations, no treatments will occur. In reality, lack of APHIS involvement can result in more chemicals being applied on private land with less restrictions to buffers and sensitive species coupled harsher chemicals being released into the environment. In recent public meetings, private landowners eagerly supported the use of Malathion on their own lands in the wake of APHIS' lack of treatments. APHIS treatments under the preferred alternative using the RAATs method would result in less private applications of pesticides due to reduced densities in the area.

  The commenter assumes APHIS will treat when requested. There have been years when the land managers have requested treatments, but because the populations did not merit treatments therefore no treatments did occur. The commenter failed to provide the methodology used in the research cited. Also, the commenter failed to describe if the outbreaks were gradient or eruptive in the research cited. Berryman (2008) describes in detail the population dynamics of these two types of outbreaks and methods to address these types of outbreaks. The commenter must understand that outbreaks reoccur to some degree due to favorable ecological factors and grasshopper populations respond. Consequently, grasshopper treatments may reoccur in the same vicinity.

13. APHIS fails to meaningfully analyze the risk to grassland birds, many of which are declining.

McAtee (1953) examined 40,000 bird stomachs and reported that >200 spp prey on grasshoppers. Such avian predators of grasshoppers include species often seen in Western areas, such as kestrel, and meadowlark. Avian predators of grasshoppers also include grassland birds in decline, that merit special consideration, including sage-grouse, Swainson's hawk, Sprague's pipit, Baird's sparrow, chestnut- collared longspur, long-billed curlew, sage thrasher, and others.

According to McEwen (1987), grasshoppers are especially important for the raising of young by the majority of bird species. McEwen et al. (1996) cites a number of resources in stating that bird predation commonly reduces grasshopper densities on rangeland by 30-50 percent.

Despite this strong linkage between grasshoppers and the health of rangeland bird communities, APHIS only analyzes the direct toxic effect of insecticidal treatments to birds, and fails to analyze the indirect effects from loss of forage to these declining bird species.

For example Sample et al. (1986) examined the effects of diflubenzuron exposure to nine species of songbirds. The data showed that while diflubenzuron is not directly toxic to vertebrates, birds were affected indirectly through reduced availability of Lepidoptera larvae. Birds possessed differing capabilities to compensate for these diflubenzuron-induced food reductions. Most birds adjusted by switching prey, while others consumed less food.

A recent study estimated a net loss of nearly 3 billion birds since 1970, or 29% of 1970 abundance in North America (Rosenberg et al. 2019). It is critical to recognize that grassland birds—an important group of species that extends well beyond the iconic sage grouse—have suffered the largest decline (53%) among habitat-based groups since 1970, while populations of six species of grassland birds (Baird's sparrow, Cassin's sparrow, Chestnut-collared longspur, lark bunting, Sprague's pipit, and McCown's longspur) have declined by 65-94%. This is never disclosed in the EA nor considered in the cumulative effects analysis. The Prairie Pothole Region of the northern Great Plains is critical breeding, nesting and migration habitat for these grassland birds, including the species that have suffered major population declines.

Habitat loss is a huge driver of declines, yet pesticides still play a role (Hill et al. 2013), especially if their prey is affected. Birds are themselves 'free' insect control as described above (also see Bock et al. 1992), hence negative effects for birds could actually increase insect pests.

- See response to comment 9.

14. It is unrealistic to assume that APHIS can comply with mitigation measures designed to protect bees on pesticide labels.

APHIS claims that it will adhere to applicable mitigations designed to protect bees that are found on product labels. For example, the Final EIS categorically states that "Product use restrictions and suggestions to protect bees appear on US EPA approved product labels and are followed by the grasshopper program. Mitigations such as not applying to rangeland when plants visited by bees are in bloom, notifying beekeepers within 1 mile of treatment areas at least 48 hours before product is applied, limiting application times to within 2 hours of sunrise or sunset when bees are least active, appear on product labels such as Sevin® XLR Plus. Similar use restrictions and recommendations do not appear on bait labels because risks to bees are reduced. APHIS would adhere to any applicable mitigations that appear on product labels."

It should be remembered that bumble bees fly earlier and later in the day than honey bees and limiting application times to within 2 hours of sunrise or sunset may not be protective. In addition, while diflubenzuron is toxic to larval and developing forms of numerous insects, it appears that Lepidoptera (butterflies and moths, many of which are at-risk as emphasized in Xerces' comment letter from 2020) are more sensitive, as a group, than other species.

The Dimilin 2L label instructs the user to "minimize exposure of the product to bees" and to "minimize drift of this product on to beehives or to off-site pollinator attractive habitat." The Sevin XLR Plus label instructs applicators: "Do not apply this product to target crops or weeds in bloom."

However, if treated habitat is flowering and bees are active (as would be anticipated during any of the proposed treatment months), it is not clear how applications for grasshopper/Mormon cricket control can minimize exposure to bees.

Except for reduced rates and/or untreated swath widths, the EAs are silent on how it will avoid impact to pollinators. It has already been shown that within sprayed areas, risk quotients at expected application rates would be well above 1.0. Leaving skipped widths is also not a full solution at expected widths since, due to drift, untreated swaths are highly likely to be exposed to levels above risk quotients (see above comment).

In cropland areas, applicators sometimes minimize exposure to bees by applying at night. From examination of some of the flight records from past grasshopper treatments, it is clear that this is not the norm for the program, at least for aerial treatments.

- The commenter made similar comments addressed in the 2020 EAs. Please see the APHIS responses to comments 10, 12, 14, 19, 20, 25, 28 and 41 in the 2020 EAs.

  The commenter is correct that APHIS believes the use of RAATs mitigates the risk to non-target insects including pollinators and bees. APHIS does not believe the adherence to product use restrictions mitigates all harm to these species. Instead, APHIS has analyzed the benefits of relatively small grasshopper treatments against the potential for significant impacts to bee populations within the large area covered by the EAs. The environmental consequences risk analysis of carbaryl and diflubenzuron treatments is provided under the “A. Environmental Consequences of the Alternatives, 2. Insecticide Applications at Conventional Rates or Reduced Agent Area Treatments with Adaptive Management Strategy” parts a) and b) on pages 19-25 of the 2022 EAs. Additional descriptions of APHIS’ analysis methods and discussion of the toxicology can be found in the 2019 EIS.

15. Endangered Species Act Assessment Incomplete

APHIS states in the EA:
On February 10, 2022, APHIS reached informal consultation with the USFWS office in Helena, MT (Appendix C).

However, neither the Biological Assessment nor the Concurrence letter is included in the Draft EA.

Since the Services do not evaluate No Effect calls to listed species, including justification for such calls in the body of the EA is especially important.

Due to the absence of such concurrence at this stage, it is incumbent upon APHIS to disclose its determinations for all species and the measures it plans to implement to avoid impacts to listed species.

We provided several comments on inadequacies of last year’s Biological Assessment in our 2021 comment letter (for example, scant or incomplete reasoning to support conclusions, lack of analysis of impacts to pollinators or prey of listed species, lack of clarity on whether drift analyses were available to USFWS – and other comments) and hope that APHIS took steps to improve this year’s BA. Please incorporate those comments by reference.

In the 2022 EAs, APHIS references buffers that will be applied to protect listed species, but does not provide any detail on how large these would be and whether they would vary by chemical, formulation or application method. As a result it is impossible for us to evaluate the adequacy of protection for listed species. However, we note that in the 2021 concurrence letter from FWS included in the 2021 Final EA, buffers for ground sprays were ambiguous. We urge APHIS to include buffers should ground applications be used.

Also, from last year's BA, it appeared that Montana APHIS was planning to allow aerial or ground applications of diflubenzuron or carbaryl bait within 3 miles of the Spalding's catchfly habitat.

If so, APHIS has not discussed the potential for diflubenzuron to impact juvenile bees, and the long-term impact of this upon the persistence and viability of the Spalding's catchfly. If APHIS did not include this information in its BA, was USFWS apprised about the risks of diflubenzuron to the viability of this species, and thus is its concurrence adequately informed?

It is also unclear if APHIS will institute protections around only known occupied habitat or also around predicted suitable habitat (for example, see map of predicted suitable habitat for *Spiranthes diluvialis* from the Montana Natural Heritage Program (2020). Instituting buffers around predicted suitable habitat would be the prudent course of action for any listed species for which such modeling is available.

Finally, APHIS makes no mention of how it will consider upstream and watershed effects to species that utilize streams or rivers. The diflubenzuron label indicates that the chemical is subject to runoff for months after application. Given this, together with the vast size of past treatment areas, numbering in the hundreds of thousands of acres in many cases, such considerations are necessary.

- Please see the Biological Assessment and Concurrence Letter in this Final EA.

16. The monarch butterfly, now a candidate species under the Endangered Species Act, needs protection from liquid insecticides.

No information is available in the EAs about the potential for effects to the monarch butterfly, recently designated a Candidate species under the Endangered Species Act. Similarly no conservation measures are included. APHIS must address the oversight and analyze impacts to the monarch under all alternatives

In 2016 and 2017, the U.S. Department of Agriculture National Resources Conservation Service's (NRCS) developed regional Monarch Butterfly Wildlife Habitat Evaluation Guides, and discouraged placement of monarch breeding habitat within 38 m (125 ft.) of crop fields treated with herbicides or insecticides (NRCS 2016).

The risk of carbaryl applications may be unacceptably high for Lepidoptera, including the monarch, based on data from Abivardi et al. (1999) as explained earlier in this comment letter. Any of the liquid insecticides poses a concern to caterpillars of these species if exposed. Chlorantraniliprole appears to be in the queue for APHIS use in the suppression program in the near future. Chlorantraniliprole is sometimes considered non-toxic to honey bees but is very important to be aware of its high toxicity to other pollinators. Krishnan et al. (2021) tested chlorantraniliprole along with five other insecticides on monarch caterpillars, finding that chlorantraniliprole was far and away the most toxic to monarch caterpillars when consumed, even more so than the neonics tested. This causes us considerable concern if indeed chlorantraniliprole is adopted for use under the APHIS program.

In addition, lepidopteran species are often quite sensitive to diflubenzuron, as documented elsewhere in this comment letter, therefore, impacts to this highly diminished species from diflubenzuron should be specifically analyzed.

- The commenter posed a similar comment in 2021. Please see the response to comment #11 in the 2021 EA. Again, the commenter discusses chlorantraniliprole, a chemical that APHIS has not included as an alternative under this EA.

17. Carbaryl has been analyzed on listed species nationwide with widespread "likely to adversely affect" determinations –but no mention of this or mitigation for its harmful effects is found in the EAs.

The EAs do not mention a recent nationwide consultation effort on carbaryl's effect to listed species. EPA released a final BE for carbaryl in March 2021. This BE made determinations of Likely to Adversely Affect (LAA) for 1,640 species and 736 species' critical habitats. The BE includes a documentation of a variety of effects to birds, mammals, insects, bees, fish, aquatic inverts, and plants. While the consultation has yet to be fully completed, these determinations are an indicator of widespread impact from use of this chemical.

- The commentor posed similar comments in both 2020 and 2021. Please refer to APHIS response to comment 17 in the 2020 EA.

18. Aquatic areas are not adequately protected with the existing buffers

Given the potential for drift (outlined above and charted in the APHIS 2010 BE to NMFS) and the critical importance of aquatic areas in arid rangeland environments, the current buffers for aquatic habitats do not provide enough margin of safety. Significant drift may still occur even with buffers of 500 feet. In addition, a huge number of rangeland species depend on riparian and aquatic areas.

- All bodies of water are buffered according to APHIS Treatment guidelines and the protective measures agreed upon during the consultation process. If the land manager requests a greater buffer distance around water or other sensitive sites APHIS follows that request.

19. Freshwater mussels are at risk across the country and need particular attention.

The Dimilin label indicates that the product is toxic to mollusks. The Sevin XLR Plus label indicates that the product is extremely toxic to aquatic invertebrates.

Nationally, more than 90 mussel species are federally listed as endangered and threatened, and more than 70% are thought to be in decline. About 32 species are thought to have already gone extinct. In the western U.S., populations of western pearlshell, California floater, and western ridged mussel are all in decline, especially in Arizona, California, Montana, and Utah.

The 2019 EIS includes an aquatic residue analysis but does not take the next risk assessment step of comparing its residue analysis to known toxicity endpoints for freshwater mussels or other aquatic invertebrates.

- All bodies of water are buffered according to APHIS Treatment guidelines and the protective measures agreed upon during the consultation process. If the land manager requests a greater buffer distance around water or other sensitive sites APHIS follows that request.

  APHIS believes the buffers for aquatic habitats are protective of the freshwater mussels the commenter has identified. Implementation of the proposed buffers along with the other mitigation measures will provide protection of mussel food items as well as any freshwater fish hosts that are required for transformation of glochidia to juvenile mussels.

  The commenter gave the same comment in the 2020 EAs. Please see APHIS response to comment 42 in the 2020 EAs.

20. APHIS includes no information about whether an NPDES permit has been obtained, and what provisions it includes.

APHIS includes no information about whether an NPDES permit has been obtained, and what provisions it includes. As described on the Dimilin 2L label, diflubenzuron is susceptible to runoff, and could result in discharges to surface water. Under the Clean Water Act, discharges require permit coverage under the National Pollutant Discharge Elimination System. An NPDES permit may be required. Even if an NPDES isn't required for certain activities, APHIS still has a duty to comply with state water quality standards under the Clean Water Act. Further, an NPDES permit does not absolve the agency of its duty to disclose impacts to water quality under NEPA.

Aquatic impacts could occur weeks or months beyond the treatment period, given difluenzuron's persistence. It is not clear if environmental monitoring is conducted in such a way as to pick up delayed transfer of diflubenzuron to nearby waterways.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 17 in the 2021 EAs.

21. Special status lands

Montana contains numerous areas of special status lands. However, the EAs contain no analysis of impacts to or any specific protections to be accorded to special status lands such as Wilderness areas, Wilderness study areas, National Monuments, National Parks, Research Natural Areas, National Wildlife Refuges, Important Bird Areas and/or designated or proposed Areas of Critical Environmental Concern within or near potential treatment areas. This is especially disheartening, since these areas are so associated with some of the last refugia for declining species, as is made evident in the BA, which identifies the areas where species are known to occur. In addition there is no mention of whether the program is in compliance with the 1977 Montana Wilderness Study Area Act.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 18 in the 2021 EAs.

22. Avoidance of Lands Where Organic or Transitioning Production Occurs

The general treatment guidelines for 2022 state: *"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."*

Montana's questionnaire for landowners requesting treatment also includes a question about local organic producers.

We are concerned about the potential for drift and runoff to certified organic or transitioning lands. Certified organic farmers who receive drift, even if unintentional, would risk losing certification for three years. That would mean these producers would also lose any income from those acres, and they would then have to manage affected lands completely separately from other unaffected acres.

Organic producers place a large emphasis on improving biodiversity on their lands, per the National Organic Standard. Many organic farmers approach this by establishing or conserving permanent pollinator and native habitat – an effort that can take years.

Montana is the nation's largest producer of organic wheat and lentils. Depending on the location of treatments this could be a significant impact to the state.

The general guidelines, crafted for the program as a whole, and included in each state's EAs, leave a number of questions about notification and avoidance of impacts to organic or transitioning producers, including:

- It is unclear if each state maintains a complete registry of organic and transitioning producers, and if that registry is spatially referenced. Many producers farm land in disparate locations. There are a number of certifying organizations across the west, not just the states. It is unclear if these different organizations share information, and if APHIS would be accessing a complete list in any locality.
- It is unclear what the notification process to organic and transitioning producers is. A public meeting is likely to not be sufficient. Given the short time frames between final treatment decisions and the fact that treatments usually occur in the early, critical part of the growing season, it also seems likely that some organic producers could completely miss a notification.
- APHIS appears to make the establishment of buffers optional. Given the issues we've outlined with notification, optional buffers are not a sufficient protection.

While it is helpful that landowners requesting treatment are asked to identify organic producers in their vicinity, landowners may not, and should not be expected to, know the exact agricultural processes and philosophers of all landowners in the vicinity. We are concerned that some organic, and especially transitioning, parcels could be missed if APHIS does not cast a wide net to identify all locations where organic or transitioning farms exist.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 19 in the 2021 EAs.

23. Extent of treatment to private lands

We have concerns about grasshopper treatments on public lands, which have resource values above and beyond cattle forage that must be taken into account. The EA notes that APHIS will also take requests for treatment from private landowners. The Montana EAs even include stipulations for treatments on BLM lands when those treatments are requested by non-BLM parties. In addition to our public lands concerns, we are also concerned about impacts to resources and species that overlap with private lands and the scope of APHIS's program, which is not supposed to be geared toward private lands. For example, determining occupied habitat occupied by listed or candidate species on private land may be difficult or tricky.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 20 in the 2021 EAs.

24. Cumulative effects analysis

There is insufficient analysis of cumulative impacts in the EAs. For example, the EAs do not adequately disclose the locations where spraying has occurred in the past, nor did the APHIS 2019 EIS.

In the EAs, APHIS states that cumulative effects "are not expected to be significant" basing its reasoning on the assertion that the probability of an outbreak occurring in the same area as a previous outbreak is unlikely. Yet, APHIS does not disclose the scale of treatments in any previous years, nor the impact of those treatments.

Based on our independent review of contract solicitation maps (not easy to find), Montana's history of recent treatments does not support its statement that the probability of an outbreak occurring in the same area as a previous outbreak is slim. Montana in fact has treated large areas in close proximity, and even in overlapping areas in recent years, and it appears that large treatment areas have been the norm for quite some time. Cigliano et al. (1995), in examining decades-long patterns of outbreaks in Montana, were also able to map higher-probability outbreak areas. APHIS also places emphasis on the fact that its policy dictates that only one treatment a year is conducted, but does not address nearby impacts on private or state lands where more than one treatment may be conducted, which could contribute to cumulative impacts. In addition, ecological impacts can be severe even if a repeat treatment is unlikely if treatment results in adverse effects to a species confined to a small range, already in decline, or both.

APHIS mentions the many products that may be used on private lands and states that the impact of these private lands uses could be worse if the APHIS program did not exist. This self-justification of the program is based on speculation, and does not consider another alternative – what the impacts might be if chemical control were not the primary solution considered by APHIS.

In addition, some states have grasshopper programs that also operate at the state and local level. There is no mention of this or of their scale, if these in fact exist in Montana.

In addition, impacts to migratory species from cumulative exposures (such as honeybees which, as the EA discloses, are in large part transported to California during the almond bloom) are not addressed.

Finally, the EAs do not discuss in any meaningful way the cumulative effects flowing from APHIS's treatments and other pesticide treatments conducted by private, state, tribal, and federal actors. APHIS does not exist in a vacuum; pesticide use is widespread. Yet the EAs sweep potential cumulative effects under the rug by focusing only on treatments conducted in the precise same areas as APHIS's treatments. There is no discussion of how treatments conducted *nearby*—pesticides applied to crops by farmers, for instance—might interact with APHIS's treatments.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 21 in the 2021 EAs.

25. For APHIS and its cooperative land management agencies, building resilience into the system should be the key goal.

APHIS does not identify how it coordinates with land management agencies, such as the BLM, to address site-specific sensitive issues such as sage-grouse, Resource Management Plan requirements, limitations on special status lands, etc. Due to the spatial specificity of such issues, the national MOUs simply cannot adequately address such concerns.

Unfortunately APHIS also makes no mention in the EAs of what is most sorely needed: cooperation and planning with land managers to take appropriate steps to prevent the types of grasshopper and cricket outbreaks that are now dealt with by chemical controls. We believe that APHIS and its land management partners need to invest in longer-term strategic thinking regarding grasshopper management on Western rangelands. Building resilience into the system should be the key goal.

According to the Rangeland Management section of the Grasshopper IPM handbook, high diversity in canopy structure and plant species composition tends to support high diversity in grasshopper species and this diversity and composition tend to provide stability and to suppress pest species that exploit disturbance.

Emphasizing cultural techniques through appropriate grazing management could help to reduce reliance on pesticide applications and allow abiotic and biotic factors to regulate grasshopper and Mormon cricket populations to the greatest extent possible. For example Onsager (2000) found that (compared to season-long grazing) rotational grazing resulted in significantly less adult *Melanoplus sanguinipe*s grasshoppers and significantly less damage to forage. Under rotational grazing, the nymphs developed significantly slower and their stage-specific survival rates were significantly lower and less variable.

Consequently, significantly fewer adults were produced significantly later in the season under rotational grazing. Seasonal presence of all grasshopper species combined averaged 3.3X higher under season-long grazing than under rotational grazing. Local outbreaks that generated 18 and 27 adult grasshoppers per square meter under season-long grazing in 1997 and 1998, respectively, did not occur under rotational grazing. The outbreaks consumed 91% and 168%, respectively, as much forage as had been allocated for livestock, as opposed to 10% and 23%, respectively, under rotational grazing.

In addition, some research suggests that grasshoppers could be managed without insecticides by carefully timing fire and grazing to manage vegetation and reduce habitat suitability for target species (Capinera and Sechrist 1982; Welch et al. 1991; Fielding and Brusven 1995; O'Neill et al. 2003; Branson et al. 2006). While more research is needed to develop species- and region-specific management treatments that use alternatives to pesticides (Vermeire et al. 2004), there is likely enough data to employ cultural techniques now.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 22 in the 2021 EAs.

26. Overall Transparency of the APHIS Grasshopper / Mormon Cricket Suppression Program Must Be Improved.

We appreciate that public notice of this site-specific EA and its comment period was posted at the APHIS website. Grasshopper suppression efforts, especially those on federal lands, are of more than local concern. The action being proposed is a federal action, proposing to use federal taxpayer funds. The species of the United States, our natural heritage, do not observe ownership, county, tribal, or state boundaries. As such, APHIS should not claim that grasshopper suppression actions are only of local

interest. All proposed grasshopper suppression actions and environmental documents should be noticed properly to stakeholders across the United States. The proper and accepted way of doing this is to publish notices and decisions in the Federal Register.
We understand that this program may have attracted little public attention in the past. This is not a valid reason for not using broad methods to invite public participation, such as notices of availability in the Federal Register. It is past time for APHIS to be more transparent about its actions, particularly on public lands. To do so will build trust. As such, there is little to lose and much to gain.

- The commentor gave the same comment in the 2021 EAs. Please see APHIS response to comment 23 in the 2021 EAs.

27. The 2022 EA has the same/similar deficiencies as the previous EAs so comments by CBD and Xerces Society for Invertebrate Conservation comments for the 2020 and 2021 EAs are still applicable.

- The commenter submitted similar comments for the 2021 EAs. See response to comment #21 of the 2021 EA. The responses for comments 1 through 174 are found in the 2020 EAs. These responses are equally applicable for the 2021 EAs.

28. **The EA assumes recreation is not a significant use of potentially treated areas. Recreational uses of rangelands have dramatically increased, including in areas where recreation was not previously a significant use.**

- The commenter wrongly assumes APHIS does not consider recreation to be a significant use of rangelands in Montana. APHIS talks about recreational use of rangelands on pages 14-15 of the EAs under the "Socioeconomic Issues" section of the "Site-Specific Considerations". As described by the local populations and governments within the impacted areas, the presence of high densities of Mormon crickets significantly deter from recreational activities on rangelands. Recreation takes place in established areas that already have had significant disturbance by recreational activities (i.e. ATVs, vehicles, mountain bikes, camping equipment). In the presence of high densities of Mormon crickets and grasshoppers, campers and recreationalists migrate into areas that were not previously used for recreation and cause increased impacts to areas with less historical disturbances.

  APHIS does not treat directly onto campsites where recreationists are occupying. APHIS monitors the treatment areas and makes a concerted effort to notify potential recreationists directly and by posting notification of treatments at centralized points of entry. APHIS also consults with the land managing agency to identify areas of significant recreational use where individuals may be impacted and notify those individuals of treatment plans and work to restrict access into the treatment areas. APHIS would not conduct a treatment of rangeland if people were present.

29. **The EA does not consider impacts to recreation and recreationists, specifically treatment impacts on adults, children, horses, and dogs. Visitors do not want to be subjected to insecticide exposure, nor do they want their dogs, horses, or kids exposed.**

- APHIS would not conduct a treatment of rangeland if people or their pets were present. APHIS provides analysis of the potential effects of program applied insecticides on humans and animals in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. APHIS does not believe the program treatment will affect unseen bystanders or reduce recreational opportunities. Lastly, if a party was intending to recreate on the vast rangeland, they would be free to conduct those recreational activities anywhere else outside of the comparatively small grasshopper control areas. APHIS does not believe this minor inconvenience would cause significant impacts to the human environment.

30. **The EA does not consider impacts to species recreationists are traveling to see, including birds, butterflies, and bees.**

- APHIS provides analysis of the potential effects of program applied insecticides on humans and animals in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. APHIS does not believe the program treatment will have significant impacts on the rangeland populations of birds, bees or butterflies, or reduce recreational opportunities to see these animals. If parties wish to observe wildlife on the vast rangeland, they would be free to conduct those recreational activities anywhere else outside of the comparatively small grasshopper control areas. APHIS does not believe this minor inconvenience would cause significant impacts to the human environment.

31. **The EA failed to consider how treatments, including aerial spraying of diflubenzuron, would affect bumble bee sites. *Bombus centralis* and *Bombus huntii* have been reported near treatment sites outside of Mosby. These species and many other species exist in these areas likely because there is so much protected land around them. This includes multiple National Wildlife Refuges, protected wetland and wilderness areas, areas where wildlife should be able to thrive without exposure to insecticides.**

- APHIS provides analysis of the potential effects of program applied insecticides on pollinators including bumble bees in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously. See our responses to comments #3, 4, 8, 9, and 13 above; comments #5, 6, 9, 13 in the 2021; and comments #10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 38, and 41 of the 2020 EAs.

  APHIS does not believe grasshopper treatments will cause significant impacts to these pollinator populations.

32. **The EA fails to fully account for impacts of this program on native bees, various bumblebees, the American bumblebee may be present, various species of solidary bees. Spraying is occurring in and around areas where native bee species are reported.**

- APHIS disagrees with the commenter's opinion concerning the robustness of our risk analysis for native bees. APHIS provides analysis of the potential effects of program applied insecticides on pollinators including bumble bees in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously. See our responses to comments #3, 4, 8, 9, and 13 above; comments #5, 6, 9, 13 in the 2021; and comments #10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 38, and 41 of the 2020 EAs.

33. **Treatments in and around protected lands reduce the value of lands to wildlife (including bumble bees)**

- APHIS would like the commenter to explain in greater detail how the value of rangeland to wildlife is reduced after a destructive grasshopper outbreak is controlled. This unfounded assertion is so outlandish, the commenter must not understand the reality of grasshopper herbivory.

34. **The EA fails to fully account for impacts of this program on butterflies in the area. There may be species in the area that APHIS has failed to consider (particularly bees and butterflies. including many swallowtail, frittilary [sic], checkerspot, and sulfur species; monarch butterflies (candidates for ESA listing).**

- APHIS disagrees with the commenter's opinion concerning the robustness of our risk analysis for butterflies. APHIS provides analysis of the potential effects of program applied insecticides on non-target insects in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously. See our responses to comments #3, 4, 8, 9, and 13 above; comments #5, 6, 9, 13 in the 2021; and comments #10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 38, and 41 of the 2020 EAs.

APHIS does not believe grasshopper treatments will cause significant impacts to the butterfly populations named by the commenter.

35. The EA fails to consult Montana's species of concern list to consider impacts on listed species. Montana's list has eight species of butterfly, dozens of other invertebrates (including stoneflies, mayflies, dragonflies, damselflies, caddisflies, and more).

- APHIS is not obligated to consult on State "Species of Concern" lists to comply with the Endangered Species Act.

  APHIS provides analysis of the potential effects of program applied insecticides on non-target insects in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously. See our responses to comments 6 and 11 in the 2020 and 2021 EAs.

  APHIS does not believe grasshopper treatments will cause significant impacts to the specific insect populations named by the commenter.

36. The EA fails to consider impacts to species that depend on other (potentially) directly affected species for various parts of their life cycles.

- See response to comment 35.

37. The EA fails to fully account for impacts of this program on listed and non-listed insect species.

- APHIS disagrees with the commenter's opinion concerning the robustness of our risk analysis for insect species. APHIS provides analysis of the potential effects of program applied insecticides on non-target insects in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. The commenter has expressed these concerns repeatedly, and APHIS has addressed them previously. See our responses to comments #3, 4, 8, 9, and 13 above; comments #5, 6, 9, 13 in the 2021; and comments #10, 12, 14, 19, 20, 21, 23, 24, 25, 28, 38, and 41 of the 2020 EAs.

  APHIS does not believe grasshopper treatments will cause significant impacts to the specific insect populations named by the commenter.

38. The EA fails to fully account for impacts of this program on greater sage grouse as treatments have occurred in, adjacent to, and around greater sage grouse habitat. Impacts like having food sources eliminated and causing disturbances from treatment activities like aerial spraying, includes, but is not limited to, treatment areas east of Forestgrove.

- See response to comment 11 in this Final EA.

39. The EA does not address how treatments impact the environment when combined with other pesticide treatment activities conducted by private, local, state, and other federal programs. Millions of acres of federal public land are treated with pesticides for various reasons each year. APHIS's analysis does not consider how these other treatments conducted by the federal family interact with its own activities, much less other treatments such as those conducted by private entities. Further analysis is needed; APHIS should look at cumulative effects of treatments on impacts to non-target species. Likely all these treatments combined greatly exacerbate impacts to non-target species.

- APHIS discussed the potential of overlapping chemical treatments in the areas where outbreaks of grasshoppers have occurred or could occur in the future in the cumulative impacts section of the final EIS, from page 79 to 84 and in the draft EA. It is unlikely there would be significant overlap between other APHIS pest programs and the grasshopper program. Current label restrictions and operational mitigations minimize significant exposure of soil, water and air to Program insecticides. Grasshopper chemical treatments are not expected to persist or bioaccumulate in the environment and there is a lack of significant routes of exposure.

40. The EA does not incorporate new knowledge about pesticides (carbaryl, malathion).

- These concerns are <u>similar to</u> comments submitted by the Center for the 2021 EA's, see response to comment #12 of the 2021 EA. Please see the APHIS responses to comments #17 in the 2020 EAs.

41. APHIS should be communicating to EPA and FWS about its use of pesticides in this program so these agencies can incorporate this information into their endangered species analyses.

- The use of what chemicals used in Montana is detailed in the Biological Assessment submitted to FWS and concurred to APHIS by FWS. The USFWS Field and State Offices are all clearly aware of the pesticides used in Montana. These USFWS offices all review the Biological Assessment and prepare the concurrence letters addressed to APHIS in Montana. The pesticides used in Montana are approved for use by US EPA and the state of Montana. The pesticide labels are strictly adhered too as well other Program measures designed to reduce risk to nontarget organisms, including listed species.

42. The EAs lack of specific information on treatments and their impacts.

- This is a similar comment from the 2020 and 2021 EA's see response to comment # 10 of the 2021 EA. A similar comment from the 2020 EA's. Please see the APHIS responses to comments 1, 2, 3, 4, 5, 6, 8, 55, 91, 92, 95, 99 and 158 in the 2020 EA's. APHIS explained the reason why treatment maps cannot be provided in the draft Environmental Assessments in the 2020 and 2021 EA's.

  APHIS disagrees with the commenter's opinion concerning the robustness of our risk analysis in the EAs. APHIS provides analysis of the potential effects of program applied insecticides on the human environment in the Environmental Consequences section of the EAs, the Potential Environmental Impacts section of the Programmatic EIS (2019) and the human health and ecological risk assessments prepared for insecticides used by the grasshopper program. APHIS wishes to remind the Center that the NEPA standard of risk evaluation is "Significant Impacts". We believe based on our risk analysis those effects will not be long lasting or severe enough to cause significant impacts. Our operational procedures prevent or reduce the severity of these effects.